



Research Article

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Mobile learning based on augmented reality

Jianbiao Chen

School of Computer and Information Engineering, Xinxiang University, Henan, China

ABSTRACT

The conception mobile has become the main theme of human society's technological development and innovation in the future, in this context; mobile learning which makes education and mobile together will naturally become an important research field of modern pedagogy. Mobile learning theory and applied research have foundations; more and more people began to focus on mobile learning. But compared with the achievements of the mobile technology in other fields, the field of education is still a relatively weak link. Focus on the concepts of mobile learning, this paper combined mobile device technology and mobile learning theory and explains how to design and implement mobile learning systems in the mobile terminal device.

Keywords: mobile; technology; learning theory

INTRODUCTION

Mobile learning is a distance learning combined with modern mobile communication technology. The use of mobile terminal equipment in mobile learning is the progress of distance learning technology, at the same time due to the personalization introduced by mobile learning such as scene interaction, wireless communication, time space randomness, it has many differences compared with the distance learning relying on wired network and the portable terminal device. Mobile learning, as a new branch of distance learning, has a close relationship with the traditional distance learning. These two kinds of learning have many similarities.

Augmented reality is a technology computer-generated which combines virtual information of two-dimensional or three-dimensional scenes with real environment, it integrates different subjects such as computer graphics, fusion display, multiple sensors, image processing, computer vision etc and is a new domain of developing on the basis of the virtual reality. The users of augmented reality system can see the real environment and augmented information computer-generated [1]. This information could be not only virtual objects coexisting with the real objects in the real environment but also be related to the non-geometry information related to the real object. At present, the augmented reality technology has been widely used in medicine, entertainment, military training, teaching and training, project design, consumer design and many other fields. Augmented reality system based on a desktop computer, due to the defects such as heavy, high cost, easy to damage, is inconvenient in practical use and operation. The small mobile devices such as smart phones, have close to ordinary EF machine operation ability, as well as the massive storage capacity and high-quality display effect, It is inevitably a trend of new augmented reality to choose mobile phone as platform of the development and application. Augmented reality based on mobile phone, not only break various restrictions based on desktop EF machine of augmented reality, but also has strong advantages in terms of mobility, portability, and interactive interface[2]. Therefore, more mobile learning applications. In view of this, this paper attempts to discuss about augmented reality based on mobile phone.

2 THE CHARACTERISTICS OF MOBILE LEARNINGDIGITAL INFORMATION OF EDUCATION RESOURCES

With the progress of human science and technology, the renewal speed of knowledge is increasing, if the person just

rely on the traditional teaching mode and teaching method to learn the knowledge of books, that when the learning process is ended, knowledge what learners are learning may already outdate, it is undoubtedly a great irony, also unnecessary waste of education resources in short supply conditions, knowledge is processed by using the digital information technology, and transfer and share in various learning equipment[3]. Learners can use the internet to visit education resources of universities, libraries, education institutions, without restriction by the lectures and books. Thus education of knowledge application value is in the maximum. The application of digital information technology, not only improve the education resource sharing rate and utilization rate, but also cause the transfer of teaching ideas. It is well-known that “the science and technology are the first productivity”, Productivity means that the social demand for high-quality talents are also ascending simultaneously, the simple of talent training mode in the past is out of date in fierce competitive society already, only full of knowledge, skilled, strong learning ability, creative thinking people can be available and become the most outstanding person in the society. In recent years, educational experts point out that the new way of education in which the traditional way of learning activities the teacher is the center transfer to the learners as the center, and the digital information education resources provide enough solid technical support to the new mode of education practice[4].

STUDY INTERACTION

Interaction is the characteristics of a behavior in learning activity using the technology convenience; generally speaking the interaction can be divided into the interaction between the learner with assistance, learners between each other, the interaction between learners and learning resources. For all kinds of interaction of distance learning, many experts have carried on an in-depth study[5]. In 1989, Moore proposed three types of interaction in distance learning, respectively is: the interaction between learners and teaching content, the interaction between the learners and teaching, the interaction between learners and learners. Then in 1994, Hilleman and others shows another type of interaction, namely the interaction between the learner and interface, under this theory, interacting objects of the learner throughout the learning activity can be the random combination of teaching content, teachers and other learners as well as other interfaces. Interaction makes the identity of the learners in the learning activity changing, teachers no longer play a leading role, Learners can specify learning plan featured own characteristics. This way of learning is to exercise students' autonomous learning ability, humanized teaching system is realized by providing rich learning content, and rapid information feedback mechanism[6]. The features contraction between mobile learning and distance learning in the aspect of interaction are shown in table 1.

