

## Development of 3D Application For Mobile Phone Based on J2ME

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### ABSTRACT

John Carmack who invented the 3D games let us know about the great 3D world and because of the MIDP 2.0(Mobile Information Device Profile)'s entering, it is not a fame to achieve playing 3D games with a mobile device. The data offered by iResearch market consultation show that the figure of mobile game players all around the world will take a steady increase from 290 million in 2005 to 1030 million in 2008, and the market income will mount up from \$10,200 million to \$52,000 million. 3D games will be a current, the most famous kind of mobile games. In this paper I design 3D application based on J2ME (Java 2 Micro Edition) and implement a freely removable 3D object which happened in a 3D scene by receiving the keyboard response of mobile device with WTK (Wireless ToolKit) simulator.

### 1. INTRODUCTION

At 1997, NOKIA released a new mobile device. It offered few of memory for a mobile game which is called "Snake", like earlier period games which circulated on other platform, "Snake" is a simple mobile game and more and more people become addicted in it. Because it circulated on mobile device, "Snake" is the most famous on that days.

February in 1999, NTT DoCoMo company in Japan released I-mode, that was a mobile service and allowed users receive a few quantity data through the DoCoMo wireless network.

In January of 2001, the DoCoMo started I-appli, the downloaded software can run on its device, so some of the video games came out for the first time,

Form the 2002 summer, Sprint and Verizon starting mobile games service and lots of contents and proceeds mode were according to the DoCoMo. In the same year's autumn, ATT company starting their service too. It illustrated that a formal market competition was beginning. [4]

May in 2003, Sprint declared that they had already sold 20 million single and multiplayer games after August of 2002. In the end of 2003 April, users had downloaded 8.5 million mobile entertainment applications which have been announced by Verizon

company and there were 3.2 million mobile devices had the function of download the mobile contents. At that time, Jamdat declared five of theirs games have already sold 100 thousand copies.

At present, a continuously increased global contents system have been built. The most famous are Sega Mobile and THQ Wireless. Electronic Arts, Activision, Microsoft studios and Atari have researched in mobile games. The video frequency game of Japan company, Dwango and many other companies have already got into the mobile game market of the U.S. and Europe, The Com2uS and the company of GameVI L of Korea are leading the mobile game into a globalization market. [4]

By the fast development of 3G world, the next generation mobile gaming platform includes enhanced 3D game graphics capability and user-friendly search, Purchase, share and installation of high-quality rich games, as well as connected gaming with instant access to a global gaming mobile community. [3]

### 2. PLATFORM FOR 3D MOBILE GAMES

The Java platform is the name for a computing environment, from Sun Microsystems which can run

applications developed using the Java programming language and set of development tools. In this case, the platform is an execution engine called a virtual machine, and a set of standard libraries which provide common functionality. Java platform includes the Java Platform, Standard Edition or Java SE (formerly J2SE), the Java Platform, Enterprise Edition or Java EE (formerly J2EE), and the Java Platform, Micro Edition or Java ME (formerly J2ME). Specifications for Java SE, Java EE, and Java ME are developed under the aegis of the Java Community Process (JCP). A Java specification begins life as a Java Specification Request (JSR). Every JSR is assigned a number. [2]

Java ME is a set of technologies and specifications developed for small devices like pagers, mobile phones, and set-top boxes. Java ME uses smaller-footprint subsets of Java SE components, such as smaller virtual machines and leaner APIs, and defines a number of APIs that are specifically targeted at consumer and embedded devices. J2ME platform is composed of Configuration and Profile.

Configurations are specifications that detail a virtual machine and a base set of class libraries which provide the necessary APIs. They provide the base functionality for a particular range of devices that share similar characteristics, such as network connectivity and memory footprint.. The virtual machine is either a full Java Virtual Machine (JVM), as described in the specification or some subset of the full JVM. The set of APIs is customarily a subset of the Java SE APIs. Currently, there are two Java ME configurations: the Connected Limited Device Configuration (CLDC) and the Connected Device Configuration (CDC). [1]

CLDC is a fundamental part of the architecture of the J2ME. J2ME technology is delivered in API bundles called configurations, profiles, and optional packages. A J2ME application environment includes both a configuration like CLDC and a profile like the MIDP.

