
CUBIES
Version 1.1b
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CUBIES: A 2D Mobile Game

A Software Project

Presented to the

Faculty of the College of Computer Studies and Systems

University of the East, Manila

In Partial Fulfillment

of the Requirements for the Degree in

Bachelor of Science in Computer Science

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March 9, 2007

ABSTRACT

This game will run on a mobile phone with a Java-enabled capability using a set of game technologies on the device. Cubies is an addictive puzzle game with elements of strategy. The objective of the player of this game is to eliminate all cubes for a limited period of time. The player will be able to achieve this only if he chooses the right strategy and carefully plan all your moves. Finding a correct combination is a no easy task that will challenge even the most experienced puzzle enthusiasts. The number of cubes on the playing field will increase from level to level, and the winning strategy will become more and more complex. Completing all of them takes sufficient amount of time, but the player will certainly not be bored.

In every level, there is a given randomized cube in able to eliminate similar cube patterns. If the cube pattern eliminated has a similar adjacent pattern, then all of them will be eliminated whether it is arranged in a row or in a column. Otherwise, the cube will become part of the cubes to be eliminated. The user may use the Super Cube if the given randomized cube pattern does not match any of the cube pattern that can be eliminated directly, but the number of Super Cube is limited depending on the difficulty set by the user. If the user runs out of time or when the cube reaches the cube ladder then it means game over. The user can be a part of the high scorers if he beats any of the current high scorers in the table and will display the 5 letter codename of the user which he entered during the start of the game.

DEDICATION

We whole-heartedly dedicate this project to the following persons who made this venture possible:

To our parents who are with us giving their best to provide us with everything we need.

To our advisers, who shared their expertise in the technical aspects and for their encouragement they had given to us.

To the technical experts who generously assisted us in gaining professional advice and giving some references.

To all our friends who give inspiration for us to finish this project.

ACKNOWLEDGEMENT

While everybody has been busy with their respective concerns, we have been busy working on this documentation. It took months of painstaking writing and editing before we saw it printed and published.

Now that it is done, we would like to express our sincerest gratitude to the people whose advises had made the work easier. Their invaluable cooperation helped us through the proper documentation of this work.

To Michael Angelo Lampa, who lend us his Nokia 6630 cellphone.

To Prof. Bernadette San Diego, who gave us an inspiration to do our very best. And for patiently correcting our Data Flow Diagram during the hard times.

To Prof. Jose Ronello Bartolome, whom we seek advice when we are in the middle of confusion in coding the game.

To Prof. Dhonne Manalo, as our THESA Adviser, who initiates and encourages us to develop our game in a mobile phone.

To Prof. Arne Bana, as our SWPRJ Adviser, whose suggestions had helped in modifying the game concept and for his praise, positive criticism and encouragement in the development of our game.

To all of our professors who generously share their knowledge to us that had greatly helped in understanding the game concept.

And lastly to the Almighty God, who made all this things possible and for giving us blessings to overcome all the obstacles that we have encountered. May everything from this documentation be use for his Holy Will.

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Chapter 1

INTRODUCTION

INTRODUCTION

In recent times, mobile games have gained popularity for providing personal entertainment. The popularity of mobile gaming plays a key role in revenue generation for the cellular carriers, mobile advertisers and handset makers while generating numerous opportunities for game developers and associated professionals.

Mobile gaming has already proved very popular in Japan, where people are happy to pay to download relatively simple games that can be played anywhere. This initiates the development of new technology like Java to create games for mobile game lovers, as well as the spread of new handsets, which were effectively small computers.

With the number of mobile gamers around the world expected to reach 220 million by 2009, the mobile gaming business is projected to expand to higher levels and constitute a bigger portion of the pie for the cellular carriers and handset makers. Mobile games have become a new source of advertisements of products. (Chauhan, 2006)

In this chapter, the researchers will be tackling about the context of the study, which explains the reason for the researchers to conduct this study. The objectives will provide answers to support the establish problems in the context of such study. The scope and limitation of the study discusses the extent of the thesis. And the significance of this study explains the benefits of the thesis for future researchers and its contribution to the society.

CONTEXT OF THE STUDY

The first-ever mobile phone game was the black-and-white Snake embedded in the Nokia 6110 model in 1997. The gameplay was simple, as the user led the "snake" around the screen to collect dots. Mobile gamers would remain color blind until 2001, when Nokia introduced the first color screens; a major step in the presentation of mobile games.

Figure 1: Nokia 6110 model in 3 different colors

After the release of colored screen phones, mobile games have evolved from series of dots to 2D and 3D graphic effects, ranging from fun educational games to interactive adventure games. In comparison with PC games, mobile games are far from being “Realistic” in terms of graphical features. Simply because mobile phones have limits to how much graphics it can handle unlike PC’s, they can be upgraded with video cards, sound cards, etc. Mobile phones are evolving fast, every month new technologies are developed and mass-produced, because of man’s need for satisfaction. (McLachlan, 2006)

The mobile gaming industry is now growing as new technology arises, and this means that mobile games can now be a little bit “sophisticated” be more “realistic” than ever. The researchers have decided to develop a 2D game named “Cubies” this game will run on a mobile phone with a Java-enabled capability using a set of game technologies on the device. The objective of the player of this game is to eliminate all cubes on a number of successive levels. The player will be able to achieve this only if he chooses the right strategy and carefully plan all his moves. Finding a correct combination is no easy task that will challenge even the most experienced puzzle enthusiast. The number of cubes on the playing field will increase from level to level, and the winning strategy will become more and more complex. Completing all of them takes sufficient amount of time, but the player will certainly not be bored.

OBJECTIVES OF THE STUDY

The researchers have placed the following objectives that should be observed all throughout the study.

General Objective

The general objective of the study is to develop a mobile game that will encourage Filipino computer programmers to be more active in making mobile games that will make the Philippines at par with other countries in the field of mobile game development.

Specific Objectives

Below is an in-depth list of the objectives that would help the researchers establish the overall objective for this study:

- To design a prototype for the game program that will run in an emulator for the researchers to test and enhance the system.
- To contribute to the existing resources for future researchers in the field of mobile game development.
- To increase the level of competency of the Filipino computer programmers.
- To change the perspective of Filipinos towards locally developed mobile games.

SCOPE AND LIMITATIONS OF THE STUDY

The scope and limitation of the study discusses the boundary that the study will be dealing with. It enumerates all the features that will be included and excluded in the study. This enables the researchers to know the limit of their research so as to provide an adequate understanding of the proposed system to be undertaken with.

Below are the scopes to be encompassed in the study:

- It will cover the development of mobile games from the birth of mobile phones, video game consoles and lastly the incorporation of mobile games in different mobile phones.

- It discusses the current technologies used in mobile games. This is significant because this touches the different programming languages that are used to create an interactive and entertaining mobile game.
- It also discusses the pros and cons of playing a mobile game. Since many people uses mobile phones to play mobile games, then this thesis will discuss the effects of this mobile games to them.
- This mobile game will compose the following menu namely; New Game, High Score, Settings, Instructions, and Exit Game. These menus are necessary for the user to customize the way he wants to play the game.
- This mobile game will also store the top 5 High scorers of the game and will show the 5 letter codename of the user which he entered during the start of the game.

Below are the limitations of the study:

- It will only focus on the 2D mobile game development. Since the proposed mobile game will run in a 2D environment, then this thesis will not tackle 3D mobile game development.
- It will not dwell deeper in network game technology. Since the proposed mobile game will run in a mobile phone, then there will be a minimal discussion about the network game technology.

- This mobile game is only intended for a single player to enjoy and entertain. Since the player does not require to know complex gaming rules, then the game is relative easy to play.
- This mobile game does not update its contents except high score data.
- This mobile game will only run in an emulator of a J2ME wireless toolkit or in an emulator of a different cellphone brands such as Nokia, Sony Erickson, Siemens and Motorola.
- It can be deployed in the cellphones that supports MIDP 2.0 and CLDC 1.1 such Nokia models which are series 60 to 90.

SIGNIFICANCE OF THE STUDY

The issue regarding Mobile Game Culture helps clearly in understanding the genuine meaning of mobile enhancements and technology.

The study would be very beneficial to our country in order to be recognized in the field of mobile game development around the world and the Filipinos will be motivated to develop more mobile games. If this would happen, our country will be known as one of the mobile game producers and might contribute to uplift the economy through export of this game.

Players would recognize what Filipino programmers can produce and what they can contribute to the new technology of our modern world. They can be proud to the Filipinos for having produced this mobile game.

As the researchers of this system, we will acquire new skills in developing mobile game. This will serve as a jumpstart for the continuous future development of this mobile game.

The system will provide future researchers a reference and help gain knowledge in creating systems related to this.

Mobile phone companies can acquire this game to be put into their newly manufactured mobile phones.

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

REVIEW OF RELATED LITERATURE AND STUDIES

The Review of Related Literature and Studies tackles the different articles that were taken from books, periodicals, and electronic sources which are summarized and arranged according to the degree of importance. Few theses taken from both the UE Computer Science Library and the World Wide Web are used in this chapter in order to relate our study with their previous theses. In addition, the conceptual framework and the operations definition of terms are included in this chapter to provide the reader the needed components for the proposed system to work and the terms which are frequently used in the study that must be familiar to the readers.

Review of Related Literatures

I. Evolution of Mobile Phone

The first radiotelephone service was introduced in the US at the end of the 1940s, and was meant to connect mobile users in cars to the public fixed network. In the 1960s, a new system launched by Bell Systems called “Improved Mobile Telephone Service" (IMTS), which brought many improvements like direct dialing and higher bandwidth. The first analog cellular systems were based on IMTS and developed in the late 1960s and early 1970s. The systems were "cellular" because coverage areas were split into smaller areas or "cells", each of which is served by a low-power transmitter and receiver.

First generation - 1G analog system for mobile communications saw two key improvements during the 1970s: the invention of the microprocessor and the digitization of the control link between the mobile phone and the cell site. Advance mobile phone system (AMPS) was first launched by US. The 1G mobile system, which is best on Frequency Division Multiple Access (FDMA) technology which allows users to make voice calls within one country.

The first handheld mobile phone to become commercially available was the Motorola DynaTAC 8000X, which received approval in 1983. Mobile phones began to proliferate through the 1980s with the introduction of cellular phones based on cellular networks with multiple base stations located relatively close to each other, and protocols for the automated "handover" between two cells when a phone moved from one cell to the other. At this time analog transmission was in use in all systems.

Second generation - 2G digital cellular systems were first developed at the end of the 1980s. These systems digitized not only the control link but also the voice signal. The new system provided better quality and higher capacity at lower cost to consumers. Global system for mobile communication (GSM) was the first commercially operated digital cellular system which is based on TDMA.

In September 1981, the first cell phone network with automatic roaming was started in Saudi Arabia, which was manufactured by an NMT system.

In the 1990s, second generation (2G) mobile phone systems such as GSM, IS-136 ("TDMA"), iDEN and IS-95 ("CDMA") began to be introduced. The first digital cellular phone call was made in the United States in 1990.

In 1991, the first GSM network opened in Europe. 2G phone systems were characterized by digital circuit switched transmission and the introduction of advanced and fast phone to network signaling. In America, the IS-54 standard was deployed in the same band as AMPS and displaced some of the existing analog channels.

Third generation – Not long after the introduction of 2G networks, 3G systems were being developed. Inevitably there were many different standards with different contenders pushing their own technologies. At that point, the vision for a single unified worldwide standard broke down and several different standards were introduced.

3G initiative came from device manufacturers but not from operators. In 1996, the development was initiated by Nippon Telephone & Telegraph (NTT) and Ericsson. In 1997, the Telecommunications Industry Association (TIA) in the USA chose CDMA as a technology for 3G. Then in 1998, the European Telecommunications Standards Institute (ETSI) did the same thing. And finally in 1998, wideband CDMA (W-CDMA) and cdma2000 were adopted for the Universal Mobile Telecommunications System (UMTS).

At the beginning of the 21st century, 3G mobile phone systems such as UMTS and CDMA2000 1xEV-DO have now begun to be publicly available.

W-CDMA and CDMA 2000 are two major proposals for 3G. In this CDMA the information bearing signal is multiplied with another faster rate, wider bandwidth digital signal that may carry a unique orthogonal code. W-CDMA uses dedicated time division multiplexing (TDM) whereby channel estimation information is collected from another signal stream. CDMA 2000 uses common code division multiplexing (CDM) whereby channel estimation information can be collected with the signal stream.

3G systems promise faster communications services, including voice, fax and Internet, anytime and anywhere with seamless global roaming. ITU's IMT-2000 global standard for 3G has opened the way for enabling innovative applications and services (e.g. multimedia entertainment, infotainment and location-based services, among others). The first 3G network was deployed in Japan in 2001. 2.5G networks, such as Global Packet Radio Service (GPRS) are already available in some parts of Europe. The 3G technology supports bandwidths ranging from 144 Kbps with high speed movement (e.g. vehicles), 384 Kbps (e.g. on campus) and to 2 Mbps for stationary (e.g. in building).

Nokia, the world's leader in mobile communication recently announced that they will bring mobile gaming into the next level. Nokia will expand wireless multiplayer platform for level or remote gaming by the use of Bluetooth and cellular networks; enriching, interactive mobile-gaming experience. (Nokia brings mobility to the games industry, 2003). It has team up with Rage Software, the

fourth largest game software house in United Kingdom, in able to develop mobile gaming facilities for wireless carriers around the world. (Gold, 2001)

Motorola, the largest mobile phone maker in the US, produced its wireless device that combines the power of a Personal Digital Assistant (PDA), two-way radio, and internet-ready mobile phone. It is also the first phone in the world to use Java-based software environment called the Motorola i85. The biggest highlight at the phone is its full-customability showing users to adjust the phone's setting. Incorporating a Microsystem's Java 2 Platform Micro Edition (J2ME) - the first in a mobile phone, the i85 allows users fully customize the phone's application for their individual needs. (Villafania, 2001)

In 2001, Mobile phone makers such as Nokia, Erickson, Motorola, and Siemens teamed up in an effort to develop a wireless gaming standard. This will be an important source of future income for operators of the third-generation (3G) mobile networks. (Phone makers team up to push wireless games, 2001)

Fourth generation – In the field of mobile communication services, the 4G mobile services are the advanced version of the 3G mobile communication services. The 4G mobile communication services are expected to provide broadband, large capacity, high speed data transmission, providing users with high quality color video images, 3D graphic animation games, and audio services in 5.1 channels. We have been researching the vision of 4G mobile communication systems, services, and architectures. We also have been developing the terminal protocol technology for high capacity, high speed packet

services, public software platform technology that enables downloading application programs, multimode radio access platform technology, and high quality media coding technology over mobile networks.

At present, the download speed for mode data is limited to 9.6 kbit/sec, which is about 6 times slower than an Integrated Services Digital Network (ISDN) fixed line connection. Recently, with 504i handsets the download data rate was increased 3-fold to 28.8kbps. However, in actual use the data rates are usually slower, especially in crowded areas, or when the network is "congested". For third generation mobile (3G, FOMA) data rates are 384 kbps (download) maximum, typically around 200kbps, and 64kbps upload since spring 2001. Fourth generation (4G) mobile communications will have higher data transmission rates than 3G. 4G mobile data transmission rates are planned to be up to 20 megabits per second. (Take, 2004)

II. History of Mobile Gaming

Before the advent of mobile games, video games have been around for nearly 50 years. Many companies have participated in the development of video games such as Nintendo Co. Ltd., Atari, Midway, Coleco, Namco, IBM, Apple, Microsoft, Sony, Sega, Nokia, and Squaresoft.

And to think that if it were not for William Higinbotham and his oscilloscope, gamers around the world would still be playing board games. With his oscilloscope, he developed a game called “Tennis for Two” released in 1958. (The Gaming Console, Nearly 50 Years Old, 2005)

After the success of William's "Tennis for Two", a series of games were released from various companies. Then in 1972, Magnavox' Odyssey, which is designed by Ralph Baer, becomes the first home game console. Meanwhile, Nolan Bushnell and Ted Dabney form Atari and hired programming wiz Al Alcorn, whose first project is to design an arcade game called "Pong". Atari's "Pong Doubles" became the first arcade game which allows four players to simultaneously play. Three years later, Al Alcorn's dedicated TV game "Pong" becomes Atari's first home video game.

Years later, people wanted more from these video games. So in 1980, Namco gave them "Pac-Man", the first animated main character in an arcade game. And a year later, Nintendo released the game "Donkey Kong".

In 1990, SquareSoft released "Final Fantasy", the first in what will become the best-selling console role-playing series ever. Also Nintendo introduced a new kind of game console – the Game Boy with changeable game cartridges. This device became dominant in the market and marks nearly a synonym for portable game consoles. Nintendo with its partners has launched hundreds of game titles for the device and its more advanced successors. Sony released PS (PlayStation) in Japan four years after the release of "Final Fantasy". In 1995, Sony decided to release PS in America. Two years later, Sega released a home video game system called Sega Dreamcast.

