A New Model as English Tutorial Assistant based on Augmented Reality

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ABSTRACT: English learning as an international language is a required skill for students but despite of trying there are factors which limited the learning progress. These factors have negative effects on student's learning process such as their fatigue, not learning all vocabularies around students and lack of motivation in English learning activities, and training time and students limited practice out of their classroom. It is obvious that cognitive and social skills of children has developed over time and also modern technologies as Augmented Reality(AR) and virtual reality has lead to innovative learning environment in informal learning which could make the learning interactive, effective and powerful, and decrease the negative effect of traditional training. In this paper a model has presented for development of augmented reality in English training for children. In this model, children without any filled back pack, and facilities could utilize this technology as a second language only with a smart phone or tablet. In this paper, after implementation of this model in a pilot, the possibility of performance and essential in order to develop this technology in mobile learning has explained, then related advantages and impact of this has examined on some students with questionnaire survey.

Keywords: Augmented reality, M-learning, children and computer interaction, Second language learning.

INTRODUCTION

Today, while the children start learning, they are effected by visual techniques and computer games, so they could not connect with books and pamphlets, as the visual influence is stable in their mind; particularly, learning second language need effort and as a result it causes early fatigue. Therefore, if we use new technologies for children training beside original and educational books, it would be possible to increase their motivation for learning and reduce their fatigue. English learning as an international language is a required skill for students but despite the trying there are some factors which limit the learning process. These factors have negative effects on student's learning process such as tiresome class environment, not learning all vocabularies around students and lack of motivation in English learning activities, and training time and students limited practice out of their classroom (Liu et al., 2010). It is obvious that cognitive and social skills of children has developed over time (Bruckman et al, 2002; Piaget, 1972) and Also emerging technologies as Augmented reality and virtual reality has lead to innovative learning environment in training which could make the learning interactive, effective and powerful and enable student to interact more complex and valid than before, and even create learning experience and training in real world to the students (Kirkley & Kirkley, 2004). AR is a technology that allows virtual information to be overlaid onto Real world in real time. This technology which is vastly used in trading, tourism and marketing …, would be helpful in portable learning and effect learning of students. The first models of wearable augmented reality were created with combination of mobile learning and augmented reality for this purpose. Touring Machine was one of these kinds of systems samples which Developed at Columbia University. The three-dimensional data of these systems were observable through head-mounted display (HMD). These systems that is kept in a backpack compactly, due to complexity, high expenses and odd appearance which forced the users to utilize from HMD, rendering them unfit for large-scale deployment outside laboratory environments (Liu & 2008; Ronald Azuma et al., 2001) but in recent years with development of systems based on AR, specially smart phones and tablets, we can use from this technology in learning easily, and display visual videos without HMD (Ronald Azuma et al., 2001). With decreasing volume and weight of these models, and high expense that only some of people could use, a new idea of applying mobile and portable systems, instead of wearable augmented reality, was raises.

This paper provides a model for application of augmented reality (AR) in mobile learning in order to teach children English as a second language. Children could use a light smart phone or tablet for coping with new skills instead of heavy pack of AR systems or HMD equipment. The major idea of this model is to provide

data to the student via cell phone and AR technology that covers teaching materials which is referred to recognized images. This information is prepared by instructors in internet host for students. Students in their predefined rooms or English classrooms might learn (e.g. name, spell, Synonymous, and 3D picture of objects) with simply pointing to the targets. This model relies on the idea that combination of AR-learning and mobile learning can eliminate both time and geographical limitations. Moreover it can increase students' learning motivation and practice time by entertainment and inadvertently learning in home. Even this kind of training could be used not only for learning second language but also for other skills training to children. For example by this model, we can train citizenship skills to children in each place. The rest of this article is organized as follows, in the second Section, the concept of augmented reality and the role of AR in education will be described. Section 4 describes the structure and essentials discussed in detail. Section 6 presents the evolution result and Future works and conclusions.

