

Emerging Paradigms and Opportunities in Mobile Game Development

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Abstract

Technology advancements in every sphere are reforming our lives. Mobile technology and smartphones particularly has been the biggest game changer. It changed the way we worked, the way we communicated, the way we learned and also the way we played games. Mobile games development is primarily rooted in console or PC based game development approaches. But few specific characteristics of mobile devices can be exploited for truly “mobile” gaming experiences. Technological support in the form of gaming engines is instrumental in providing the required abstraction and framework which resulted into much needed acceleration to the mobile gaming development. Though the increase in the mobile game development market is significant, the success rate of such apps is relatively low. Developing games is not easy and requires entirely different computing paradigms and complex game logic. The paper discusses emerging paradigms, opportunities and challenges in mobile game development.

Keywords

Mobile Game Development, Gaming Engines, Pervasive Games, Computational Intelligence in Games

I. Introduction

Game development process is very complex and differs significantly from any other application development. The quality of a game depends on the ability to keep the users amused which results into the popularity of the game. There may be teams of professionals working on a game development project or it could be Indie game, game developed by game enthusiast. The proliferation of mobile computing devices has revolutionized game development field radically [1]. Mobile game market has seen explosive growth in recent years. Experts predict further increase in the mobile gaming market. Since Indie developers get immediate response to their game app, there has been increasing interest in game development across platforms. Continuous advancements in mobile technology necessitates for evolving paradigms for game developments [2].

The success and popularity of a game predominantly depends on two aspects

1. Aesthetics and Animation

The appealing visual representation of gaming environment forms strong base for attracting users. The design of objects, animation and rendering effects in the simulated environment are major contributors in the popularity of any game.

2. The Engaging Logic of the Game

Responses from user are inputs to the moves of the game and designing of interactive responses is the core activity of any game development. This need of spontaneous, intelligent and interactive responses from a game makes both, user interface for game as well as game logic very challenging

This paper discusses emerging paradigms in mobile game development, major tools and technologies used for mobile game development and challenges faced in the process. The paper briefly

discusses the importance of computational intelligence and related research in the field of mobile game development and concludes with a short introduction to pervasive mobile gaming.

II. Emerging Paradigms in Mobile Game Development

The evolution of mobile technology has resulted into varied domains of opportunities both in applications and research and mobile game development is one of it. In earlier game development scenario it was required for a programmer to write everything from scratch using a programming language like C/C++ or java. Game development was considered to be all-programming activity with the program doing everything from animation, graphics rendering and writing game rules without the support of any reusable and customizable components. With the infiltration of mobile devices, game development is fast becoming very popular. The arrival of gaming engines in 1990s has given the much needed momentum to the gaming industry. Major strength of a gaming engine lies in the abstraction that it provides to the developers [3]. As shown in figure 1, a gaming engine has sub components for customizing rendering, audio and also provides support for programming game logic by providing necessary framework. Each of these subsystems is evolving as a result of continuous research. Providing rapid game development framework with 2D and 3D effects, support for sound and video design and rendering subsystems of today’s gaming engines like unity, libGDX and Unreal are major advantages. Even though gaming engines are considered to be essential for game development, researchers are highlighting the requirement of for more generic framework. Most of the gaming engines today are Genre based which makes them suitable only for specific types of games.

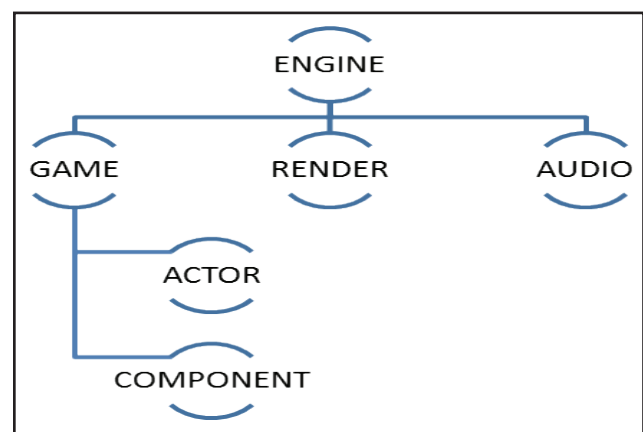


Fig. 1: Generic Componets of a Gaming Engine

Though gaming engine provides required base for development of mobile games, the process is challenged by several other factors which are very specific to the architecture of mobile devices. There exist many mobile operating systems around the world and user of each one of them wants to experience the gameplay, thus, the developers need to design a single game for all the OS versions like IOS, Android, Windows and BlackBerry etc. Along with that the same game should be available on all the platforms available like tablet, Web, Desktop, mobile and so on. Hence, the accounts,

levels, scores and purchases everything needs to be synced across all the devices providing experience of game play to the user.