In the year 2000, PS2 was released. It is backward-compatible meaning games from the previous version of PlayStation can also be played in this

console. A year later, Microsoft released Xbox and Nintendo released GameCube and the Game Boy Advance handheld system, which is backward-compatible with Game Boy and Game Boy color cartridges. Four years later, Sony introduced a new version of the original PS2 in a smaller and slimmer box. In 2005, Sony released their first handheld device called PSP (PlayStation Portable), it was said that most games look good in PSP than those in PS2. This was also the time when Sony, Microsoft and Nintendo revealed their next-generation game consoles namely PS3, Xbox 360, and Nintendo Revolution respectively. PS3 is now set for a November 2006 launch. (Brief Video Game Console History, 2006)

Mobile games have been around and been developed during a period of over twenty years, one of the earliest examples are the handheld Game & Watch games from Nintendo that was manufactured during 1980 to 1991. It is said that it is the “progenitor” of all mobile game devices. Each of these games is a single game by itself and has no changeable cartridges. The games were quite simple with few controls and a limited game story. These games were mobile in the sense that they could be use in almost every environment; the game is not limited to a single surrounding. These games can only be played in single player mode. There is no support for a multiplayer gaming experience.

Figure 2: Game & Watch game console from Nintendo

The development of mobile games continues with other handheld devices like the Nintendo Game Boy in 1989. These games were more advanced than the early Game & Watch games. They had better graphics and audio, more advanced controls and an extended style of gaming. These games are also mobile in the sense that they can be used everywhere. The Game Boy later supported multiplayer use by connecting the devices with a cable; the multiplayer gaming experience is, in this case, dependent on other Game Boys in the vicinity of each other.

Figure 3: Game Boy and Game Boy Advance from Nintendo

Games in mobile phones are also mobile games in the sense that they can be played almost everywhere and are not limited to a specific setting. The games are fairly limited and the graphics are often monochrome and the sound scheme is very basic. Some examples of these games are Tetris, Space Invaders and Worm. The games are no longer played with typical game consoles but with devices that can be used for a number of different things. The games can also provide a multiplayer experience with infrared transmission between two players. (Liljedal, 2002)

On the other hand, Mobile Phone manufacturers caught on the success of the major video game systems giants Sega and Nintendo with the Game Gear and Game Boy respectively and found an even more convenient way of amusing the users who are waiting to board a vehicle or are generally bored. (Mobile Gaming History, 2004)

When the European GSM cellular network was released in the early 1990s, there were instant demands for mobile phones despite their expensive handset prices and call rates. The competition among all the major handset manufacturers grew, all trying to include appealing features to be supplied or installed in handsets in order to try and win over customers. In 1996, Nokia released a mobile phone model 6110 with a game in it called “Snake”. Being the first mobile phone manufacturer to install a game on their mobile phones, Snake was the game which millions of people were playing competitively or just for fun and this became an instant success. Many other manufacturers tried to develop

their own games but people rather play Snake, which is a simple black and white game using simple graphics. And as soon as Nokia noticed that people loved the idea of putting games into mobile phones they started to enhance their phones making it more compatible with games of high requirements.

Wireless gaming emerged with Nokia's launch of the Snake game in 1997. The simple Snake-game became surprisingly popular and Nokia brought additional titles to their devices. Simple mobile games provide relaxation and an escape from stress.

With the introduction of Wireless Application Protocol (WAP) enabled phones and mobile phones with Java support, the players got a bigger choice of more advanced games and games with multiplayer support that were independent of physical proximity of the players. (Liljedal, 2002)

In the end of the 1990s, Japanese success of I-Mode network-based games created a boom for WAP-games – games that mobile phone users would use through their WAP-browsers in their phones. In Europe, Nokia's 7100 series of phones were the first ones capable for this activity. The slow connection speed made these games a very disappointing experience and thus they never reached the mainstream markets. Yet, some SMS-based games have gained popularity, especially when supported by television broadcasting.

In 2001, the introduction of downloadable games and color screens on mobile devices has brought wireless games into mass markets. Suddenly, consumers were willing to start purchasing small chunks of entertainment to

broaden their game selections on the mobile devices. In addition, mobile phones are constantly developing towards small microcomputers – smart phones and thus game play is nowadays much richer than the simple Snake-like-gaming that it used to be. 3D-graphics and natural sounds are entering also wireless games. Nokia has continued to pioneer in the field of wireless gaming.

In 2003, it introduced its N-Gage game deck and wireless online gaming with N-gage Arena. This device is a full-scale game console with changeable cartridges and smart phone functionality. In addition, the N-Gage started a new era in online gaming – the device and some of its game titles are link to a game server via GPRS networks and thus enable group games in an online community. Furthermore, N-Gage has Bluetooth gaming functionalities for short-range (10 meter) group games. The N-Gage launch was carried out in large scale. Yet, there are still no guarantees of business success for the device.

Nevertheless, the N-Gage has created increasing interest towards mobile games and Nokia's competitors like Sony are also planning on a similar activity in the handheld game device markets.

III. Technologies Used in Mobile Gaming

Mobile games may be played using the communications technologies present in the phone itself, such as by text message (SMS), multimedia message (MMS) or GPRS location identification. More common, however, are games that are downloaded to the mobile phone and played using a set of game technologies on the device. The games are usually downloaded via the mobile

operator's radio network, but in some cases are also loaded into the mobile handsets when purchased, or via infrared connection, Bluetooth or memory card.

There a number of different types of mobile games that can be classified as embedded games, SMS games, or browser games. (Mobile Gaming Boom, 2003)

A. Embedded Games

Some games are programmed to run natively on a mobile phone's chipset, installed on the mobile phone at the factory, and shipped with it. Snake is the most famous example. New embedded games cannot be installed by the consumer, and they are becoming less prevalent.

B. SMS Games

Short Message Service (SMS) is used to deliver short text messages from one mobile phone to another. SMS games are played by sending a message to a phone number that corresponds to the game provider's server, which receives the messages, performs some processing, and returns a message to the player with the results.

SMS is not a particularly good technology for games. Since it is a command-line environment, then it is dependent on text entry by the user. Although the deployment of Multimedia Message Service (MMS) technology makes message-based games more appealing, this is still not a great gameplay.

C. Browsing Games

Every mobile phone includes a Wireless Application Protocol (WAP) browser. WAP is, in essence, a static browsing medium, much like a vastly simplified form of the Web, optimized for the small form factors and low bandwidth of mobile phones. WAP games are played by going to the game provider's URL (usually through a link on the carrier's portal), downloading and viewing one or more pages, making a menu selection or entering text, submitting that data to the server and then viewing more pages. One version of WAP (1.x) uses a unique markup language called WML and allows users to download collections of pages called decks. The new version of WAP (2.x) uses a subset of XHTML, delivers one page at a time, and allows better control over display formatting.

Either version of WAP offers a friendlier interface than SMS, and is generally less expensive for consumers who pay for airtime only, rather than by the message. But it is a static browsing medium; little or no processing can be done on the phone itself, and all gameplay must be over the network, with all processing performed by a remote server.

Phones will continue to contain WAP browsers, and developers may find WAP useful to deliver more detailed help or rules to players than can be contained in a game application, since most games are still subject to strict memory limits. However, WAP has failed to achieve high levels of usage, and both carriers and game developers are moving away from WAP technology.

The types of mobile games mentioned above can be developed using software technologies such as Sun's J2ME (Java 2 Micro Edition, recently rebranded simply "Java ME"), Qualcomm's BREW (Binary Runtime Environment for Wireless), Infusio's ExEn (Execution Environment), Morphun, or Symbian.

A. J2ME

It was developed by Sun Microsystems. Java is a software platform that spans high-tech devices of all types. From the servers that power office networks to the phone in pocket right now.

There is almost certainly a version installed on the user's handset, along with nearly every single other mobile phone in the UK. Although there have been several iterations as mobile technology has developed, the most common flavor today is known as Java 2 Mobile Edition, abbreviated for obvious reasons to J2ME. It is easily the dominant gaming platform in UK handsets, though slightly less so in Europe where competing formats are establishing a greater presence.

Originally predicted to be a standard platform that would be identical on any handset from any manufacturer and consequently able to run any piece of compatible software, the wide-ranging hardware differences between ever-evolving phone models has rather Sun's utopian vision. As a result, although J2ME exists as a single product name and shares a fundamental core, there are slight differences in its implementation on various handsets, at least between handset families – one reason why a particular game can sometimes run on one

handset but not another, even if the handsets are made by the same manufacturer.

Like just about everything else in the mobile world, Java is forever evolving and being adjusted, and indeed we are currently witnessing the transition from an older version of J2ME components to a more modern iteration called the Mobile Information Device Profile (MIDP), which is part of the platform that specifies just what can be achieved by applications made to run on J2ME.

Until recently, handsets have featured MIDP version 1.0, which was not all that well-suited to gaming, assuming a small screen size, no audio and a limit on the actual size of a program. Restricted graphical performance was the main drawback, and it hampered games developers. The newer version, MIDP 2.0, is much more powerful in all regards.

The difference between the two is best illustrated by the Nokia N-Gage QD handset; while acquire its own 3D graphics chip for running games like *Asphalt Urban GT2*, the version of J2ME installed upon it is MIDP 1.0.

This means that there is a huge difference between the visual quality of Java games and N-Gage games on the handset, something we are sure that owners of the N-Gage have noticed several times over, most recently with *The Fast and the Furious: Tokyo Drift*. The N-Gage, despite its once-fancy hardware, is limited to running the low-quality 2D edition of the game.

Despite these issues and the fact that it is arguably not the most powerful gaming technology available, J2ME remains the dominant force in the UK, with its rivals struggling for a foothold.

Sun Microsystems Inc.'s introduction of Java 2 Micro Edition, a version of Java specifically for PDAs, two-way pagers, will help extend access to corporate data from these devices. (Caton, 1999)

Sun Microsystems Inc. introduces new programs, aimed to simplify Java development for applications that run on mobile phones. The first program will create a standard way of testing and certifying "Java verified" applications that run on devices made by Nokia, Siemens, Motorola, and Sony Ericsson. Sun Developer Network Mobility program is another program designed to help Java developers write J2ME applications, create and test their applications. (McMillan, 2003)

Sun recently announced a partnership with network operator Orange to help developers using J2ME to cut down on development and testing costs. Part of an effort to encourage more programmers to get involved in creating J2ME applications, there is already a wide base of hobby programmers who, thanks to the ease with which J2ME can be used, are putting out innovative games and programs.

A relatively easy language with which to pick up and begin programming (similar to the PC language C++), the only drawback is compatibility testing. With so many different versions of J2ME out there, each one for a different family of

mobile phone handsets, even if a developer only aims to cover the popular handsets testing can dwarf the actual creation of the game.

Still, the game developer can download the software development kit, program a game and then release it for download by himself. He may charge a fee for it, without having to pay Sun a royalty. It is a testament to all that J2ME has going for it. And Sun has the deep pockets and the desire to keep J2ME at the forefront of mobile application development.

B. BREW

A big competitor to J2ME, BREW is a concoction created by Qualcomm, an American communications company. It has yet to make much of an impact in the UK and Europe in general. But it is a different story in the USA, though, where BREW has grown strongly and is already the premier mobile gaming platform.

The big advantage of BREW is its 3D capabilities. It is a far more advanced platform than J2ME, and it enables developers to make much more complex games provided the destination handset has the processing power to run them.

Due to the technological advances enabled by BREW, the games that Americans have access to on their phones have matured beyond the standard 2D fare that's prominent in the UK.

The J2ME version of “Brothers in Arms: Earned in Blood” that we were treated to in Britain is a 2D shooter that is similar to any number of other games,

such as “Call of Duty 2” and “War Hero 1944”. The BREW version of “Brothers in Arms: Earned in Blood” is a different story altogether. It is a fully-3D shooter, viewed in a third-person perspective that would not look entirely out of place on the Nintendo DS.

Aside from the more powerful gaming credentials of BREW, there are a number of advantages for developers. Firstly, the platform is less fragmented than J2ME. There are far fewer differences in BREW running on a Samsung handset to BREW running on a Nokia model, for instance.

Secondly, the way in which BREW games are written is even easier to get to grips with than Java, as it uses the popular C and C++ languages, both of which are commonly used in the PC arena. It requires a working knowledge of either C or C++. The game developer will be able to get started programming in BREW almost immediately by downloading the free SDK.

Without getting into the too-technical details, the reason for BREW's low-profile in the UK comes down to the way that mobile phones work. The BREW platform in the US is tied into the network and handset hardware, and until now Qualcomm has not offered the gaming part of BREW as a separate piece of software.

That is about to change, though, as Qualcomm has now split the gaming elements out and, as of June 2006, it is been offering them to European handset manufacturers and networks as a standalone platform that can be installed on any mobile phone.

Qualcomm believes this will help European network operators and games publishers to make more money from mobile games.

Whereas Java is an open source platform – once they have got the development kit, anyone can start programming games and then release them – BREW is much more closed off.

Developers that want to program games (or indeed any application) in BREW have to first register with Qualcomm, purchase an expensive compiler that is essential for turning a mass of code into a playable game, and also present the said code to Qualcomm for testing. This testing called TRUE BREW certification must be paid for by the developer or the network operator and without it, the game cannot be distributed.

These higher development costs mean that hobbyist programmers using BREW are few and far between, and also that games cost the customer a great deal more to buy.

The way in which BREW games are distributed also cranks up the cost of titles, due to different price plans. When a customer buys a J2ME game, it is his outright. It is saved onto his handset until he decided to remove it. While BREW games can be sold in the same manner, they can also be tailored so that they only work if the customer pays a monthly subscription fee. If he did not pay one month and the game will not work.

BREW games can also be priced to give the customer a certain number of plays before requiring him to pay again. It is this capability – for a program to

charge in his mobile phone account – that in part necessitates the “TRUE BREW” testing and certification process.

The arrival of BREW in the UK is very much a double-edged sword, then. While it could usher in a revolution in mobile phone gaming, the customer is more likely to spend a lot for it.

C. ExEn

ExEn is short for Execution Engine, a proprietary piece of software developed by games publisher In-Fusio. It is dedicated to running games and nothing else (unlike J2ME and BREW, which are built to support all sorts of applications) and was developed to provide better performance and visuals for games.

It is not as widely distributed though, and according to In-Fusio's website, it is not available on Nokia, Sony Ericsson, and Samsung or Motorola handsets. And of all the UK network operators, it is supported solely by Orange.

But In-Fusio is hoping that ExEn will be picked up by the other handset manufacturers. As it sits on top of the J2ME MIDP 1.0 platform, In-Fusio thinks it would mean that game developers would not need to write a different version of every game that they create for every make and model of handset.

ExEn 2 is currently in the works. It will link up with J2ME's MIDP 2.0 platform and offer further enhancements to games.

D. MORPHUN

Mophun aims to improve the pocket gaming experience by better harnessing a handset's hardware. There are two versions of Mophun: 2D and 3D, for low-end and high-end handsets, and it is often used to provide embedded (pre-installed) games on mobile phone handsets.

Mophun has been around for a few years now and seems to be showing its age. It still has a few aces up its sleeve, mind. Firstly, it is very small and takes up very little memory space. Secondly, it is very secure, which means that pre-installed games cannot be copied or pirated. And last, but by no means, the platform is featured on UK network Three.

E. SYMBIAN

Symbian is better known as an operating system for phones. After all, it is the software foundation for just about every single Nokia mobile phone in one shape or another, and is also being used to run selected 3G handsets from Samsung and Sony Ericsson.

In this respect it is the Microsoft Windows of the mobile phone world, but on higher-end handsets it is also a pretty solid games platform.

It is the “higher-end handsets” that are the key – Symbian games only really make a showing for themselves on Nokia Series 60 devices, such as the N-Gage QD.

Removing the middle-man from the equation (there's no need for J2ME, for instance) together with the fact it is a given that a Series 60 handset's

specification is going to be good means the customer will end up with titles like Raging Thunder.

However, like the BREW platform, with more impressive games come larger file sizes and costs. Some Symbian games can cost as much as £8 and they can be five times the size of a J2ME game.

This has not swayed some people from backing it as the mobile phone games platform of the future. As Symbian is the same on every Symbian handset, it saves developers time and money, causing some pundits to predict Symbian will come to the fore in 2007. Gameloft, one of the largest mobile publishers is joining smaller specialist publishers like Telco games and titles like “Midnight Bowling 3D” are starting to appear on Vodafone's portals.

IV. Game Enhancements from Consoles to Mobile Phones

A. Tetris

Tetris is widely known as the most popular computer puzzle game of all time. It was invented by Alexey Pazhitnov in 1985, while he was working for the Dorodnicyn Computing Centre of the Russian Academy of Sciences in Moscow, during the days of the Soviet Union. It became the most popular video game ever created, selling more than 60 million copies worldwide.

But one thing never changes in all of the Tetris at any console, the main blocks. Seven randomly rendered tetrominoes (sometimes called "tetrads" in older versions) - shapes composed of four blocks each - fall down the playing field. The seven rendered tetrominoes in *Tetris* are referred to as *I*, *T*, *O*, *L*, *J*, *S*,

and *Z*. All are capable of single and double clears. *I*, *L*, and *J* are able to clear triples. Only the *I* tetromino has the capacity to clear four lines simultaneously, and this clear is referred to as a "tetris".

The objective of the game is to manipulate these tetrominoes with the aim of creating a horizontal line of blocks without gaps. When such a line is created, it disappears, and the blocks above fall. As the game progresses, the tetrominoes fall faster, and the game ends when the stack of Tetrominoes reaches the top of the playing field and no new tetrominoes are able to enter.

As popular as Tetris is with consumers, it might be even more so with developers. Since the game is a sure hit, there is little risk involved in porting Tetris to a new platform. That is why in almost every console, there is a Tetris game each varying from one to the other along with new features. It has appeared on just about every console ever made, so it is hardly surprising to see it appear on mobile developed by Blue Lava Wireless entitled as “Tetris Marathon”. Its familiar gameplay made it an obvious choice for the mobile market.