MIDP is a key element of the J2ME. When combined with the CLDC, MIDP provides a standard Java runtime environment for today's most popular mobile information devices, such as cell phones and mainstream personal digital assistants (PDA). The

MIDP specification was defined through the JCP by an expert group of more than 50 companies, including leading device manufacturers, wireless carriers, and vendors of mobile software. It defines a platform for dynamically and securely deploying optimized, graphical, networked applications. In addition, optional packages provide capability in specific areas of functionality, such as wireless messaging and multimedia capture and playback. The ability to choose from among the various bundles enables product designers and developers to match software capabilities with hardware capabilities very closely. They can use APIs that give them easy access to the components a particular kind of device actually has, without the overhead of APIs designed for capabilities the device doesn't support. [5]

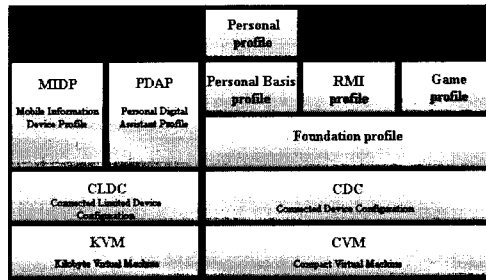


Fig 2-1 Architecture of java platform

### 3. METHOD AND ALGORITHM

If you are using MIDP1.0 to carry on user interface compile program, there are two ways you can choose, one is to use advanced UI class, and another is to edit everything from the first by yourself. The first choice always impossible, that is why the game developer have to develop own 3D engine for their deluxe games. Doubtless, that needs to pay a great deal of both time and efforts. But CLDC1.0 (Connected Limited Device Configuration) which is lack in floating point support can hardly resolved problem.

In the MIDP2.0, there is a software package which is called mobile 3Dgraphics API (Application Program Interface) or JSR 184 is the first tridimensional graphics software package in mobile equipment based on java. 3D graphics API have

both high-level and low-level characteristic. The former is called mediate-mode and the latter is called immediate-mode. In mediate-mode, developer using scene graphics can make the object in the scene to apply color by itself according to the position of the virtual camera and light, immediate-mode allows drawing object directly by applications. It is possible to use both of two kinds of mode in one application. However, immediate-mode of JSR 184 is very slow and complicated in exploitation. As developer has to handcraft all the 3D object, and any tridimensional objects' corner-point of application must be independently edit in the array.

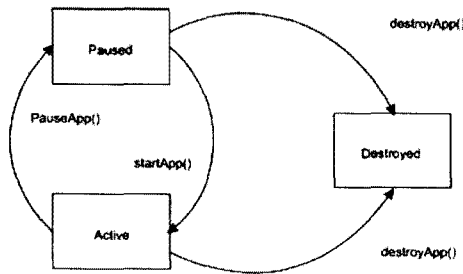


Fig 3-1 Application flow for algorithm 3-1

The high-level mode which is called mediate-mode allows developer to use 3D Max Studio which is the 3D modeling software designing main scene and used in application. This software supports to output M3G format document and it is the exclusive appointment format in the JSR 184.

paint(Graphics g)	Draw the animation object on screen
KeyEvent()	MIDlet keyEvent method
CommandAction()	Handle commands
RefreshTask	Refresh screen
ExampleCanvas	Name of the Canvas class

Table 3-1 Modules and descriptions for algorithm 3-1

INPUT	User selects start option to load 3D world' contents and exit option to give up the connection loading.
OUTPUT	Starts application or ends the application.
STEP1	Modeling, design a M3G format 3D model.
STEP2	Use the load() method to load the 3D world it belongs to loader class.
STEP3	Use find() method which in the getObject() in 3Dworld to get model object and execute setupAspectRatio() to regulate aspect ratio.
STEP4	Use KeyEvent() to control what happen and MoveActor() to implement event.
STEP5	Create ExampleCanvas (name of the Canvas in this example) to implement Runnable application programming interface.