III. Computational Intelligence in Mobile Games

Game logic is the heart and strength of any game. Game development is an art which aims at modeling computer processes and algorithms and game object behavior according to the interactive responses given by the end user. Artificial intelligence, AI has been a strong contributor to the field of computer/video game from 1960s. Many popular games like F.E.A.R, S.T.A.L.K.E.R and Far Cry 2 are considered to be very successful in applying AI concepts for game object modeling. AI has been the backbone in providing the simulated gaming environments especially in modeling non player characteristics-NPC. Intelligent behavior of agent which can adapt itself to the changing game environments and situations is the most desirable property of the game. Significance AI for methods, interactions and end user modeling for game development has been described in [4]. The shift of AI paradigm to Computational intelligence, CI in game development has also been significant and provided divergent perspective in gaming development. Computational intelligence provided evolutionary paradigm in game development and evolutionary algorithms, artificial neural network, fuzzy logic arrived in the gaming industry. Application of computational intelligence in games primarily aims at optimized adaptation in agent behaviors [5]. Game development for mobile devices is differentiated from console or PC game development by specific features of mobile devices. Mobile devices are characterized by small display screen, relatively limited computing power and a short battery life. Interaction with the game is possible only through the touch screen responses. Though it results into decreased complexity of environment but also affects the interestingness of game logic.

Strong association of artificial and computational intelligence in the success of video and console based games is well observed. With the massive infiltration of smart phones very lucrative mobile game industry is entering into the market. Artificial and Computational intelligence with its encompassing techniques can be instrumental in enhancing the gaming experience of user on mobile devices. Application of AI methods for mobile game development is challenged mainly due to the limited computing power of these devices [6]. Features of mobile devices like context awareness, Smart user Interfaces, Intermittent connectivity are potentially very significant in the development of any real mobile app. But due to the limited computing power, optimum utilization of these mobile aspects for application of artificial and computational research is still a research problem [7]. Unreliable communications and relatively low time bursts of play additionally complicate the mobile game design and development. Intelligent techniques such as user profiling and application of classification techniques can be used for improving game logic and better gaming experiences. Lightweight versions of machine learning algorithms suited for mobile computing scenario have been proposed to enhance the mobile gaming logic [8]. There have been efforts to apply fuzzy logic and neural networks in mobile gaming. Cloud based implementations to elucidate the limitations of low computing power have been proposed by researchers. Lightweight AI/CI libraries for mobile platforms still remain a challenge. These challenges which can also be considered as research opportunities will guide the future of new age mobile gaming paradigms.

IV. Pervasive Mobile Games – The future of Mobile Gaming

Mobile devices are capable of receiving spatio temporal and environment specific information with the help of GPS and sensors. Such information defines the context of the user. Context and location awareness of mobile devices has paved way for new game development paradigm – Pervasive gaming. Pervasive computing has been attracting researcher from past few years. Mobile devices can be helpful in exploiting the pervasive environment of a user. Fig. 2 describes important features of pervasive environment.

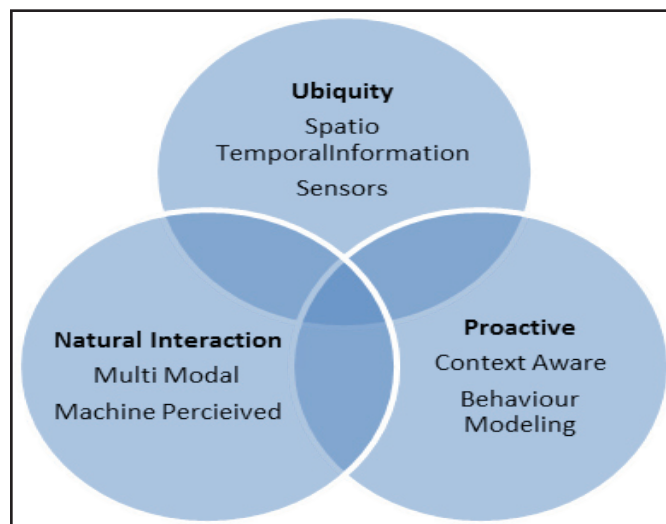


Fig. 2: Pervasive Computing Environment

Three major components of pervasive game development are ubiquity i.e. continuous background input information, Proactivity which is based on context awareness and Interactions due to various connected components to which automated machine response are obtained. Thus, pervasive games aim to go beyond the device screen and take inputs from the real world to decide the actions and moves of the game. This is a very challenging game development approach and is expected to revolutionize the mobile gaming experiences. The GPS and sensors of mobile devices can fetch the location, temporal and environmental context which can then be combined with the social context of the real world to develop the responses of mobile game [9]. Highlights major concerns design of a pervasive game. Challenges in pervasive are discusses with the help of pervasive treasure hunt game [10]. Pervasive game design principles and approach is significantly different than generic game development. The perception of context is very much vital in the designing of pervasive games as it gets mapped to game logic. It requires careful interpretation of context information to provide required uncertainty and ambiguity to add fun element to the game. Modeling of information in such a way that every user gets a fair chance to play is another major design challenge. Though the design is context based providing enough flexibility to play the game any time becomes a prime requirement of such gaming. Incorporation of various communication modes into game logic is considered as one of the major factor while designing pervasive games. With many smart devices around us, compatibility and designing the appropriate context in the game is the biggest challenge in pervasive gaming. Though the technological solutions like compatible gaming engines may offer little help in resolving the compatibility, the paradigm shift from active to pervasive gaming requires entirely different thinking which pose challenges in designing of pervasive games.

V. Conclusion

Mobile game development is an evolving field with tremendous opportunities. It offers challenging programming paradigms and is supplemented by research outcomes in the field. The paper has been an effort to discuss major challenges faced in the development of mobile games. The authors have tried to give a balanced emphasis on the research and the game development technology to put across generic challenges faced by mobile game development community. The paper also discusses about the conceivable characteristics of future mobile games.

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