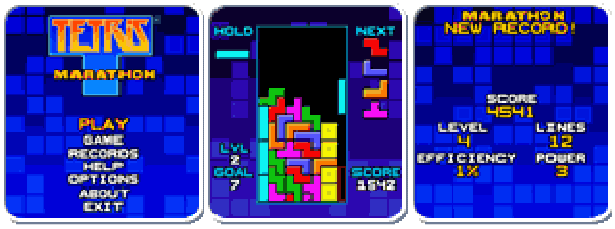


Figure 4: Screenshots for the Tetris Marathon Mobile Game by Blue Lava Wireless

This version of the game is wholly competent. Its best feature is a shadow that dynamically indicates to the player as to where a piece will land. Although there have been many other Tetris games that have used this shadowing idea, it is a very necessary inclusion for the small mobile screen.

B. Pac-Man

Pac-Man is universally considered classic of the medium, virtually synonymous with video games, and an icon of 1980's popular culture. This non-violent game appealed to both boys and girls. The game was developed primarily by Namco's employee Toru Iwatani. After receiving inspiration from a pizza with one slice missing, game designer Iwatani spent approximately seventeen months on a game that revolved around eating. Iwatani's efforts to appeal to a wider audience eventually lead him to add in elements of a maze.

Pac-Man is one of the few games to have been consistently re-released for over two decades. In the 1980s, it was released for the Atari 2600, Atari 5200, Atari 8-Bit Computers (400/800/etc.), Intellivision and Commodore 64, and the Nintendo Entertainment System from 1987 to 1990. In the handheld world, it was released on the Game Boy and Sega Game Gear in 1991, Neo-Geo Pocket Color and Pac-Man: Special Color Edition for the Game Boy Color in 1999, and Pac-Man Collection for the Game Boy Advance in 2001. However, it has been most widely distributed in Namco's long-running Namco Museum series, starting on the PlayStation in 1996 and continuing to this day on every major console as

well as the PSP and Game Boy Advance with the 50th Anniversary Collection in 2005.

In 2001, this old classic game is resurrected in mobile phone which was developed by Namco. By clicking the * button in the mobile phone, the player can either on or off the sound of the game. Just like the original version, the objective of the player is to help Pac-Man avoid the monsters and rid the screen of dots. When Pac-man eats an energizer, the monsters are rendered harmless and turn dark blue. Now it is Pac-Man's turn to eat them and earn points.

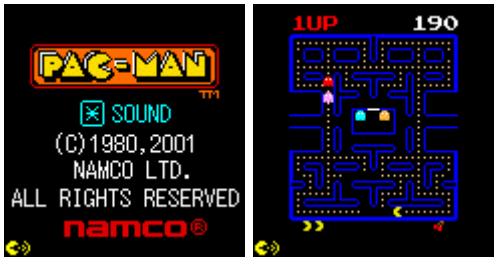


Figure 5: Screenshots for the Pac-Man Mobile Game released in 2001 by Namco

This mobile port is a good representation of the arcade classic for cell phones. Pac-Man mobile's failure is merely in the sound department, which does not render the beloved sound effects quite the same way as the original. Otherwise, all the best aspects of the game are solidly translated to this very portable format.

C. Arkanoid

Arkanoid is an arcade game developed by Taito in 1986. The player controls a small pad, known as the "vaus" space vessel, which prevents a ball from falling from the playing field, attempting to bounce it against a number of

bricks. The ball striking a brick causes the brick to disappear. When all the bricks are gone, the player goes to the next level, where another pattern of bricks appear. There are a number of variations (bricks that have to be hit multiple times, flying enemy ships, and other features) and power-up capsules to enhance the vaus (expand the player's vaus, multiply the number of balls, equip a laser cannon, break directly to the next level), but the main gameplay remains the same.

At round 33, the final stage, the player will take on the game's boss, "Doh". Once a player reaches round 33, he must defeat "Doh" with his remaining number of vauses in reserve. Otherwise, it will mean game over. In other words, there are no continues on the final round.

Many of the 8-bit computer ports (ZX Spectrum, Amstrad CPC 464, Commodore 64, MSX, Atari 8-bit, and Apple II) were very popular in Europe in the 1980s. Console ports on the NES and Game Boy were also popular and the game was also ported for 16-bit computers Amiga, Atari ST, Apple IIGS and IBM PC. A port was released for the TRS-80 Color Computer in 1989. A Super NES version called "Arkanoid: Doh It Again" was released in 1997. The sequels "Arkanoid Returns" and "Arkanoid Returns" were released in 2000 in Japan for the Sony PlayStation. 16-bit versions had identical graphics as the arcade game. Commodore 64 conversion of Arkanoid is known as the first game for the system to feature music that used digitized samples, which was composed by Martin Galway. Computer conversions were published by Imagine.

The controls used by various conversions differ from machine to machine, and some conversions allow for multiple control methods. The two basic control methods are digital and analog. Digital controls (many joysticks and control pads, and keyboards) are considered less desirable than analog controls (most mice, trackballs, and paddles); while digital controls limit the player to single-speed control, analog controls allow the player to move the Vaus at nearly any desired speed across the screen.

In 2005, a newer mobile version of the game entitled “Arkanoid: Doh It Again (Version 3)” was developed by both I-Play and Taito which provides a greater enhancement over the original.

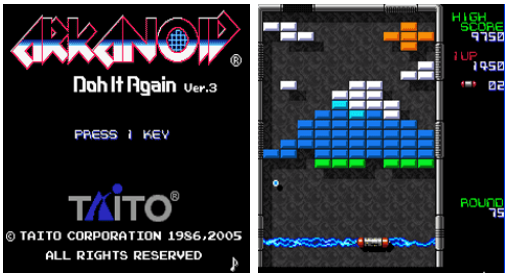


Figure 6: Screenshots for the Arkanoid: Doh It Again Mobile Game released in 2005 by I-Play and Taito

The first noticeably cool aspect in this version of Arkanoid is the clear, detailed graphics. Everything from the level design to the color scheme is straight from the arcade game. Even better, Arkanoid maintains this level of graphical acuity while keeping up with the oft-frantic pace of gameplay. This is quite crucial when trying to follow a small ball on a portable game screen.

Another aspect lies in gameplay variety, thanks to an array of now-familiar paddle boosters. Special bricks release power-ups ranging from wider paddles to

safety nets. Power-up blending is also a treat, just think about the brick-busting rampage the player can initiate after grabbing two paddle-widening icons in a row.

D. Galaxian

Galaxian is an arcade game released by Namco in 1979. It was the first major space shooter to serve as a legitimate successor to Space Invaders. Furthermore, it is also the predecessor to Galaga, which is perhaps the most successful space shooter game of all time. In Galaxian, as in most games of the genre, the player control a space ship that can move horizontally along the bottom of the screen and fire vertically at attacking aliens. Galaxian holds a special place in video game history because it is the first arcade game to use true RGB (Red Green Blue) color throughout all its graphics.

In 2001, the first mobile version of the game that is playable with a single player was developed by Namco. The game is basically the same as of the original.

Figure 7: Screenshots for the Galaxian Mini Mobile Game released in 2001 by Namco

As in the usual gameplay, swarm after swarm of alien armies attacked the player's ship that moved left and right at the bottom of the screen. The ship could

only fire sparingly by default, but rearmed instantly when an enemy was hit. The player would defeat one swarm, only to have it replaced by another more aggressive and challenging army in the next screen.

E. Gradius

Gradius is a horizontally-scrolling shooting game released by Konami in 1985 for video arcades. The arcade version of Gradius was released in North America and Europe as Nemesis. The game has the distinction of popularizing a weapon selection bar called "Power meter", based upon collecting capsules to acquire additional weapons. It is considered a highly influential game and has set the foundation for many other horizontal shooters in the present and in the years to come.

The player controls the trans-dimensional spaceship Vic Viper, and must battle waves of enemies through various different environments. The game was ported to many systems, most notably the Nintendo Entertainment System and the Japanese MSX computer.

When gameplay begins, the Vic Viper is relatively slow and has only a weak gun. This level of capability is generally insufficient for engaging enemies, but the Vic Viper can gain greater capabilities by collecting and using power-up items.

While most arcade games utilize distinct power up-items that each correspond to a specific effect on the player character, Gradius has a single power-up item. The effect of this power-up item is to advance the currently

selected item in a power-up menu that appears at the bottom of the screen. When the desired power-up is highlighted, the player can obtain it by pressing the power-up button, returning the menu to its initial state in which no power-up is highlighted.

Home console and portable versions of Gradius spawned the now-legendary Konami Code, considered by some to be one of the defining elements of Gradius. The code (traditionally Up, Up, Down, Down, Left, Right, Left, Right, B, A; variants also exist), when entered while the game is paused, grants the player most of the available power ups. While this is essentially a cheat code, the player is only allowed a limited number of uses, suggesting that this is meant only as a limited adjustment of the difficulty. In most cases, the limit starts at one use and an additional use is granted for each completed level.

In 2004, a mobile version of the game was developed by Konami. The game is exactly the same as the 1985 arcade version.

Figure 8: Screenshots for the Gradius Mobile Game released in 2004 by Konami

V. The Pros and Cons of Mobile Gaming

A. Gamer's Point of View

Mobile gaming today is well-known to most people. As the user's cellphone model upgrades, mobile games became one of his favorite past time especially for kids and students. Through modern technology, our cellphone today can also be used as a game gadget like Game Boy. As we all noticed, some of the games from the usual family computer and personal computer were converted into mobile games like the Super Mario Bros., Snakes, Tetris, Bomber Man, Text Twist, NBA, Billiards and many more.

Mobile games are enjoyable by itself. Aside from being popular to most people, there are corresponding advantages and disadvantages in playing these mobile games. The advantage of playing mobile games is that it "brings out the child" in everyone. The gamer explores the world of the mobile game he is playing. Another main advantage is that it also instinctively sharpens the mind of the gamer. The gamer may improve his gaming abilities and gain new techniques. Another main advantage of playing mobile games is that it is portable, handy, and can be brought anywhere, unlike the family computer and the personal computer which is limited only inside the player's house.

But there are disadvantages when used frequently. Gamers tend to neglect their studies when they are addicted to these games. Another main disadvantage is that economically, in the long run, it will be very expensive to the gamers because there will be often and occasionally battery charging.

B. Game Developer's Point of View

On other hand, there are advantages and a main disadvantage in creating mobile games for game developers. The advantage in creating mobile games is that a development team can complete a game within 12 weeks or less. They can create a simple mobile game with one programmer, one contracted artist, and one audio engineer.

Another advantage is that mobile games can also be extremely profitable if the game developer get on the right carriers with the right and/or license. The shelf-life of a mobile game can last over years. Console game's shelf lives can be relatively short, usually not more than a single sales season. Since mobile technology with installed multi-media chips is rapidly growing, then the shelf life of an average cell phone can be prolonged to about two years.

However, the main disadvantage in creating mobile games is that publishers must have some sort of an arrangement with cell phone operators in regions the world over. This is the only way to make a significant profit. But each carrier has their own technology sets, methods of communication, and rules the game developer must comply with before the game developer's application on their deck will be approved for porting. Since porting is very expensive and can be difficult to manage. The game developer may have to port his application to literally hundreds of handsets and publishers have a high expectation rate of what games for mobile phones to be placed.

VI. The Future of Mobile Gaming

Current mobile games are often portable versions of classic computer games. The N-Gage and Java games are just the start of something massive. In 2005, the Sony are to release a high powered hand hold game system called the PlayStation Portable (PSP) will should revolutionize the game industry and should have a knock on effect with the mobile gaming industry. (Mobile Gaming Future)

In a speech delivered at the Leipzig GC Developer Conference, I-play's Stephane Labrunie has declared that mobile gaming is set to overtake console gaming by the end of year 2006. To support this argument, Labrunie pointed to the fact that 48 percent of mobile gamers are female, while 58 percent are aged between 18 and 34. Although he conceded that the market "will take time to grow", Labrunie stated that "This market will sell more games on mobile than traditional consoles in 2006."

However, Labrunie said, there are still problems to overcome. Around 33 percent of handset owners do not know they can play games on their phones, and while more than 50 percent have played embedded games or demos, just 5 percent have actually downloaded a game. (Gibson, 2006)

According to Informa, only five percent of mobile phone users actually download games. Getting the other 95 percent of subscribers to buy games remains the challenge for operators - 3D graphics have not lived up to their lofty

predictions, and flexible billing, easier downloading, and offering a smaller range of quality games, seem to be more important.

“The big sellers are still the big brands”, said Chris Coffman, senior research analyst at Informa, “but that is changing, with gameplay becoming more important as customers get burnt from poorly designed, but well-branded games.”

According to Coffman, the UK is particularly strong in using clever marketing, such as animated GIFS showing screen shots, and targeted MMS marketing. But he said that many operators around the world are failing to follow through on their intention to offer a tighter range of higher-quality games.

Informa predicts that Asia Pacific, which dominates mobile games sales, will account for nearly half the industry by 2011. It also says the USA is rapidly becoming the largest single-country market, thanks to its single language and small number of operators - factors which could constrain growth in Europe. (Ray, 2006)

With the arrival of 3G technology, the future promises to bring more advancement in multiplayer mobile gaming. Again, 3G will also be responsible for enabling the user’s mobile handsets to download high resolution videos and music with higher sound quality to provide more entertainment. It may well be a worthy challenge for game developers to continuously provide games that are more exciting than ever.

With multiplayer gaming, there will be growing pains and costs as the developers struggle to implement the full range of features that the consumer will expect in the near future. (Marie, 2006)

These high-speed networks enable the proliferation of premium mobile games, as higher download speeds allow the delivery of larger feature-rich titles in episodic format. This is changing the way publishers and developers design their wireless games because they are no longer constrained by a single standalone download, but instead can leverage the network as a virtual hard drive by swapping out assets and content on the fly on an as-needed basis.

In USA alone, games have evolved over the years from being simple 2D, approximately 20K in size resident on handset devices and 20K in total size, to now being PlayStation 1 quality 3D titles that are approximately 2MB in size resident on the handset and 30MB in total size.

With more than 800 million devices purchased every year, wireless gaming has incredible potential ahead of it and may very well exceed the console/PC market someday. The size of the installed based of phones simply dwarfs the installed base of consoles or gaming PCs. And as the minimum baseline of performance and technology in these connected devices constantly resets to a new level, the sheer size of the wireless economy cannot be ignored.

Casual gaming titles like Tetris, Zuma or Bejeweled are going away, but it does mean that technologies like 3D, GPS, 3D surround and positional sound, and others will essentially be “free” in the device and available for publishers and

developers to exploit. Couple this with high-speed 3G networks, secure wireless digital distribution and established models of purchase such as recurring monthly subscriptions and micro transactions, and the future of wireless gaming looks very promising. (Yuen, 2006)

To the gamers, it means better and cost effective technologies to play around the globe. To the Technology enthusiasts, it would mean moving towards wireless and related technologies, exploring new innovations, in wireless as well as in gaming.

A lot of innovations are going on to incorporate AI (Artificial Intelligence) into games, inspiring the gamers to have overwhelming gaming enjoyment. The games based on AI (Artificial Intelligence) would obviously adapt and learn in response to the player's actions and certain general rules, leaving the specific options for game play wide open.

Along with Mobile Games, the new generation of PlayStation and Xbox are aspiring to get launched soon. As per the aggressive claims of the vendors including the new Sony PlayStation Portable, a gaming device, will eventually change the way games are played. (Vaid, 2005)

Review of Related Studies

A. LOCAL

DOOS (Iranian eGame)

About the Game

This game is not very much familiar in our country. The researchers decided to give it a more interactive look and the way of playing it through networking, 3-dimensional designs, real-time simultaneous moves and graphical user interface. This stand-alone game must be played using 2 computers.

Mechanics of the Game

The concept of the game is that each player has 12 pieces, wherein one set called white and the other being black. The game is played on a standard DOOS board, which is then drawn on a flat board or surface with the use of a marker or any writing tool. The pieces are made out of stones, pebbles or any materials that would serve as the chips of the players.

In the first move, white will always be the first one to move. The 2 players alternately place their piece at a time in a certain place on the board. Unless there are no pieces at hand, each player may only move their piece on the board. If one of the player is able to generate three successive pieces with a diagonal, horizontal or vertical pattern or line, either by placing it on board or moving the pieces on the board. The player can take a piece from the other player, which then be removed from the hand of the player if there are still pieces at hand or from the pieces already positioned on the board if there are no existing pieces at

hand. Pieces can move backward again as long as it will move once. Player with the greater remaining pieces wins. The score of the players will depend on the pieces they capture.

JUMANJI (A Network Education Game for High School)

About the Game

Typically, this game was adopted from the popular movie of the same title were characters from the story could survive the greatest adventure game of all and surpass the obstacles within the game. But the difference of this game from the movie is that it should be played in a computer environment and the obstacles were academic questions instead of hard combat adventure and survival just like in the movie. It is a network-based game which can be played with a maximum of 4 players.

Mechanics of the Game

The game is designed to display a riddle whenever a certain opponent is done doing his moves and the player needs to first answer the question correctly in order to advance his board piece to another block. As similar to the movie, they could advance to another task only if they are fortunate to overcome the coming challenges and obstacles. But in this computer version, it is a little different because the player will just answer a science or other academic trivia correctly and then his board piece can now advance to another block. This ruling will continue until one player could reach the goal and wins the game.

RAJAH (3D Card Game)

About the Game

The concept of the game was adopted from the Japanese TV series “Yu-Gi-Oh”. Also the card characters, magic, and traps used in the system were Philippine-inspired, meaning characters are based from the well-known Philippine history and culture. Rajah is a stand-alone game which can only be played by 2 players. Just like any other games, it has a main menu containing all the options needed in playing the game. The player can select to play, do some changes in settings, and configure or manipulate the deck of cards that the player is using.