Algorithm 3-1 Example3D algorithms

Module	Description
Example3D	The name of object used in scene
startApp()	Start application
setupAspectRatio()	Render content with the correct aspect ratio
getObject()	Get the animation object
GoActor()	Go backwards or forwards
CheckWorldEdge()	Stop going off the edge(world)
TurnActor()	Turns the actor
AnimateActor()	Hopping animation loops correctly
MoveActor()	Act on key presses and any collision detection to move the actor
pauseApp()	Pause application
DestroyApp()	Stop and release application

#### 4. ALGORITHM 3-1 IMPLEMENTATION

At present, advanced internet operators in 3G worldwide market are providing more and more special mobile phones which can celebrate the 3 Dimensions graph with hardware. AS mobile game, consumer interface, navigate service and 3 dimensions animation, much of implement software which is with the real 3 Dimensions function has already been provided in some of ending devices by the six most advanced operators all over the world. The most effective game developer is showing the new generation 3D technology for 3G mobile phones cheerfully one after another. "Next generation mobile phones will utilize from

advanced mobile game to 3D implement provision, high qualities 3D taste on mobilephones becomes more and more important.” Said Masahiro Inoue who is senior assistant for CEO & manager of Japan KDDI product engineering, and actually it is an irresistible general trend. Nevertheless, mobile phone is not only a game device for game player. 3D game of mobile phone has already faced a series of technology challenge. For example some problems can not be avoided (such as volume, heat, waste of energy and so on) because of separated 3D graphic chip in mobile phone; as needing more higher resolution than PC monitor since low elements of mobile phone display and unsure distance between eyes and mobile phone in utilizing; conflict between small memory of mobile phone and sampling technology. Therefore, 3D mobile phone implement can not be simulated as the module of PC, on the contrary the developing experiences in implement field are more critical.

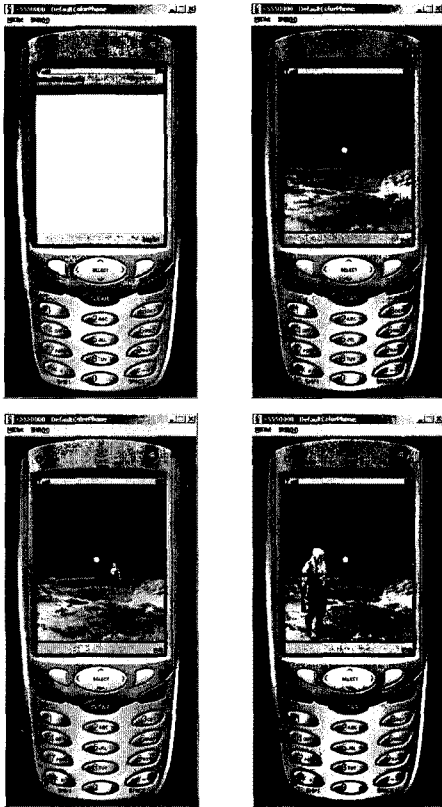


Fig 4-1 Result of algorithm 3-1

In this paper, mobile 3D graphic API for J2ME MID2.0 realize the 3D animation process. These figures next can show you the output after executing the WTK virtual machine.

## 5. CONCLUSION

Since varieties of game characters, mobile phone games can be accepted by consumers easily. More blazing appearance, more breeds of game, mobile phones user will be increased consistently. Therefore, the game will be evolved step by step. Long times ago some popular games make consumer boring now, such as snake, gobang, black&white chess and so on, from then on, more and more action internet games were made with exquisite pictures , but it is not enough to be content with the effective; But now, the mobile phone game technology is in the developing to most advanced 3D technology. And the mobile phone 3D game optimistic market prospect should be thanked to the development of 3D display technology.

In this paper, we utilize the JSR 184(the same to 3D API) to create display of 3D implement programming. Under Remain module, 3D environments and the objects which are outputted to M3G file are all created by 3D creation tools. Meanwhile drawing the 3D world view on screen.

## 6. REFERENCES

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