Tab.1 interactive features Comparison of remote learning and mobile learning environment

Distance learning	Mobile learning
The interaction between the learner and help scholars	
Non-real-time, Asynchronous interaction	The real time, Synchronous interaction
Passive, predetermined	Initiative, spontaneous
The interaction between learners and learners	
Need to cable network connection	Only need the wireless network connection
Members of the weak interaction	Members of the interactive

LEARNERS IS THE CENTER OF THE LEARNING ACTIVITIES

In mobile learning and distance learning, learners master the learning initiative, the learning activities, learning time, learning location, learning content in studying activities can be self-regulated which are conform to the personalized study concept in today's mainstream society. In obtaining learning content, learners can no longer constrained by the book, instead of relying on the technical means to get the latest content which are stored in the terminal device[7]. It is different from the traditional learning, the learners can learn specific content many times on terminal equipment in order to achieve more satisfaction learning results. In terms of inspecting study products, mobile learning and distance learning also offers a variety of testing methods, help learners to understand their own learning situation from the perspective of diversification, communicate with teachers using the inspection results to obtain advice and help[8].

AUGMENTED REALITY BASED ON MOBILE PHONES

The structure of mobile augmented reality

Augmented reality system not only enables users to see the real environment around, but also can see a computer-generated virtual objects or non-geometric information. Augmented reality system is mainly composed of camera and processing module, the register positioning module, the fusion of rendering module, display module, several key parts of the system(as shown in fig.1), working process is roughly as follows, first of all, the camera and processing module acquire real scene through the image acquisition device, and reduce noise through a certain algorithm; secondly, registration and orientation module calculate the observer's current position and posture as registration information by hardware or software; third, the fusion of rendering module

that obtain accurate observer registration information, according to which generated virtual scene or object by the computer graphic system, and through the video signal fusion and realize computer generated virtual scene and real scene fusion; finally, through the display device output, the observer submerged in the enhanced scene.

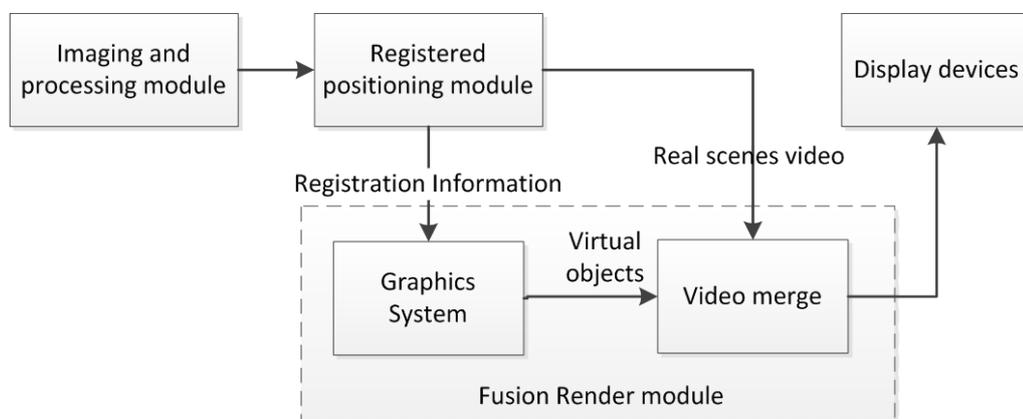


Fig .1 structure of augmented reality

MOBILE LEARNING SYSTEM DEVELOPMENT TECHNOLOGY THE MOBILE LEARNING SYSTEM BASED ON THE INFORMATION SERVICE

Teachers using information service provided by the application of mobile communication network operators, send learners learning content, curriculum teaching summary, after-class exercises, and arrangement information. Mobile learning system based on the information service basically has the following three types: use mobile network operators to provide information gateway, the use of message mass equipment, a mass of information services provided by third-party company.

MOBILE LEARNING SYSTEM BASED ON WAP TECHNOLOGY DEVELOPMENT

WAP provides the effective support for the mobile terminal accessing to the Internet, the WML language in the application layer convert the HTML content on the Internet to display content which is suitable for mobile devices[9]. Development of mobile learning system based on WAP is mainly using WML to write the WAP website, supporting scripting language to implement interactive operation, displaying and running through the IIS, Apache Web server and so on.

MOBILE LEARNING SYSTEM BASED ON C/S STRUCTURE

Compared with the mobile learning system, C/S structure of the mobile learning system based on WAP has more interactive and more powerful function, is dependent on the network less, the intelligent mobile terminal equipment support applications written in Java, C/C ++, C# programming languages. Learners run client procedure in the mobile terminal equipment, interact with the server, and complete the learning process.

MOBILE AUGMENTED REALITY APPLICATION IN MOBILE LEARNING

Mobile learning is a kind of learning under mobile equipment support occur at any time, any place, the real-visual mixed learning environment based on the mobile phone augmented reality, is possible to present mobile learning content, interactive way and the activities of process, mobile learning applications in mobile augmented reality will be discussed in three aspects as the following :learning based on situational awareness, scientific research learning and learning participating in the simulation study .