Mechanics of the Game

The principle of the game is concentrated on how well the player uses his mind to win. The rules of the game were taken directly from the Universal Trading Card Game ruling. How the player will win depends on how powerful the deck of cards that the player possess. For instance, if a player has a Monster Card obtaining an attack power of 3000, then the opponent should watch out for the player’s card. But that is not always the case. The player needs to have a great collection of Magic and Trap Cards to back up the Monster Cards. Without these cards, the player will never win even if he has very powerful Monster Cards. This is how this game really tests the player’s mind. The player needs to think how to use all the cards and associate them systematically and do some tricks in order to win.

DOU SHOU QI

About the Game

Dou Shou Qi is a traditional chess game which is widely known among common Chinese people especially children. The game embeds logic, strategy, philosophy, and wisdom. And like a usual chess, the unification of philosophic theory and entertainment becomes the reason of popularity. The researchers had made it a LAN-based network game where it requires only 2 players on 2 computers.

Mechanics of the Game

The board is a 7 by 9 grid, which represents the territories of two warring packs of animals. Between them lies a river spanned by 3 bridges. At each end of the board is a den surrounded by 3 traps.

Each player has 8 animal pieces which have a strict hierarchy system. The principle of capturing a piece is based on the animal's physical size. The bigger the animal is, the higher the rank it states. The animals pieces are arranged in ascending order in the board namely rat, cat, dog, wolf, leopard, tiger, lion, and elephant. Only the lion and tiger can leap in a straight line across the river or from bridge to bridge. Other animal pieces can move one square at a time in any non-diagonal direction. An animal piece cannot enter its own den and only the rat can enter the water. A rat in the water blocks the leap of a lion or tiger, whether friendly or enemy, but it cannot attack the elephant. An animal

piece can capture any other animal piece that has the same or a smaller size by moving onto the same square.

RUINS OF WAR (Multiplayer Online Card Game)

About the Game

The Ruins of War is a multiplayer support application and has a client-server program communication. The concept of the game was very much adopted from the Triple Triad card game of Final Fantasy VIII in the PlayStation console. The researchers have made it possible for the players to communicate during the game which encourages social interaction. The design of the game has a user-friendly interface which would not confuse even first time players. And they have the option to take the in-game tutorial to guide them in the card gaming experience.

Mechanics of the Game

The objective of this card game is that the player has to beat other player's card game deck. The player's deck has a level which depends on the experience the player got during card battle. Each card has its own classification and statistics represented by element name and numbers. In addition, every card has different character representations drawn will add excitement for the card collection. Players pitted for card battle can play different card game rules to enjoy game play variations. The player will travel in the presented world with his character and collect cards by competing with other players connected to the same server.

JOURNEY FOR FREEDOM: A 3-Dimensional Strategy Game Based on the History of the Colonization of Philippines

About the Game

It is a 3-dimensional strategy game that is based on the colonization of the Philippines from the Spanish era up to the American era. The researchers had made the game challenging by using AI (Artificial Intelligence) to control the opponents in the game which are controlled by the computer itself. And they provide different maps in every level of the game where the war will take place. However, this strategy game contains maximum violence but is important enough to show the realistic scenario in the historical events within the gameplay.

Mechanics of the Game

The goal of the game is to avoid being invaded by the opponents and defeat them in order for the Philippines to achieve independence. To defeat an army of opponents, the player controls an army that is ready to engage in battle against them.

B. FOREIGN

Mobile Tamagotchi Game

"Tamagotchi" was first created in 1996 in Japan and was presented to the world in the beginning of the 1997 by Bandai. Most of the virtual pets share a list of basic functionality.

The proponent Anna Ivanova made this thesis to provide a solution to the mobile "Tamagotchi" game which reflects a simple Artificial Intelligence model on

the mobile phone using Java 2 Micro Edition Wireless Toolkit. Much research has been done in different areas such as virtual pets, mobile application platforms, artificial intelligence and artificial life and mobile specifications.

The basic routine of the “Tamagotchi” game is that an owner of the virtual pet had to feed it in order to keep him alive and happy. After some time, a virtual pet feels tired and wants to sleep. In this case there used to be some buttons to switch off the light to allow pet to rest. The cleanliness of the place is very important. The pet feels much happier if everything is clean. Going to the toilet is an everyday procedure and an important functionality of a virtual pet. Playing with a pet keeps it and its owner happy.

These games could be shaking hands (guess which hand) or playing ball (help to catch ball) or fighting. Training and disciplining of the pet is yet another important functionality. Teaching the pet how to do tricks based on commands and reward procedure is an interesting process but punishing it if the pet does something wrong should not be neglected. Once the pet is sick, the pet needs some medicine and the owner calls the doctor.

An extra button or a menu function shows statistics of the pet. This normally includes score, age, weight, health meter, sometimes happiness, hunger and discipline. Alert function can remind the owner that something is wrong with its pet. The evolution chart of the virtual pet is similar for every pet and is based on the principle of 1 day being 1 year.

Design Implications for Context Aware Mobile Games

In this thesis a study was conducted in which a prototype of a mobile game called Ghost Catcher was evaluated to examine the user reactions when playing this game. The game was evaluated and the players' reactions, comments and concerns when playing it were examined by letting them play the game in its proposed setting. The test sessions were recorded with video cameras and qualitative interviews of the users were also conducted.

This thesis has resulted in a list of design implications for mobile games. This list consists of a number of different insights: how the physical and virtual objects that the players interact with should appear, the importance of an introduction and feedback in a game and finally how the device that is used the game should look like and appear.

EGGG: The Extensible Graphical Game Generator

According to the proponent Jon Orwant, this thesis is made because there is a lot in common between games that such a software system can be constructed. As its name suggests, EGGG is a system that creates computer games and also translates the rules of a game into a program was built. In addition, the system exploits these similarities between games, making it possible for game designers to create games with a minimum of programming expertise.

Designers have to specify only the rules that make their game different from more generic examples of the genre. EGGG's reusable components supply the rest of the game logic.

The games that EGGG creates are those that lend themselves to concise descriptions: the simpler the game, the better. It is best-suited for creating games involving pieces and boards and cards and icons, and not well-suited at all for games like Mortal Kombat, or Doom, or sports simulations. The graphical sheen of games like Mortal Kombat and Doom is intrinsic to their appeal, and EGGG cannot supply artistry.

A Generic 2D Graphics API with Object Framework and Applications

Screens and printers have remained the primary output devices of every computer, which is why the field of 2D graphics still plays a central role in today's computer systems. Most graphical programming interfaces have been around for many years; they were designed at a time when object-oriented programming was in its infancy. Thus, they offer a fixed set of definitions and procedures, which can only be reused as a whole and which cannot be extended.

In this thesis made by Erich Oswald, it examines the concepts behind common 2D graphics interfaces. It extract those features that is considered essential and combine them with the principles of object-oriented and extensible programming to synthesize a new programming interface. On top of this interface, it implements an object framework that models structure and behavior of graphical scenes. To prove the feasibility of the design, the proponent use

programming interface and object framework in two applications, an interactive graphics editor and a graphical description language.

His contributions to the field include a novel approach for specifying general paths made from lines and curves, an innovative pen concept to paint such paths in various styles, and working implementations that show how these ideas work out in practice. Due to the abstract nature of the graphical contexts in the programming interface, components that integrate graphics within existing environments are light-weight and can be implemented with little effort. In addition, objects from otherwise independent applications can be integrated within another if they rely on these graphical contexts to draw

Real-time Display of 3D Graphics for Handheld Mobile Devices

Alan Cummings' thesis is concern with the investigation and implementation of real-time display of computer graphics on mobile devices. More specifically, this thesis uses the display of a virtual city and character models as a test bed application upon which to investigate whether traditional speedup techniques may be used effectively on mobile platforms. Rationale is presented for the choice of mobile hardware and software. Culling, level-of-detail, impostor and point-based techniques are then implemented and applied to the test application on the chosen hardware. These techniques focus on minimizing the amount of rendering time required per frame. An overall framework is suggested which incorporates these methods while ensuring that mobile-specific constraints such as distribution and memory are catered for. Experimentation

results are then presented, showing that a system capable of real-time rendering is feasible on such devices.

Handoff Techniques for Next Generation Wireless Multimedia Systems

The commercial success of cellular networks, combined with advances in digital electronics, signal processing, and telecommunications research have lead to the design of next generation wireless systems. The next generation wireless system (NGWS) is a system of globally available, wireless multimedia networks that are anticipated to deliver service to a mobile computer terminal "anywhere at anytime."

In this dissertation, new handoff techniques were developed to support global roaming with quality of service constraints within NG wireless systems. Whereas conventional handoff techniques support single connection terminals that operate within a homogeneous network, NG wireless systems promise to support terminals with multiple connections carrying different types of traffic, with varying quality of service constraints, which may handoff between different tiers of the same network, or between different types of networks.

For intra-system roaming, a new handoff technique for real-time traffic in Mobile IP version 6 networks was created to adapt to IP-based quality of service architectures. Disruption of the communication path, bandwidth expenses, and buffering requirements were reduced. Next, a new handoff technique was developed for Wireless ATM networks that used the source switch to manage connections with multiple mobile endpoints, and to reroute connections according

to the type of traffic being carried. For inter-system roaming, new boundary elements were introduced to the NGWS architecture. A new inter-system handoff signaling and rerouting protocol was created to enable format transformations and advanced preparation for mobile terminals that may roam between network varieties. Finally, an admission control algorithm for inter-system roaming was created to provide a mechanism for quality of service re-negotiation and to regulate the admission non-subscriber traffic.

Facilitating the Education of Game Development

The proponent Lennart Nacke made this thesis which focuses on game development and educational benefits gained from teaching games to university students. It sketches the complex pipeline of tasks inherent in game development with focus on used tools. Classifying the many diverse tools used by different kinds of game developers helps to identify areas of employment within game development.

A discussion of educational facilities and the specific niches of game development that they focus on allow the conclusion that many games created there only reach up to a prototypic level. Thus, requirements for a game prototyping tool are derived. The proponent then provides estimated solutions for these needs with an extraordinary focus on the usefulness for computer science students.

This leads to an implementation of a game prototyping tool, which brings the applications of the multimedia environment Squeak into play. After showing

the educational benefits of Squeak, one can find out about some examples of educational game development with its help. This brings further information on the game engine that was used as an essential part of the prototyping tool created for this thesis.

Finally, an analysis of advantages and disadvantages of using Squeak for educational game development is done. Also, prospects and possibilities for extending the prototyping tool are discussed.

Conceptual Framework

The conceptual framework of the proposed system follows the simple process flow diagram of a Data Processing Life Cycle. It starts with Input stage by gathering all the needed information from books, articles, and electronic sources and also the needed technologies from both hardware and software to make this mobile game a reality. Then, the Process stage involves the design, development and testing of the game program is the centerpiece for the game development process. And finally, the Output stage will be the finished product, the Cubies mobile game program which can either run in Mobile phones or in an emulator provided by the J2ME Wireless Toolkit software. In between the Process and the Output stage, there is a Feedback where an evaluation of the whole program from the users and technical experts whose opinion may further enhances the appearance and feature of the game program.

INPUT

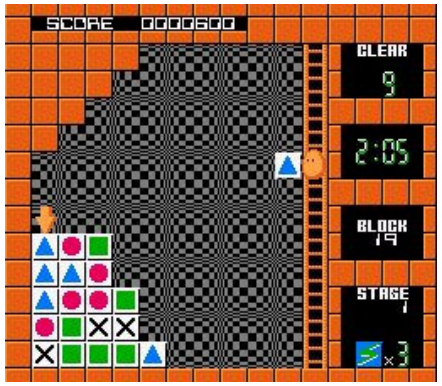
Information From
- Books
- Journals
- Electronic sources
  - Internet

Technology
- Hardware
  - Mobile phone 
  - Personal Computer
- Software
  - Java
  - J2ME
  - Image Editor

PROCESS

- To design a mobile game for colored mobile phones.
- To develop a game program for mobile phones.
- To test and implement the game program.

OUTPUT



EVALUATION OF THE WHOLE PROGRAM

Figure 9: Conceptual Framework for the Cubies A 2D Mobile Game

Operations Definition of Terms

The following terms are important in this research and must be understand by the readers.

Adobe Photoshop – It is a graphics editor developed and published by Adobe Systems. It is one of the most popular software produced by Adobe Systems.

Application Programming Interface (API) – It is the interface that a computer system, library or application provides in order to allow requests for services to be made of it by other computer programs, and/or to allow data to be exchanged between them.

Arcade game – It is a coin-operated entertainment machine, which is usually installed in businesses such as restaurants, pubs, video arcades, and Family Entertainment Centers.

Availability – It refers to the specifications that the main elements of the Cubies 2D Mobile Game are supposed to perform. It also refers to the completeness of the game itself.

Bluetooth – It provides a way to connect and exchange information between devices like personal digital assistants (PDAs), mobile phones, laptops, PCs, printers, digital cameras and video game consoles such as the Nintendo Wii and Sony PlayStation 3 via a secure, globally unlicensed short range radio frequency.

Browser games - These games are played using mobile phone's built-in microbrowser, either in online or offline mode. Players can play such games online through their cellular carrier's or a third-party game provider's game Web site, or download them for offline gaming. This category includes a wide range of games, such as solo or multiplayer games, network games, offline games, arcade games, and others.

Connected Limited Device Configuration (CLDC) – It is a specification of a framework for Java ME applications targeted at devices with very limited resources such as pagers and mobile phones. The CLDC was developed under the Java Community Process as JSR 30 (CLDC 1.0) and JSR 139 (CLDC 1.1).

Embedded games – These games are hardcoded into the mobile handset's system and shipped with it. For instance, the Snake game is shipped with all Nokia phones.

Emulator – It is a hardware or software that permits a computer system to run programs written for and process data originating from a different type of computer system.

First Generation (1G) – It is a short term for first-generation wireless telephone technology, cellphones. These are the analog cellphone standards that were introduced in the 80's and continued until being replaced by 2G digital cellphones.

Flipull – It is a 1989 Taito puzzle video game wherein the main goal of the player is to destroy as many blocks as possible on the playing field. Going from level to level, the number of blocks increases as does the difficulty.

Fourth Generation (4G) – It is a short term for fourth-generation wireless technology. The successor of 3G and is a wireless access technology.

Functionality – It refers to the ease of playing the Cubies 2D Mobile Game with very simplified gaming rules.

Game and Watch – It is a series of approximately 59 handheld electronic games made by Nintendo and created by Gunpei Yokoi from 1980 to 1991. They each feature a single game that could be played on an LCD screen, in addition to a clock and an alarm.

General Packet Radio Service (GPRS) – It is a mobile data service available to users of GSM mobile phones. It is often described as "2.5G", that is, a technology between the second (2G) and third (3G) generations of mobile telephony.

Handheld electronic game – It is a very small, portable devices used for playing interactive games, often miniaturized versions of video game consoles. They are both the precursors to and inexpensive alternatives to the handheld game console.

Handheld game – It is a video game originally designed primarily for handheld game consoles such as Nintendo's Game Boy line. In more recent history,

it has become popular in calculators, personal digital assistants (PDA), mobile phones, MP3 players, and other similar portable gadgets.

Infrared – It refers to energy in the region of the electromagnetic radiation spectrum at wavelengths longer than those of visible light, but shorter than those of radio waves. Infrared is used in a variety of wireless communications, monitoring, and control applications.

Installability – It refers to the ease of setting up the Cubies 2D Mobile Game.

Integrated Development Environment (IDE) – It is a type of computer software that assists computer programmers in developing software. It normally consists of a source code editor, a compiler and/or interpreter, build-automation tools, and usually a debugger. Many modern IDEs also integrate a class browser, an object inspector and a class hierarchy diagram, for use with object-oriented software development.

Java – It is an object-oriented programming language developed by James Gosling and colleagues at Sun Microsystems in the early 1990s. The programs written in the Java language can run in different hardware platforms.

Java 2 Micro Edition (J2ME) – It is a collection of Java APIs for the development of software for resource constrained devices such as PDAs, cell phones and other consumer appliances. It was developed under the Java Community Process as JSR 68.

Java Application Descriptor (JAD) – It is a file that describes the MIDlets that are distributed as JAR files.

Java Archive (JAR) – It is an archiving system that is use to wrap up the various components of a Java application package, such as class, image, sound, and other data files.

Maintainability – It refers to the ease of testing and maintaining the Cubies 2D Mobile Game.

Manifest – It is a text file that contains attribute value pairs which is separated by a colon.

Mobile Game – It is a computer software game played on a mobile phone.

Mobile Information Device Profile (MIDP) – It is a specification published for the use of Java on embedded devices such as cell phones and PDAs. MIDP is part of the Java Platform, Micro Edition (Java ME) framework.

Mobile Phone – It is an electronic telecommunications device which is connected to a cellular network of cell sites, which is in turn interconnected to the public switched telephone network.

Multiplayer Mobile Game – It is very similar to the multiplayer games for PCs. Unlike the old single player mobile games with artificially intelligent opponents, we have the other player with a mobile device playing the same game. This is usually achieved through Infrared, Bluetooth, GPRS, 3G, or WiFi.

Nokia PC Suite – It is a software package used to establish an interface between Nokia mobile devices and computers that run Microsoft Windows operating system. It can be used to transfer music, photos and applications. It can also be used to send Short Message Service (SMS) messages or connect to the Internet. A mobile phone can be connected by USB, Bluetooth, or Infrared.

Notepad++ – It is a free source code editor which supports several programming languages running under the Microsoft Windows environment. Some of the most common programming languages supported by Notepad++ are: C, C++, Java, C#, XML, HTML, PHP, JavaScript, ASP, SQL, CSS, and Pascal.

Personal Digital Assistants (PDAs) – These are handheld devices that were originally designed as personal organizers, but became much more versatile over the years. It can serve as a calculator, clock and calendar, play computer games, accessing the Internet, sending and receiving E-mails, a radio or stereo, video recording, recording notes, address book, and a spreadsheet.

Reliability – It refers to the absence of errors in the software and the conformance of the main elements of the Cubies 2D Mobile Game to meet the desired results.

Second-generation (2G) – It is a short term for second-generation wireless telephone technology. 2G services are frequently referred as Personal Communications Service or PCS in the US.

SMS games – These games are played by sending text messages. For example, SMS to game server—that processes them and sends back the result through SMS. Often in the form of live contests and polls. Not very popular because the cost of gaming increases with each SMS sent to the game server.

Software Development Kit (SDK) – It is typically a set of development tools that allows a software engineer to create applications for a certain software package, software framework, hardware platform, computer system, video game console, or operating system. It is also frequently include sample code and supporting technical notes or other supporting documentation to help clarify points from the primary reference material.

Sound Forge – It is a digital audio developed by Sony for editing and creation suite aimed at the professional as well as the semi-professional market.

Sun Java Wireless Toolkit – It is a state-of-the-art toolbox for developing wireless applications that are based on J2ME's Connected Limited Device Configuration (CLDC) and Mobile Information Device Profile (MIDP), and designed to run on cell phones, mainstream personal digital assistants, and other small mobile devices. This toolkit includes the emulation

environments, documentation, and examples that developers need to bring efficient and successful wireless applications to market quickly.

Tetris – It is a very popular falling blocks puzzle video game, released on a large spectrum of platforms. Alexey Pajitnov originally designed and programmed the game in 1984, while working for the Dorodnicyn Computing Centre of the Academy of Science of the USSR in Moscow.

Third-generation (3G) – It is a short term for third-generation wireless, and refers to near-future developments in wireless technology, especially mobile communications. The services associated with 3G provide the ability to transfer both voice data (a telephone call) and non-voice data (such as downloading information, exchanging email, and instant messaging).

Three-dimensional (3D) *computer graphics* – These are works of graphic art that were created with the aid of digital computers and specialized 3D software.

Two-dimensional (2D) *computer graphics* – These are computer-based generation of digital images—mostly from two-dimensional models (such as 2D geometric models, text, and digital images) and by techniques specific to them. They are mainly used in applications that were originally developed upon traditional printing and drawing technologies.

Video game – It is a computer game wherein computers monitor or television is the primary feedback device.

Video game console – It is an interactive entertainment computer. The term is used to distinguish a machine designed for consumers to buy and use solely for playing video games from a personal computer, which has many other functions, or arcade games, which are designed for businesses to buy and then charge others to play.

Wireless – It is a term used to describe telecommunications in which electromagnetic waves rather than some form of wire carry the signal over part or the entire communication path.

Wireless Application Protocol (WAP) – It is a specification for a set of communication protocols to standardize the way wireless devices works, such as cellular telephones and radio transceivers, can be used for Internet access, including email and the World Wide Web. It was conceived by four companies: Ericsson, Motorola, Nokia, and Unwired Planet (now Phone.com).

Wireless Fidelity (Wi-Fi) – It is developed for use in mobile computing devices, such as laptops, in LANs, but is now increasingly used for more applications, including Internet and VoIP phone access, gaming, and basic connectivity of consumer electronics such as televisions and DVD players, or digital cameras.

Chapter 3

METHODOLOGY

METHODOLOGY

In this chapter, the different procedures in creating and analyzing the system are discussed. The Project Design focuses on 2 subtopics: the System Framework, which enables the reader to visualize the connection between the main components of the Cubies 2D Mobile Game, and the Process Flow, which illustrates the complete Data Flow Diagram of the said game. The Project Development tackles the Waterfall Model with Prototyping and the justification of the researchers as to why they chose such system. And lastly, the Testing and Evaluation Procedure discusses the procedures in conducting the system that the respondents (Technical experts and End-users) must be familiar with. It also involves the discussion of the statistical treatment of data to be done by the researchers.

Project Design

- **System Framework**

Figure 10 shows the system framework of our system. The user can only access the system through a “medium” which is a mobile phone. Next, the program runs the graphic design coordinates with it which will enable the user to see the environment of the game.

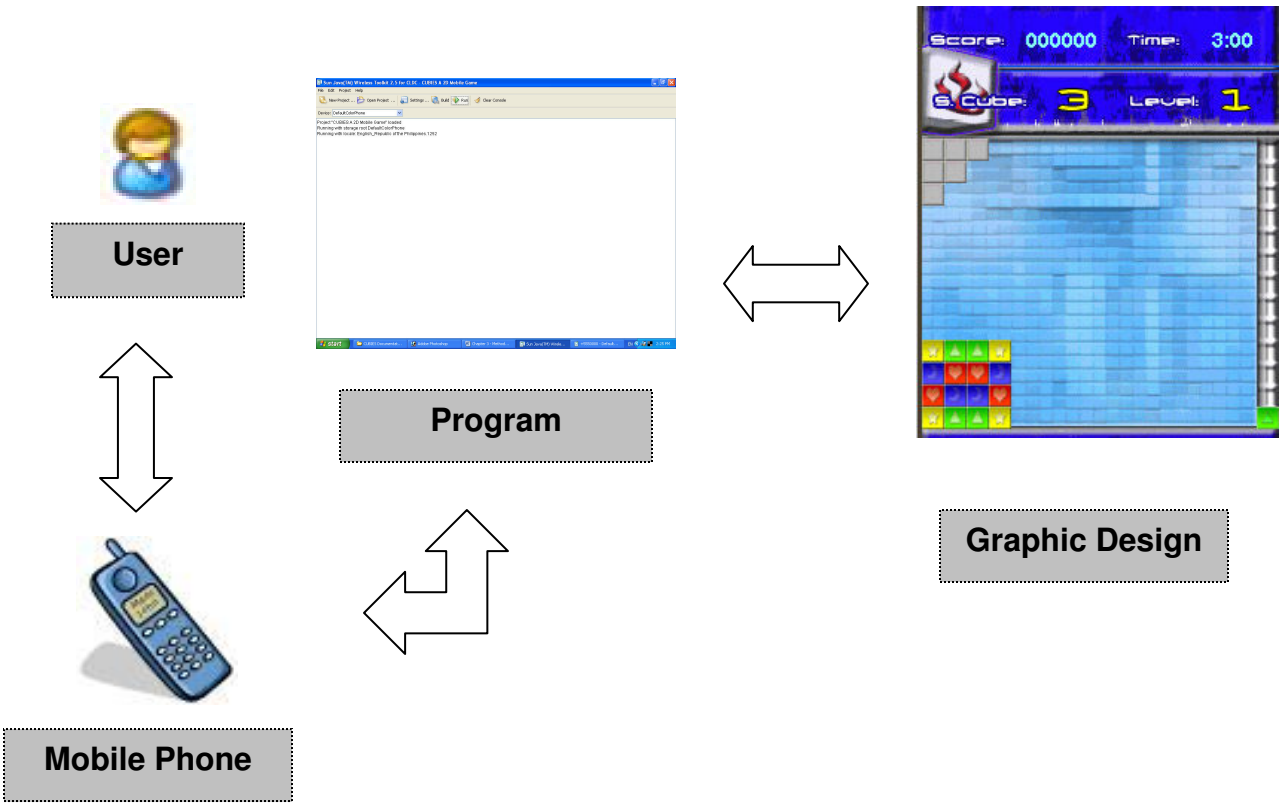


Figure 10: System Framework for the Cubies 2D Mobile Game

- **Process Flow**

Figures 11 and 12 illustrate the Context Diagram and Diagram 0 of the Cubies 2D Mobile Game respectively, which serves as a guide for users in playing our game. While Figures 13 and 14 shows the Child Diagram of Processes 4 and 8 respectively. As the user opens the game, introduction will be the first to be shown and followed by menu. The user will choose one of the menu options namely: New Game, Continue Game, High Score, Settings, Instructions, and Exit. In the New Game option, the user will play from the first

level up to the last level. The Continue Game option, the user will continue the previous game level where he had left. The High Score option displays the name of the 5 top scorers of the game including the highest level that they reach and their corresponding scores. The Settings option allows the user to configure settings for the game. The Instruction option, it shows the step-by-step instructions about the mechanics of the game. Lastly, the Exit option allows the user to close the application.