THE KEY TECHNOLOGY OF MOBILE AUGMENTED REALITY

Augmented reality system based on mobile phone should be able to track spatial position and posture of a phone in real scenes, and calculate the coordinates of virtual objects in camera according to the information, in this way it can realize images accurate matching among the virtual object images and real scene[10]. Therefore, although the research of mobile augmented reality system involves many main technologies, the actual accurate tracking registration of technology is the key technology, the tracking registration in mobile augmented reality system can be divided into two ways in general(one is registering with tracking sensor, as a tracking method in short)the other is a kind of real-time computer vision system combined with a specific algorithm, referred to as visual method, among them, the visual method and the method based on visual can be

divided into the method based on symbol and natural features, the registration method based on the tracker often uses magnetic tracking, ultrasonic tracking, optical tracking, inertial tracking, mechanical tracking, GPS tracking methods to get track registration, Due to the characteristics that different tracer methods have advantages and disadvantages and it is suitable to different application areas and also is vulnerable to interference outside, a single tracked using a sensor registration is difficult to meet the needs of practical application in the precise degree and using range. Thus, in order to get a more extensive adaptability and better performance, many systems use the compound method of tracking and visual method to improve the tracking performance and registration accuracy of augmented reality system effectively.

TRACKING REGISTRATION BASED ON SIGN

Tracking registration based on sign is registered by placing markers in advance in order to analysis obtained image, to calculate the camera's position and posture. The function of artificial sign is to map information to the virtual objects, thus reduce the computer calculation requirements and the complexity of the algorithm, also make the artificial marks become more widely used in augmented reality system. Artificial marks are divided into triangles, squares, pentagons; circular and concentric ring etc, according to the shape. also divided into black and white colors according to the colors, different artificial marks have different expressed information, the method of analysis to identify is not exactly the same, so selecting the artificial marks reasonable according to different application scenario, can effectively decrease the difficulty and improve the accuracy of identified results, the artificial symbol recognition and extracting vertices are two complicated problem, involving color filtering and image segmentation, linear fitting etc, furthermore, Another advantage using artificial marks is that the user can realize real-time interact through moving the location of marks with the virtual objects, however, some situations may not be able to use the artificial marks, if you want to present virtual and once completed building scene on the destroyed building, you can't place marks in the ruins, only by non-marked method.

THE MAIN FUNCTION FEATURES OF MOBILE AUGMENTED REALITY

Mobile augmented reality augment and expand using the additional information computer produced to the real environment, and also can make learners real-time interaction with these additional information, these additional information is virtual object or non-geometry information, thus, mobile augmented reality has the following main function characteristics:

Expansion of the real environment

It is generally acknowledged that augmented reality are supposed to develop in the virtual reality technology, but the requirement of immersion senses are obvious different, virtual reality emphasize the user totally immersed in a virtual space generated by computer. Unable to perceive the real world around, and augmented reality is committed to immerse the computer-generated virtual objects or information with real environment into a whole in order to become an integral part in the real environment, so as to enhance users' understanding of the real world and consider the virtual environment and real environment as a continuous unity(as shown in fig.2) ,virtual environment and augmented reality in reality is a mixture of real part, so the augmented reality is also called mixed reality, hence, augmented reality is supplement but not replacement, it offers the learners learning environment in which virtual objects and the natural environment fuse together, They can see what are in the real environment around at the same time, also can see a computer-generated virtual objects, furthermore, you can also interact with the virtual objects in the real environment. Therefore, virtual-real synthesis learning surrounding created by phone augmented reality technology can make learners understand the learning object more intuitively and comprehensively.

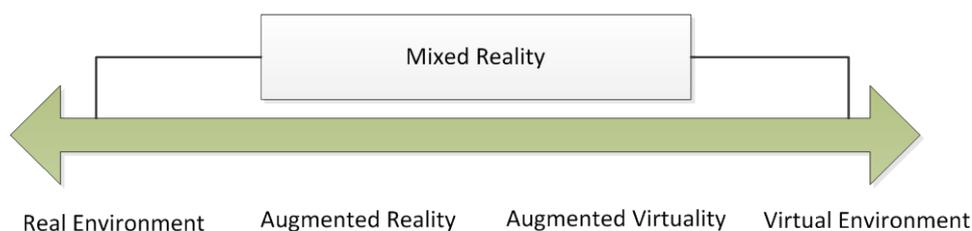


Fig.2 continuous unity

HIGHLY INTERACTIVE

Using various sensors or visual calculation, augmented reality based on the mobile phone can be in the position of the learners and the line of sight direction changes, generated by a computer to the real scene of virtual objects can be real-time follow change, meanwhile, the learners can also interact with the virtual objects, for example, when using a mobile phone camera scan empty, decorating office, mobile phone screen shows a series of office decoration virtual element, learners can complete a variety of match through the interaction with the virtual elements, in augmented reality based on mobile phones, the perfect fusion of the real world and virtual world, it's hard to notice the distinguish between the real and virtual, learners only need to click on the screen with your fingers in the scene, the mobile devices will put the information related to the scene immediately, as a result, the interaction based on the mobile phone augmented reality is no longer interactive with a clear position, also extend to the whole environment, integrate themselves in the space and objects. For mobile terminal of the augmented reality interaction make learning become more perfect and natural