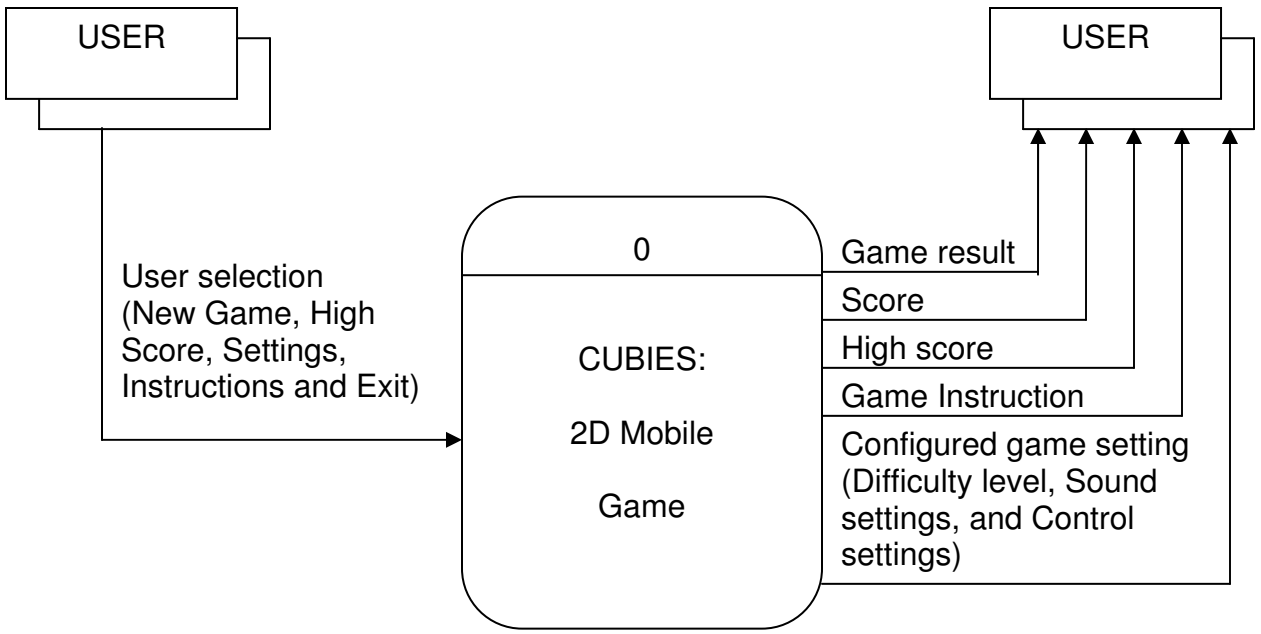


Figure 11: Context Diagram for the Cubies 2D Mobile Game

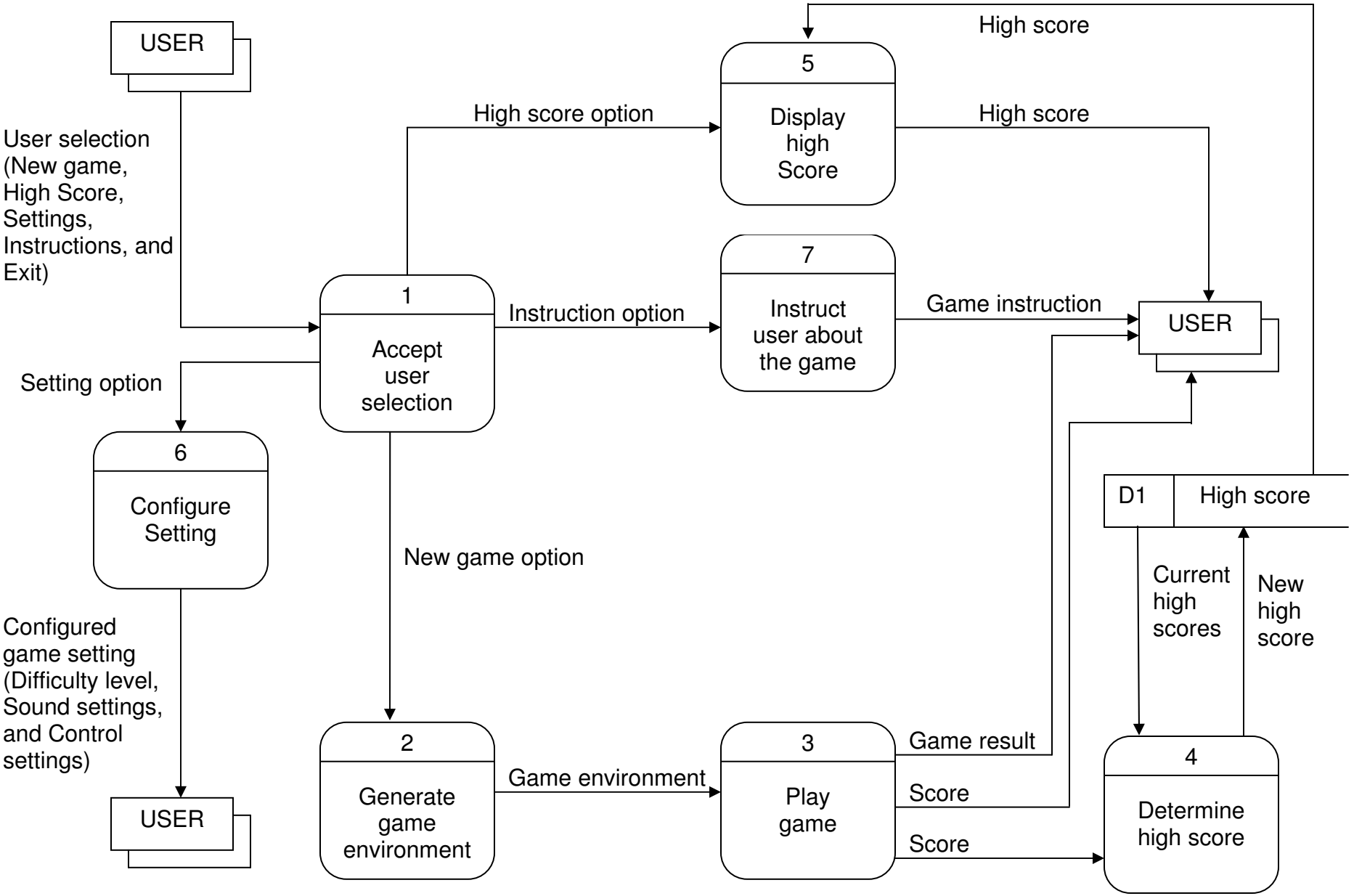


Figure 12: Diagram 0 for the Cubies 2D Mobile Game

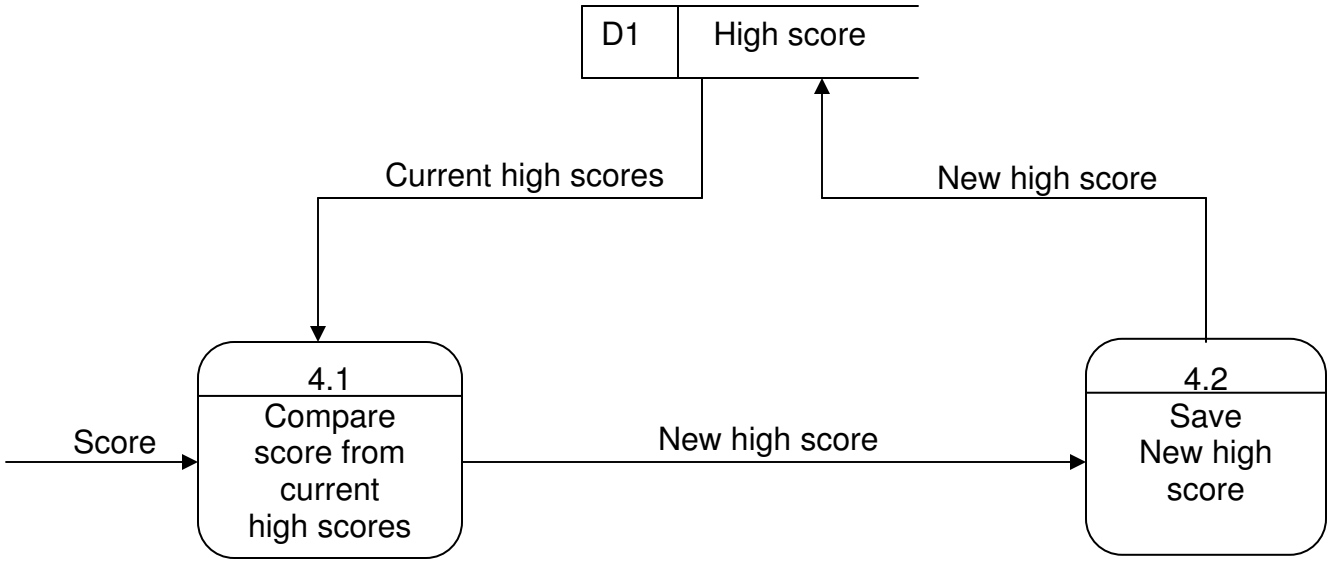


Figure 13: Child Diagram of Process 4 in Diagram 0

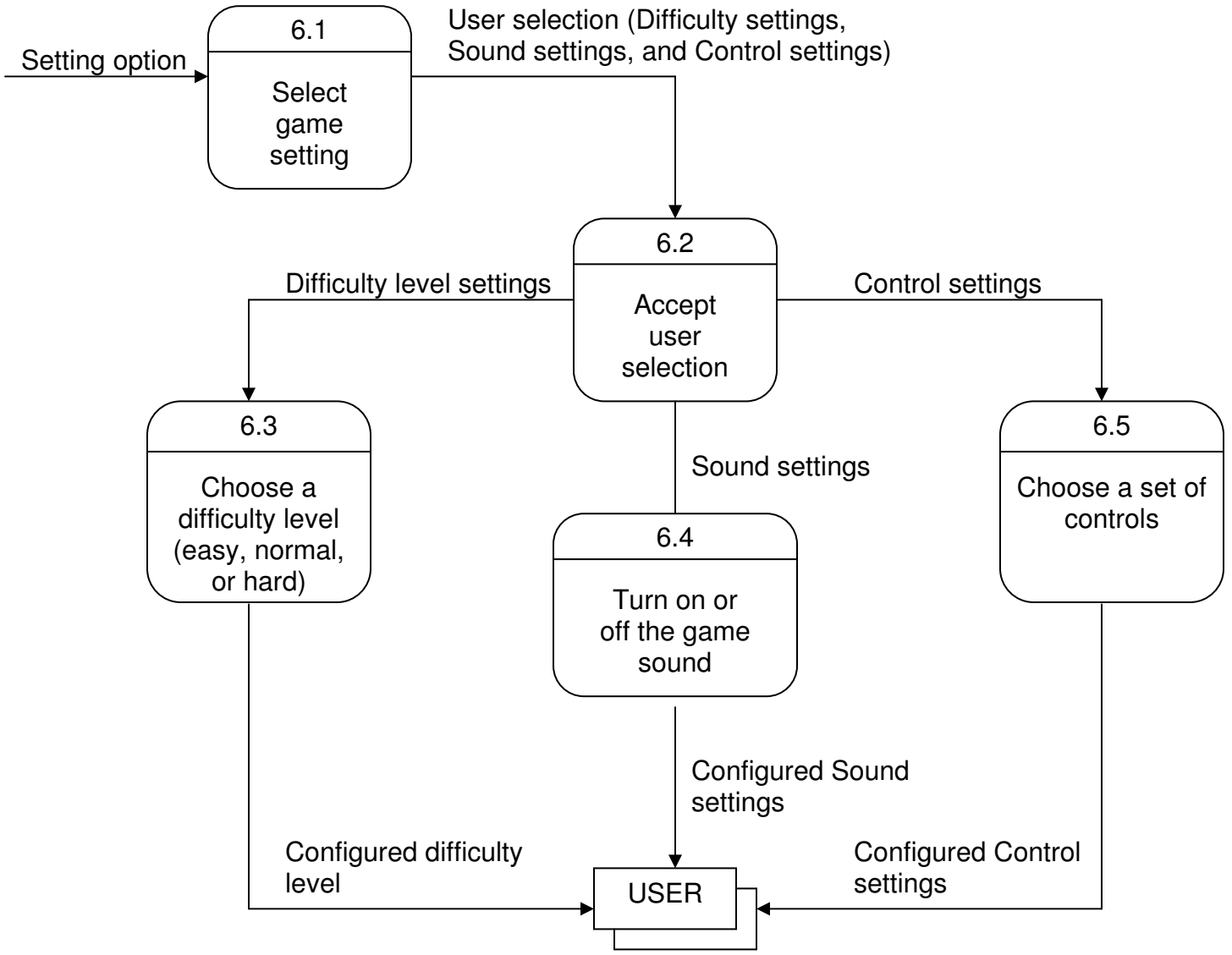


Figure 14: Child Diagram of Process 6 in Diagram 0

Project Development

Waterfall model has been used to prescribe software development activities. It will be very useful for us developers to lay out what we need to do. Its simplicity makes it easy for us to explain to those unfamiliar with software development. Many other, more complex models are really just embellishments of the waterfall model, incorporating feedback loops and extra activities.

However the waterfall model tells us nothing about the typical back and forth activities that will lead to the final product. Software development involves changes even during other phases are occurring and to solve this problem the researchers integrated the waterfall model with prototyping so that changes can be made in the process (as shown in Figure 15).

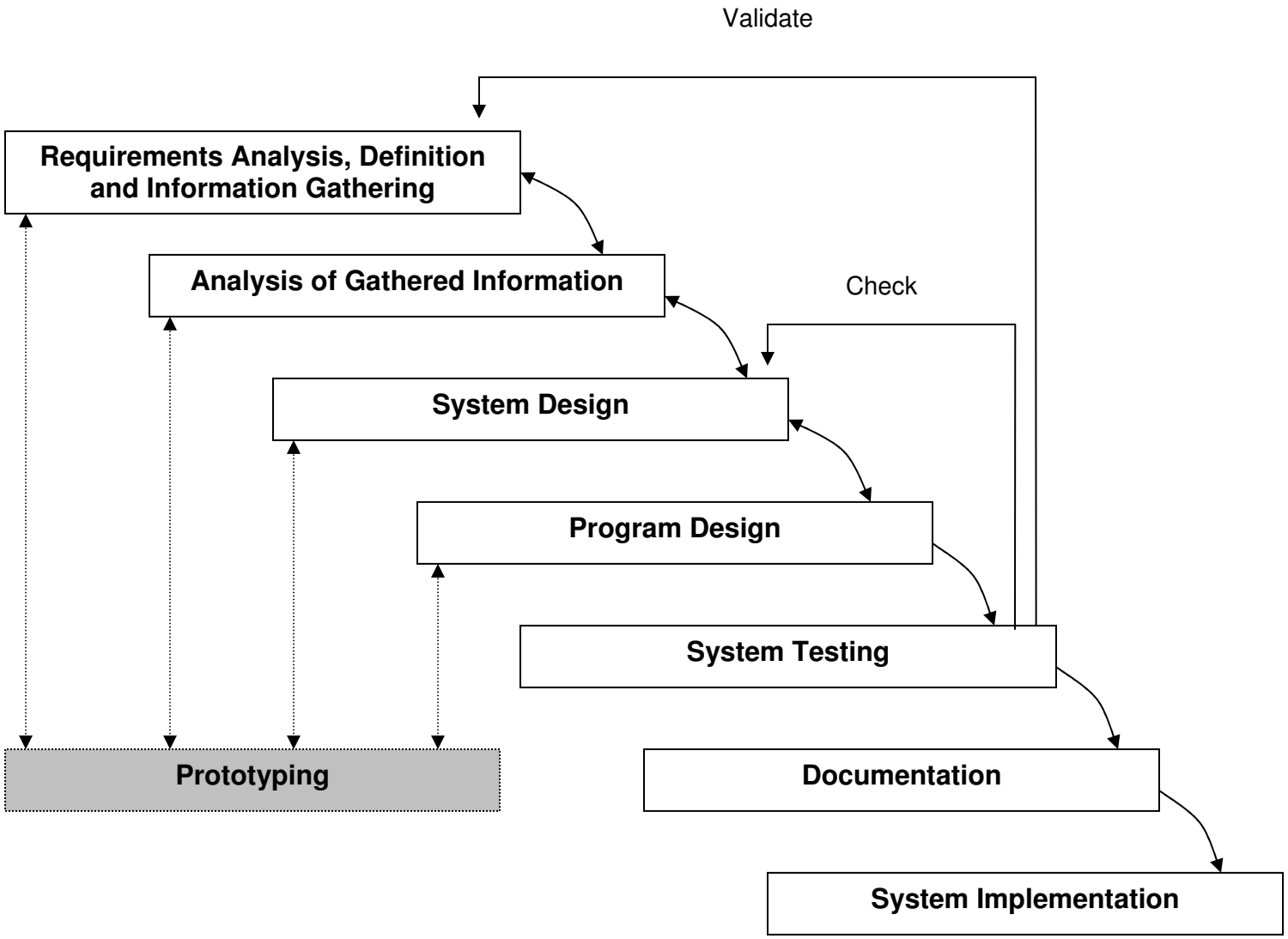


Figure 15: Waterfall Model with Prototyping

Requirements Analysis, Definition and Information Gathering

The first phase is very essential in the development of our system, this is where we will discern and define the requirements for the system to be built, and as soon as the requirements are defined, gathering of information takes place. We should consider three methods of gathering information and that is through library research, Internet research and through interview.

Analysis of Gathered Information

Analysis of the gathered information is very crucial to the development of our system as it goes hand in hand with the first phase. Because whatever will be the result in the analysis of gathered information, we will use this as basis for the succeeding phases in the software development process.

System Design

After the first two phases comes the System Design. This is where we will transform the requirements into a layout of what the system will look like in the user's perspective, what it will do and how it will interact with the user. It must contain a complete description of the functions and interactions involved.

Program Design

Once the system design is done it will be used to generate the design for the program of our system. Notice that programs come only after the functionality and appearance have been defined. This is because when the system design is accepted, the developers can now discuss programs with its basis, a well-defined description of the system.

System Testing

Once the programs have been written, they are tested and evaluated if all the requirements have been met, it will be checked if the system serves its intended purpose. To do so, it will go back to the first phase to validate if the system conforms to the defined requirements. If there are no problems with the system, then it will proceed to documentation.

Documentation

Once all the phases have been done, with no problems and inconsistency, documentation of the system takes place.

Implementation

In the last phase of software development, the implementation of our system will be put into operation. It also includes the maintenance of the system.

Testing and Evaluation Procedure

- **The type and number of respondents**

The expected number of respondents that must test and evaluate our system is 40, where 20 respondents are technical experts and the other 20 being the end-users. Both types of respondents will not be difficult to find since most people are familiar with using a mobile phone.

- **Evaluation Instrument**

The respondents will rate our system with the use of an evaluation instrument, which is provided by the researchers. There are 5 criteria in rating

our system. First, the Installability involves the ease of setting up the system in various cellphone models. Second, the Functionality focuses on the ease of loading and user-friendliness in using our system. Third, the Reliability searches the absence of failures and recoverability in using our system. Fourth, the Availability looks for the completeness, and the conformance of our system to the established requirements. And lastly, the Maintainability looks for the testability.

Each of these software criteria can be graded by knowing the rating scale is listed in the table with their corresponding range and its equivalent:

4.51 – 5.00	Excellent
3.51 – 4.50	Very Satisfactory
2.51 – 3.50	Satisfactory
1.51 – 2.50	Fair
1.00 – 1.50	Poor

Table 1: Rating Scale in the Evaluation Instrument

- **Steps in conducting the testing**

1. The researchers will distribute the evaluation instrument to 40 respondents (20 being the technical experts and the other 20 being the end-users).
2. The respondents must be oriented with the 5 criteria for testing and evaluating the software.
3. They will test the Cubies 2D Mobile Game with the use of a mobile phone or with the use of an emulator provided by J2ME in their Personal or Laptop Computers.

4. After the respondents completely test the game, they will rate our software by answering the evaluation instrument and placing a checkmark under each corresponding numerical rating with 5 being excellent and 1 being poor. They must answer the content of our evaluation instrument completely and as honestly as possible. They must compute for the Total Score by adding each score from the 5 software criteria. They may include comments and suggestions for further improvement of the system.
5. The researchers will collect all the evaluation instruments from the respondents. After which, the researchers will double check the computations done by the respondents in the evaluation instrument.
6. From their evaluation instruments, we will be able to interpret and analyze the respondent's feedback with the use of statistics. From this point, the statistical treatment of data comes in.

- **Statistical Treatment of Data**

In order for the researchers to compute for the overall rating of our system, the necessary statistical formulas such as Mean and Standard Deviation are to be used.

Below are the steps that are to be done by the researchers to know the acceptability of our system in both quantitative and qualitative terms:

1. After collecting all the evaluation instruments from the respondents, we can get the Mean by using the formula:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

It is computed by adding all X_i's from 1 to n, which comprises all the total scores from all the evaluation instruments and then divide it by n, which is the total number of respondents who answered the evaluation instrument.

2. To enable the researchers to judge the reliability of the mean, Standard Deviation must be determined. It measures the degree of how the values in the distribution are scattered. It is computed by using the formula:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}.$$

In the formula, the mean is the value determined in Step 1. From here, subtract each Xi to the mean and then square each difference. And lastly, add all the squared values and divide the sum to n minus 1.

3. For us to interpret the statistical results of our findings, the researchers must create a Frequency Distribution based from all the evaluation instruments answered by respondents. It is made by determining the range, which is the difference between the highest total score and the lowest total score from the evaluation instrument. To get the class size, divide the range with the desired number of class intervals. After getting the class size, we can also get the class mark by adding the 2 class intervals and divide by 2. Tally the frequencies for each interval based from the scores of each evaluation instrument.

4. Finally, for the readers to interpret the statistical results of our findings, we will represent the Frequency Distribution graphically by constructing a Frequency Polygon wherein the values in the x-axis represents the scores from the evaluation instrument and the values in the y-axis represents the number of respondents who answered the evaluation instrument.

Chapter 4

RESULTS AND DISCUSSIONS

RESULTS AND DISCUSSION

This chapter highlights the CUBIES Game as a finished running system. The Project Description describes the origin of the game and instruction on how to play it. The Project Structure shows the HIPO chart, which shows the hierarchy of important modules included in the system, and User Interface Screenshots also shown here along with some interesting facts in each screen. The Project Capabilities enumerate all the features of the CUBIES Game. And lastly, the Project Evaluation discusses the result of the evaluation procedure conducted by the researchers.

Project Description

The project is all about CUBIES, a 2D mobile game. Some of the rules in this mobile game are adapted from the games Flipull and Tetris. Below is the instruction in playing this mobile game.

Given a randomized cube pattern and a set of cubes to be eliminated, the user must eliminate a number of one or more similar cube patterns for a limited period of time.

If the user accidentally or intentionally hit a cube pattern in a different cube pattern, then his cube pattern will become part of the cubes to be eliminated. He has the freedom to hit a cube in the Sky Platform in order to eliminate similar cube arranged in a column. He also has the option to use a Super Cube to eliminate a line of different cubes arranged in a row or in a column.

In order for him to progress through the game, he must successfully eliminate all cubes before the time runs out. Otherwise, it will mean Game Over.

Project Structure

I. HIPO Chart

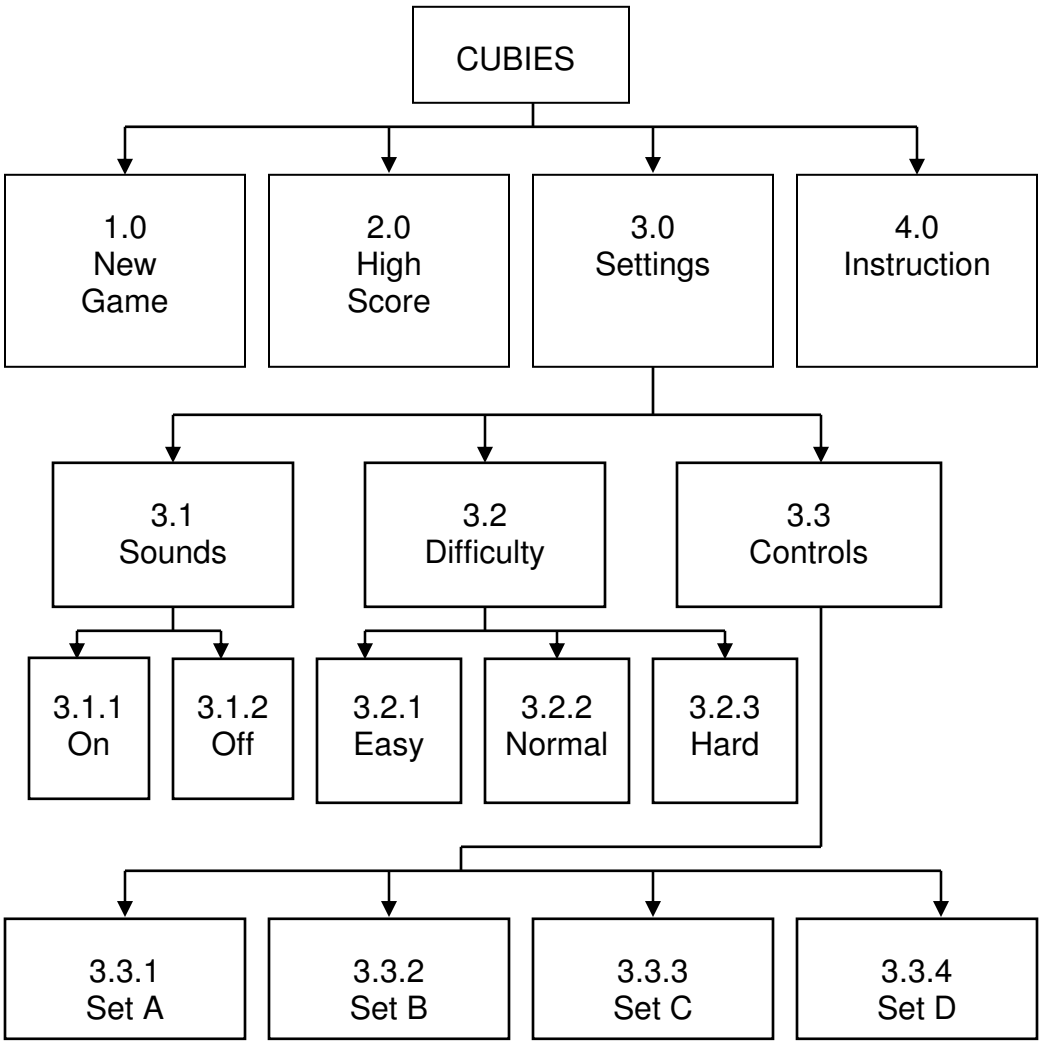


Figure 16: HIPO Chart of CUBIES: A 2D Mobile Game

II. User-Interface Screenshots

Figure 17: Title Screen

This figure shows the very first screen that the user will see upon playing this mobile game. The user has to press any key to be able to go to the Main Menu Screen.

The Title Screen bears the official emblem of the game. It has an inscription CUBIES Version 1.1b, wherein b stands for Beta. The shattered debris on the foreground represents the cube patterns to be eliminated by the user. The symbolic flame on the background represents the Super Cube wherein it can break through any obstacles. Since the Super Cube can eliminate any number of similar or different cubes arranged in either a row or column, then the symbolic flame shows an incredible power in its appearance in the official emblem of the game.

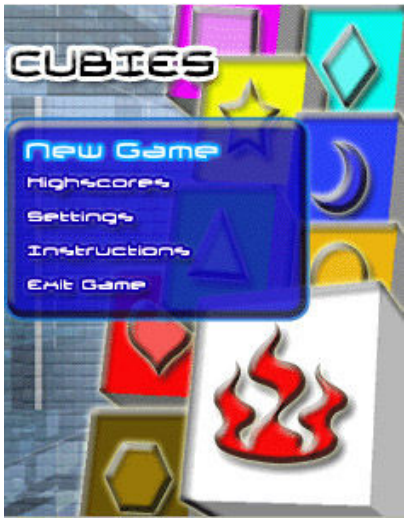


Figure 18: Main Menu Screen

This figure shows the list of menus that are present in the CUBIES Game. It has 5 options namely: New Game, High Scores, Settings, Instructions, and Exit Game. The first 4 options will lead the user to their respective screens whereas the last option will terminate the CUBIES Game.

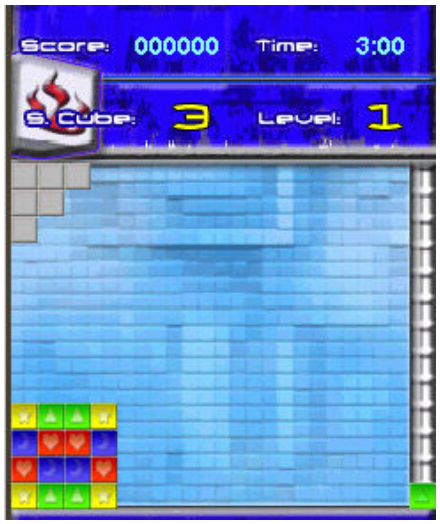


Figure 19: New Game Screen

This figure shows the complete game environment in Level 1 in Normal difficulty. It includes important game information such as score, number of Super Cubes, time remaining, and the current level. It also contains a number of cubes to be eliminated, the Sky Platform, a randomized Base Cube, and the Cube Ladder in which the Base Cube can move up or down.

The first level will be accessible to the user after he selects New Game in the Main Menu Screen. The time, the number of Super Cubes, the number of cubes and its pattern varies depending on the difficulty set by the user in the Settings Screen.

To earn a high score in every level greatly depends on the randomized cube pattern, the time it takes for the user to finish the level and his analytical intuition.

Figure 20: High Scores Screen

This figure appears after the user selects High Scores option in the Main Menu Screen. It lists all top 5 high scorers in each game difficulty. As the user has finished the game and he surpasses any of the current top five high scorers depending on the difficulty, his score will be included in the list depending on his rank and on the difficulty it fits in. By pressing Back, the user will return to the Main Menu Screen.

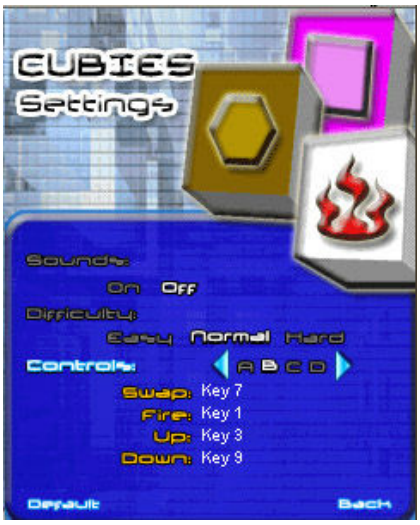


Figure 21: Settings Screen

This figure appears after the user selects the Settings option in the Main Menu Screen. It shows the setting structure of the CUBIES Game. The user can set the sound either on or off. He can also set the difficulty of the game whether it is easy, normal or hard. And he can set the controls whether it is Set A, B, C, or D. If the user wants to restore the game's original setting, he just needs to press the default button located in the lower-left corner of the screen. In this way, the sound will be set to On, the difficulty will be Normal, and the Controls will be Set A.

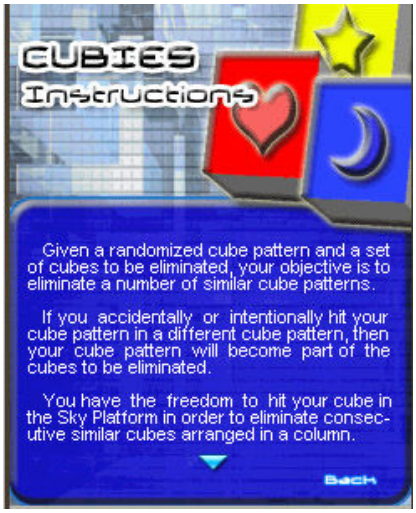


Figure 22: Instructions Screen

This figure appears after the user selects the Instructions option in the Main Menu Screen. It contains a 2-page basic instructions of the game. If the user does not know how to play this game, then he just needs to access this option and read it.

Project Capabilities

The following are the main features that the CUBIES Game has to offer.

1. **Portability** - This mobile game can be run either in J2ME Wireless Toolkit via an emulator of different cellphone brands or he can transfer it directly to his cellphone by using a software suite for the particular cellphone brand he is using.
2. **Requires MIDP 2.0 and CLDC 1.1** - This mobile game can only be deployed in cellphones that support MIDP 2.0 and CLDC 1.1 such as Nokia models which ranges from Series 60 to 90.
3. **Different Mode of Gameplay** – This mobile game allows the user to set the difficulty from Easy, Normal or Hard depending on his capability in playing the game. The number of Super Cube, cube patterns, and time alloted to finish a level is greatly dependent on the difficulty he sets.
4. **Customizable Set of Controls** – This mobile game allows the user to choose a set of pre-defined controls that he wants.
5. **Updateable High Score Data** – Everytime a user beats any of the current high scorers, then his name code, score, and level will be stored in the High Score Data.
6. **Turn the Sound On or Off** – This mobile game allows the user to turn the sound on or off depending on his preference.

Project Evaluation

The CUBIES Game was evaluated to 40 respondents who gave their opinions and comments regarding the acceptability and quality of the system Regardless as to whether their opinions and comments are positive or negative, it will help in the further improvement of the system.

The 40 respondents are composed of 20 technical experts and 20 end-users. We chose to distribute the evaluation sheet to technical experts, who work in computer-related companies since they are technologically-inclined. Therefore, they can give us a reliable response for the further improvement of our system. While the end-users, who are mostly CCSS Students, will give a good opinion about the basic functionality about the game.

The overall acceptability rate from our respondents for our system is 3.96 which is equivalent to Very Satisfactory. This simply means that the CUBIES Game is complete as a mobile game and our respondents are impressed with the outcome and quality of the system. It also means that the game is open for further improvements to produce an even better version of the game.

Table 2 shows the numerical score given by respondents in each criterion along with their equivalent descriptive meaning.

SOFTWARE CRITERIA	TECHNICAL EXPERTS		END-USERS	
	Numerical Rating	Descriptive Rating	Numerical Rating	Descriptive Rating
A. Installability				
1. Ease of setting up	4.05	Very Satisfactory	4.05	Very Satisfactory
B. Functionality				
1. Ease of operation	4.10	Very Satisfactory	3.65	Very Satisfactory
2. Provision for comfort and convenience	4.15	Very Satisfactory	3.85	Very Satisfactory
3. User-friendliness	4.25	Very Satisfactory	4.05	Very Satisfactory
4. Operability	3.80	Very Satisfactory	4.05	Very Satisfactory
C. Reliability				
1. Conformance to desired result	4.00	Very Satisfactory	4.00	Very Satisfactory
2. Accuracy of performance	4.00	Very Satisfactory	3.90	Very Satisfactory
3. Absence of failure	3.85	Very Satisfactory	4.00	Very Satisfactory
4. Recoverability	3.60	Very Satisfactory	3.90	Very Satisfactory
D. Availability				
1. Performs according to specification	3.90	Very Satisfactory	4.10	Very Satisfactory
2. Completeness of the system	3.85	Very Satisfactory	4.00	Very Satisfactory
E. Maintainability				
1. Testability	4.05	Very Satisfactory	3.85	Very Satisfactory
2. Provision for diagnostic tools and procedures	3.90	Very Satisfactory	3.55	Very Satisfactory

Table 2: Summary of Ratings for CUBIES Game in Each Criterion

Statistical Results of the CUBIES Game

I. Frequency Distribution

Table 3 shows all the total score from the 40 respondents who evaluated our system wherein the first 20 are Technical Experts while the later 20 are End-Users. These total scores were taken from each of the Evaluation Instrument answered by them.

Respondent	Total Score
1	4.15
2	3.95
3	4.25
4	3.80
5	3.80
6	3.70
7	3.80
8	4.20
9	3.40
10	3.50
11	4.25
12	4.20
13	3.95
14	4.00
15	4.00
16	4.20
17	4.10
18	4.00
19	4.35
20	3.65
21	4.15
22	4.40
23	3.80
24	3.65
25	4.85
26	4.10
27	3.30
28	3.60
29	3.65
30	4.60

31	3.55
32	4.15
33	3.10
34	4.30
35	3.50
36	3.00
37	3.80
38	4.70
39	3.65
40	4.70

Table 3: List of Total Scores from 40 Respondents of the CUBIES Game

The first step in constructing the Frequency Distribution is to get the range, which is the difference between the highest and lowest scores. In the table above, the highest score is 4.85 while the lowest is 3.00. Therefore, the range is 1.85. The next step is to divide the range with its divisible class interval which is 5 to get a class size of 0.37. Lastly to get the Frequency Distribution, tally all the total scores from the table above and get the class mark in each class interval. Table 4 shows its result and the dispersion of total score data.

Class Interval	Frequency	Class Mark
4.49 – 4.85	4	4.67
4.12 – 4.48	11	4.30
3.75 – 4.11	12	3.93
3.38 – 3.74	10	3.56
3.01 – 3.37	2	3.19
2.64 – 3.00	1	2.82
Total	40	

Table 4: Frequency Distribution based from the Evaluation Result of the CUBIES Game

II. Frequency Polygon

Finally, for the readers to easily understand and interpret the Frequency Distribution as shown above, convert it into a Frequency Polygon as shown below, wherein the x-axis represents each class mark of total scores while y-axis represents the number of respondents who answered within the class interval in the Evaluation Instrument. Each point in the graph represents the intersection between the class mark and the number of respondents.

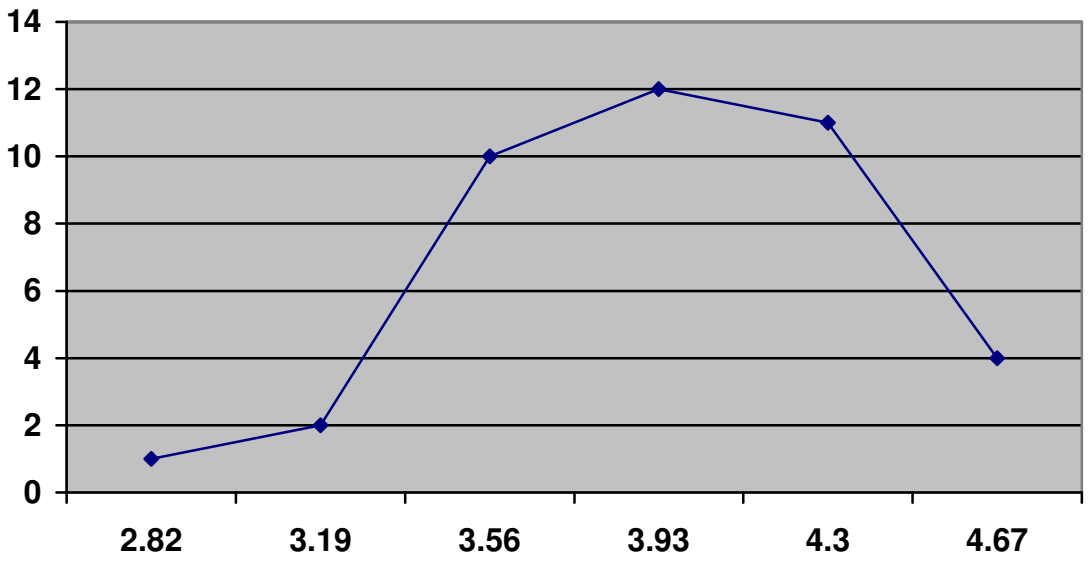


Figure 23: Frequency Polygon based from the Evaluation Result of the CUBIES Game

Chapter 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter will discuss all our findings that we had encountered during the making of this project. This will serve as the basis for future researchers who will further enhance this project. We also had our conclusion as the summary about this project together with the recommendation so that the future researchers will have a guide on the improvements to be done in this project.

Summary of Findings

Here is the summary that we found out based from the Evaluation result taken from the respondents:

Installability – This software criteria result to Very Satisfactory because when we deploy our game into the cellphone, it does not take a long time. Since they can transfer the game via a Flash Drive (to be viewed in an Emulator), Memory Card or Bluetooth (to be viewed in Cellphone). Both the Technical Experts and the End-Users gave an average rating of 4.05.

Functionality – This software criteria result to Very Satisfactory because it is user-friendly and the game is easy to understand that most of our respondents can play the game instinctively. The Technical Experts gave an average rating of 4.08 while the End-Users gave only 3.90 because the instructions of the game is not easily understood by the later.

Reliability – This software criteria result to Very Satisfactory. The Technical Experts gave an average rating of 3.93 while the End-Users gave an average rating of 3.95 because the game conforms to what it intends to do.

Availability – This software criteria result to Very Satisfactory because the system is almost complete. The Technical Experts gave an average rating of 3.93 while the End-Users gave an average rating of 4.05 because the sequence of the game is indeed logical.

Maintainability – This software criteria result to Very Satisfactory because they tested the system. The Technical Experts gave an average rating of 3.98 while the End-Users gave an average rating of 3.70. This only proves that the CUBIES Game is very testable since it has only few levels and they can see in the High Score option if their name was included in the ranking based on the difficulty played.

Based from our experience in designing and coding the program, we were refreshed about the concept of basic programming, object-oriented programming, graphic designing and learned new syntax available for the completion of the CUBIES Game. This will be very valuable for us researchers to study higher programming and graphic designing further in the near future.

Based on our observation and testing, we conclude that mobile game is really an effective past time especially to those users who want to relax for a while after studying or working. Furthermore, this mobile game is not time-consuming unlike RPGs, Fighting, and some Shooting games which require a mobile user to play for over an hour to finish the entire game. With the CUBIES Game, it would take at most 25 minutes or less to complete the whole game. And also this mobile game does not need a game demonstration like other games

available in the market. Because this game only requires 4 buttons to remember namely: Up, Down, Fire and Swap.

And lastly based on our evaluation result, the acceptability rate of our project is Very Satisfactory which means that almost all of our respondents like our mobile game. We had created a mobile game that suits the taste of our respondents in the world of mobile gaming. Although they have some comments about our game, but those comments can be reliable in able to produce an exciting game which is suitable for all ages.

Conclusions

This mobile game is suitable for all ages. It dwells on the user's skill on how tough they can solve the given problem on the given period of time. Being the creators of this game, when we share it to some users, we see that they enjoy the game even if we said that although this is a very simple game but it is quite tricky and thinkable.

As the creators of the CUBIES Game, our main objective is to develop a mobile game that will encourage future programmers to be a part of making the mobile game development popular in the Philippines. The initial objectives of the mobile game are almost parallel with the result of the evaluation procedure. Because the result of the evaluation procedure shows that the CUBIES Game can be further developed by future researchers or programmers who knew about the concept of the game. Thus, this mobile game is acceptable by modern standards.

Recommendations

This project is basically a puzzle game that will challenge everyone's mind on how to conquer all the problems that the user has to encounter. This is a game that will suit in every person's level of competency, either as a beginner or an expert. This is not just an ordinary game that will help him feel relaxed but this will also exercise his mind because he is going to solve the problem on a limited period of time.

To the future researchers, we recommend you to enhance the design of the game that would make it more recognizable to the gamer. Enhance the animation and make it more realistic. Simplify the code with the use of inheritance and multiple extensions. And to make the game more exciting, you may add a Bonus Level whenever a user got a very high score.

If possible, try to make it a multi-player game via infrared or Bluetooth™ so that gamers would appreciate it.