LOCATION INFORMATION SERVICE

Using the electronic compass positioning directional information, augmented reality based on mobile phones can dynamically provide all kinds of learning information according to the change of the learner's spatial location. Even this information can also be overlapped in the mobile phone camera in a three-dimensional way, in the actual application, mobile phone cameras aim at in a certain direction or scenery, the information details can automatically show on the phone screen, the sequences are as follows: (1) the information such as latitude, longitude and altitude obtained by GPS, oriented by electronic compass direction at the same time to determine the scope of the mobile augmented reality; (2) send searching data to wireless internet; (3) return information about a specific search scope through wireless internet and this information is superimposed on the mobile phone screen picture.

THE APPLICATION BASED ON SITUATIONAL AWARENESS OF LEARNING

In the process of knowledge production and application, contextual endowed personalized features such as conditions related with knowledge and knowledge activity, environment and background, these features are key elements to identify different knowledge and knowledge activities, key elements to fully understand the key elements. Therefore, situation has become the bridge and the link which learners connect with knowledge and communication(situational awareness, also known as situational calculation, refers to the use of environment, location, time, equipment, facilities, activities and the others situation information, provide learners with the current situation of knowledge or service, to provide better adaptability, personalized learning interaction and support. Only through situational awareness, the veracity and reliability of learners personalized knowledge demand is guaranteed in learning based on situational perception, learning content automatically is pushed to learners through the perception of learners' learning situation by the mobile learning systems which make learners to study as shown in fig.3.

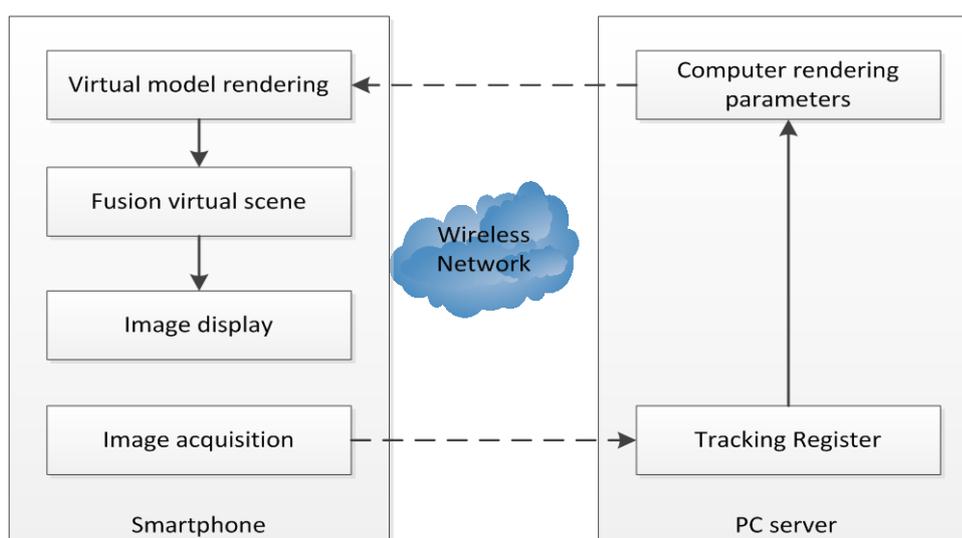


Fig .3 learning structure

THE APPLICATION OF THE SCIENCE LEARNING

First of all, the object of scientific research is nature, and a kind of natural phenomenon or problem investigation and research, secondly, as a kind of cognitive activity, scientific research has certain cognitive activity to experience

active procedure and stage. Third, in science research, in order to discover and know the characteristics of the natural phenomenon or things, reveal the development of the natural law, individuals have to use a series of scientific methods, including observation, comparison, classification, measurement, communication, forecast, assumptions, and experiment to seek the answer of the nature, get understanding of the natural world. Augmented reality based on mobile phones, due to its portability, provide highly relevant information service with the real situation, which is no longer just a supporting portable version of the desktop machine learning activities, but also develop a new mobile learning practice, provide more mobile learning experience to the learners. In the process of inquiry learning, mobile augmented reality presents a learning environment in which virtual objects and reality environment are combined to support the learners studying in the context of natural science.

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