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APPENDICES

TRANSCRIPT OF INTERVIEW

1. What do you think must always be considered by a game developer when creating mobile games?

Ans.: “As with any developers, putting the interest of the users must always be considered when creating applications.”

2. Is it true that most women prefer to play games in the mobile phone rather than a gaming console?

Ans.: “It is not that women do not prefer playing using game consoles. It is just that mobile phone games are more convenient and handy.”

3. In your opinion, if you are going to port classic games like Tetris and Pac-Man in a mobile phone will the idea click?

Ans.: “No. As these games have already reached their popularity in the game consoles. You must think of something fresh and exciting to give the gaming public.”

4. What tools do you recommend for mobile game developers today?

Ans.: “The popular development softwares currently used by mobile game developers are Microsoft C++ and J2ME. I would also advise game developers to be knowledgeable in graphic design especially with 3D graphics. Also, one has to be always updated with the latest technologies as the IT industry is ever improving.”

5. Which 3-D animation packages will most easily incorporate in mobile game development?

Ans.: “Most graphic animators use the 3D Max software for games graphics.”

6. Is it typical to create new games that will only function smoothly on the latest equipment?

Ans.: “Yes. It is also true with other application types. However, this should not be the reason why programmers would not develop games for low-end equipments.”

7. What are the possible tips for a game developer to do when making a mobile game?

Ans.: “The games you create must always appeal to the public. Be imaginative and creative. Design your characters and background with much color and detail. Make the plots exciting and challenging.”

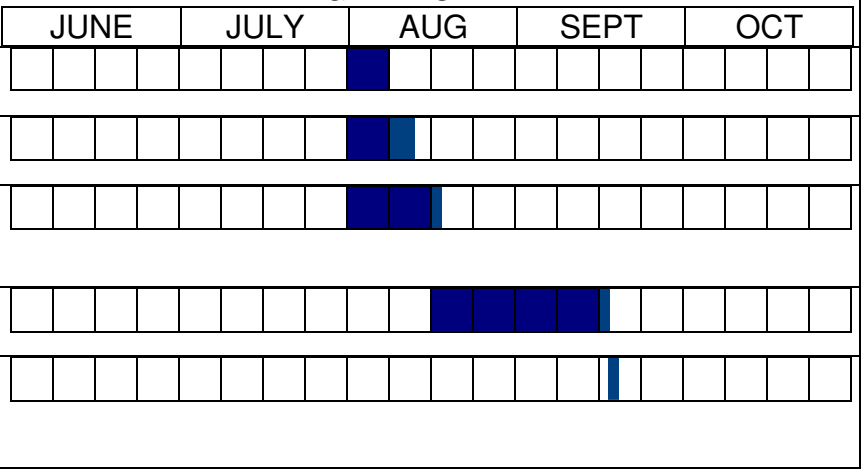
8. Are game designers pushing technology to come up with better game-play or is it the other way around?

Ans.: “I think it’s the other way around; the fast-paced technology is pushing the mobile game developers to produce more exciting applications.”

THESA SCHEDULE OF ACTIVITIES

PROJECT TITLE: **Cubies: A 2D Mobile Game**

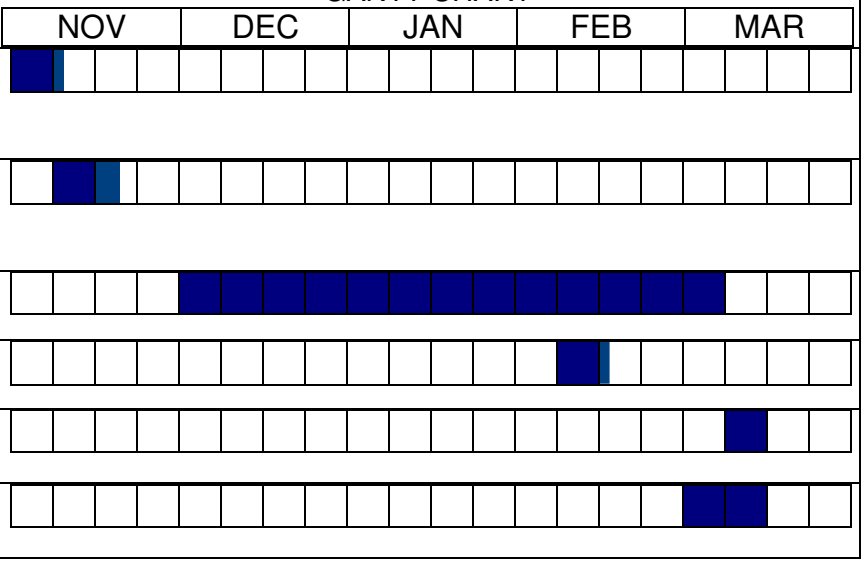
ACTIVITIES	ASSIGNED PERSON	OUTPUT	DURATION (in days)	GANTT CHART
1. Data gathering	All members	Information about the proposed game	4	
2. Library research	All members	Completion of the required number of periodicals	10	
3. Internet Research	Dee, Castillo, Paranpan	Completion of the required electronic sources	15	
4. Thesis Writing (Chapters 1 to 3)	All members	Completion of the THESA Documentation	30	
5. Interviewing	Paranpan	Information about the latest trend in mobile game development	1	



SWPRJ SCHEDULE OF ACTIVITIES

PROJECT TITLE: **Cubies: A 2D Mobile Game**

ACTIVITIES	ASSIGNED PERSON	OUTPUT	DURATION (in days)	GANTT CHART
6. Conceptual Design	All members	Overall specifications of the CUBIES 2D Mobile Game	8	
7. Program Design	Azarcon and Paranpan	Overall physical appearance of the CUBIES 2D Mobile Game	12	
8. Program Coding	Castillo and Dee	Overall functionality of the CUBIES 2D Mobile Game	91	
9. Program Testing	All members	Error-free system for the CUBIES 2D Mobile Game	8	
10. System Evaluation	All members	Acceptability of the CUBIES 2D Mobile Game	7	
11. Thesis Writing (Chapters 4 to 5)	Dee and Azarcon	System documentation for SWPRJ	14	



Evaluation Results on the Acceptability of
CUBIES: A 2D Mobile Game
By TECHNICAL EXPERTS

Evaluator	Installability	Functionality	Reliability	Availability	Maintainability
1	4.00	5.00	4.25	4.00	4.00
2	4.00	4.25	4.75	4.50	3.50
3	3.00	4.50	4.25	4.00	4.00
4	4.00	4.00	4.00	4.00	4.00
5	4.00	4.00	4.00	4.00	4.00
6	4.00	4.50	4.00	4.50	4.00
7	4.00	4.00	4.00	4.00	4.00
8	4.00	4.00	4.00	4.00	4.00
9	4.00	3.75	3.75	4.00	3.50
10	4.00	3.25	3.25	3.50	3.00
11	4.00	4.50	4.25	4.50	4.50
12	4.00	4.00	3.50	3.50	4.00
13	4.00	3.75	3.75	3.50	4.00
14	4.00	3.50	3.00	3.50	3.50
15	4.00	3.75	3.75	3.50	3.50
16	4.00	4.25	4.25	4.00	4.50
17	5.00	4.25	3.75	4.00	4.50
18	5.00	3.50	4.25	4.00	4.50
19	4.00	4.25	4.00	3.50	4.00
20	4.00	4.50	3.75	4.00	4.50
Average Score	4.05	4.08	3.93	3.93	3.98

Overall Average Score	3.99
Descriptive Rating	Very Satisfactory

Evaluation Results on the Acceptability of
CUBIES: A 2D Mobile Game
By END-USERS

Evaluator	Installability	Functionality	Reliability	Availability	Maintainability
1	5.00	4.50	4.75	5.00	5.00
2	4.00	4.25	4.25	4.00	4.00
3	3.00	3.50	3.50	3.50	3.00
4	4.00	3.50	3.50	3.50	3.50
5	4.00	3.75	3.50	3.50	3.50
6	5.00	4.50	4.50	4.50	4.50
7	4.00	3.25	3.50	4.00	3.00
8	4.00	3.75	4.00	4.50	4.50
9	3.00	3.50	3.00	3.00	3.00
10	4.00	4.50	4.00	4.50	4.50
11	4.00	3.50	3.75	3.50	3.50
12	5.00	4.50	4.50	5.00	4.50
13	4.00	3.75	3.75	3.50	2.50
14	3.00	3.00	2.50	4.00	2.50
15	5.00	3.50	4.75	4.00	2.00
16	4.00	4.50	5.00	5.00	5.00
17	4.00	4.25	4.50	4.00	4.00
18	4.00	4.25	4.75	5.00	4.00
19	4.00	4.00	3.50	3.50	4.00
20	4.00	3.75	3.50	3.50	3.50
Average Score	4.05	3.90	3.95	4.05	3.70

Overall Average Score	3.93
Descriptive Rating	Very Satisfactory

Summary of Evaluation Results
on the Acceptability of
CUBIES: A 2D Mobile Game

	TECHNICAL EXPERTS	END-USERS
Overall Average Score	3.99	3.93
Descriptive Meaning	Very Satisfactory	Very Satisfactory

Overall Average Acceptability	3.96
Descriptive Rating	Very Satisfactory

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VINCENT WARREN B. AZARCON

Educational Attainment

College: University of the East
BS Computer Science
2003 – Present

Secondary: Saint Michael's College
1999 – 2003

Elementary: Saint Michael's College
1993 – 1999

Trainings/Seminars Attended

Corel Draw Seminar 2
P.O. Domingo Center for Information Technology, University of the East
September 16, 2006

Fundamentals of networking (workshop)
P.O. Domingo Center for Information Technology, University of the East
October 22, 2005

Router Configuration
P.O. Domingo Center for Information Technology, University of the East
October 21, 2005

Switching Fundamentals
P.O. Domingo Center for Information Technology, University of the East
October 20, 2005

Fundamentals of networking (symposium)
P.O. Domingo Center for Information Technology, University of the East
October 19, 2005

Interests

Software development, Systems Analysis and Design, and Project Management

Personal Information

Nickname	:	Warren
Date of Birth	:	April 4,1986
Place of Birth	:	Surigao City
Sex	:	Male
Civil Status	:	Single
Citizenship	:	Filipino
Religion	:	Catholic
Height	:	5’5”
Weight	:	140 lbs.

Name of Parents:

Father	:	Angelberto Azarcon
Occupation:		OFW
Mother:		Rosalinda Badiang-Azarcon
Occupation:		Teacher

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Secondary: Infant Jesus Academy
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Trainings/Seminars Attended

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Interests

Software development, Systems Analysis and Design, and Project Management

Personal Information

Date of Birth	:	March 23, 1986
Place of Birth	:	Marikina City
Sex	:	Male
Civil Status	:	Single
Citizenship	:	Filipino
Religion	:	Catholic
Height	:	5'9"
Weight	:	150 lbs.
Name of Parents:		
Father	:	Ernesto Castillo
Occupation:		Businessman
Mother:		Myrna Austria-Castillo
Occupation:		Employee

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RONALD O. DEE

Educational Attainment

College: University of the East
BS Computer Science
2003 – Present

Secondary: Philippine Cultural High School
1999 – 2003

Elementary: Philippine Cultural High School
1992 – 1999

Trainings/Seminars Attended

Fundamentals of Networking (workshop)
P.O. Domingo Center for Information Technology, University of the East
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Router Configuration
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October 21, 2005

Switching Fundamentals
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October 20, 2005

Fundamentals of Networking (symposium)
P.O. Domingo Center for Information Technology, University of the East
October 19, 2005

Interests

Software development, Systems Analysis and Design, Project Management, and Consultancy

Personal Information

Nickname	:	Ronald / Nald
Date of Birth	:	September 20, 1985
Place of Birth	:	Manila
Sex	:	Male
Civil Status	:	Single
Citizenship	:	Filipino
Religion	:	Christian
Height	:	5'6"
Weight	:	148 lbs.
Name of Parents:		
Father	:	Leoncio O. Dee
Occupation:		Self-employed
Mother:		Rosa O. Dee
Occupation:		Housewife

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VINCENT C. PARANPAN

Educational Attainment

College: University of the East
BS Computer Science
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Secondary: Espiritu Santo Parochial School
1999 – 2003

Elementary: Fransisco Balagtas Elementary School
1992 – 1999

Trainings/Seminars Attended

Corel Draw Seminar 2
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Corel Draw Seminar
P.O. Domingo Center for Information Technology, University of the East
August 19, 2006

Fundamentals of Networking (workshop)
P.O. Domingo Center for Information Technology, University of the East
October 22, 2005

Router Configuration
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October 21, 2005

Switching Fundamentals
P.O. Domingo Center for Information Technology, University of the East
October 20, 2005

Fundamentals of Networking (symposium)
P.O. Domingo Center for Information Technology, University of the East
October 19, 2005

Interests

Software development, Systems Analysis and Design, Project Management, and Consultancy

Personal Information

Nickname	:	Centi / Cent / Vince
Date of Birth	:	May 5, 1985
Place of Birth	:	Manila
Sex	:	Male
Civil Status	:	Single
Citizenship	:	Filipino
Religion	:	Catholic
Height	:	5'8"
Weight	:	121 lbs.

Name of Parents:

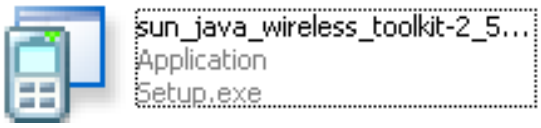
Father	:	Vicente S. Paranpan
Occupation:		Businessman
Mother:		Victoria C. Paranpan
Occupation:		Gov't Employee

USER'S MANUAL

Steps in Installing and Opening the CUBIES Game in your Computer:

1. First, install the JDK 1.4.2 or higher version.

2. Install the Sun Java(™) Wireless Toolkit 2.5 for CLDC or higher version.



3. Copy the JAR and JAD file of the CUBIES Game. Then paste it anywhere you want. Make sure that both of them are located in the same path or folder.

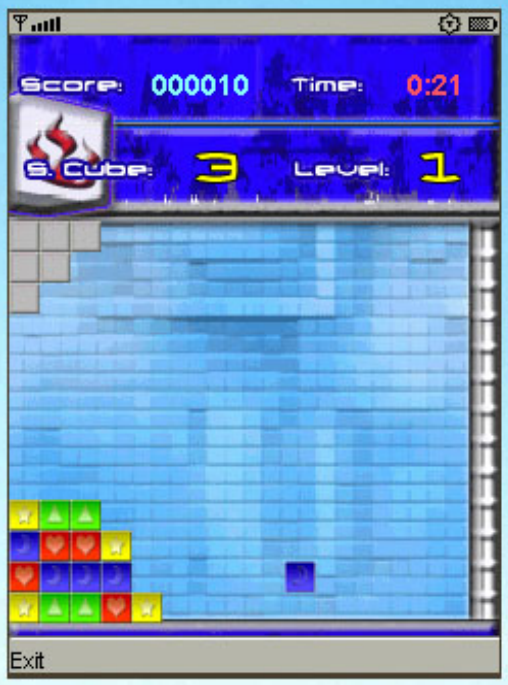
4. Open the JAD file to run the CUBIES Game.

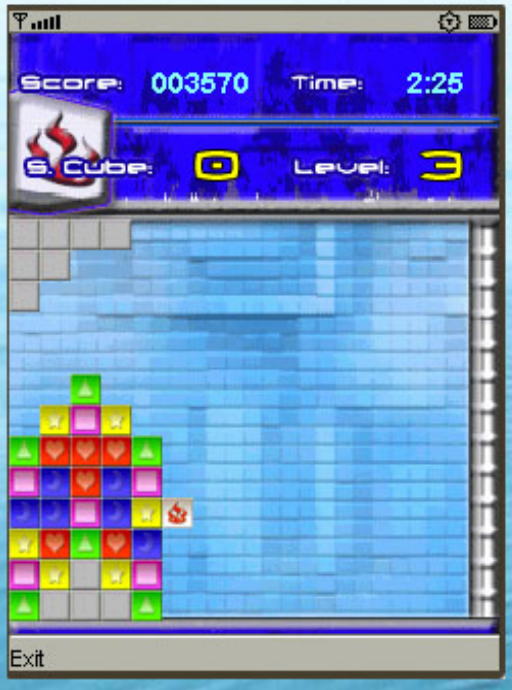
(Java software such as JDK and Sun Java(™) Wireless Toolkit 2.5 for CLDC can be downloaded in their official website at http://www.sun.java.com)

Steps in Installing and Opening the CUBIES Game in your Mobile Phone:

1. Install a PC Suite for your Connectivity Adapter Cable. (The PC Suite may vary depending on the mobile phone brand. For example, Nokia PC Suite)
2. Connect your Mobile Phone to your PC with the use of a Connectivity Adapter Cable.
3. Open your PC Suite and install the CUBIES Game in your mobile phone.
4. Once installed, you may now execute the game in your mobile phone.

PLAY THE WORTHY SUCCESSOR OF TETRIS AND FLIPULL GAMES IN A WHOLE NEW 2D DIMENSION!!!





FEATURES:

- Realistic representation of cubes with animation for the randomized cubes.
- Intuitive controls makes the game 'relatively easy' to play with.
- Challenge your skills with 3 difficulties with 5 levels each.
- Enter your name to make your mark in the top-5 High Score list based on the difficulty played.
- Easy installation in either PC or in any Java-enabled mobile phone.

SYSTEM REQUIREMENTS:

Processor: at least Pentium III 450 MHz
OS: Microsoft Windows 98, XP, or Vista
Memory: at least 32 MB RAM
Optical Drive: CD-ROM / DVD-ROM