RELATED WORK

Augmented reality (AR) is one of the emerging technologies which is observed in mobile learning that with help of this technology the user to see the real world, with virtual objects superimposed upon or composited with the real world. AR is a modern technology that permits to overlay computer graphics onto the real world. In the near past, this AR technology was consider as experimental one that was within laboratory environment, but with development of algorithm and different forms of mobile phones, this kind of technology has been changed to a portable on mobile phone and with Context-aware systems shares new dimension of human and computer's interaction to the man. This technology is such that it complements real world with virtual realities and objects generated with computer. AR get the student immediate look to location- specific information prepared by couple of sources (Carmigniani et al., 2010; Yuen et al., 2011).

At first AR is addressed as a limited application such as head mounted displays (HMDs), but AR capable of develop and expand in other fields, Azuma (1997) and Some researchers named it by three ability (RT Azuma, 1997):

- Combines real and virtual world
- Interactive in real time
- Registered in 3-D

In AR –based system, virtual and real objects are combined in real environment; real and virtual objects are registered with each other and are executed interactively in three dimensions and at real time. The advantage of presented definitions by Azuma is that,

this technology is independent from used hardware and does not limit it to a specific hardware. So we can definite kinds of systems which enable users to benefit these properties in different systems and hard wares. Even This interaction does not only relate to visual interaction and it can potentially apply to all senses, which can be recognized as an advantage in (Carmigniani et al., 2010; Van Krevelen & Poelman, 2010). Figure 1, shows chain of Milgram-Kashino Mixed-reality continuum (1994) and the difference between virtual (where whole things are non-real) and real life and AR (real life is augmented by virtual space).

Figure . Reality-Virtuality (VR) Continuum(Milgram, Takemura, Utsumi, & Kishino, 1995)

AR and AV are located somewhere in between with AR being closer to the real world environment and AV being closer to the virtual environment. As seen in Fig1, AR is a part of mixed reality public region. This region is between real world and virtual world .In both virtual reality and augmented virtual environments, real objects are added to virtual objects and the environment is replaced with its virtual environment ,In contrary, AR provides a local virtually and plays role as a connector between the virtual space full of information and low information real space (Van Krevelen & Poelman, 2010). Augmented Reality is an extension to "Virtual Reality". Virtual Reality (VR) is a technology that allows the user to be immersed in a simulated and three-dimensional world that has been produced by computer and other hardware (Carmigniani et al., 2010). Virtual reality is the immersive environment covered with computer-generated images which show reactions to human motions and the person shall be equipped with special equipment such as joystick, video glasses, and fiber-optic data gloves but Connection of virtual reality technologies with real world led to advent of augmented reality technology. AR is quite similar to virtual reality. These two are interactive, immersive and intelligent. In VR, user is completely tied to a virtual world, whereas in AR user is still centered within the real world, but with virtual objects superimposed, such that real and virtual objects seem to coexist in the same space AR enhances the user's perception of and interaction with the real world (Yuen et al., 2011; Alcañiz et al., 2010; Botden et al., 2007).

Augmented reality in education

Each year, the New Media Consortium's (NMC's) Emerging Technology Initiative generates a Horizon Report which seeks to identify and understand emerging technologies which promise to have a significant impact on various sectors around the world, and which show the potential to positively impact learning, creative inquiry, and education. Both the 2010 and 2011 Horizon Reports (NMC) show the potential of AR to positively impact learning, creative inquiry, and education (Edition, 2013; Yuen et al., 2011). In 2013 report presents some interesting predictions about trends in educational technology over the next five years. In One Year or Less, Flipped Classroom, Massive Open Online Course, Mobile Apps and Tablet Computing have a positive impact on learning and teaching. In the next two or Three Years Augmented Reality, Game-based Learning, the Internet of Things will be important in education (Edition, 2013). After all, Researchers believe that AR has vast potential implications and numerous benefits for the augmentation of teaching and learning environments**.** For example, AR has potential in education to:

- Enhance collaboration between students and teachers and among students et al., 2002).

- Help to train high risk duties and environments in which training is inaccessible and expensive (Shelton & Hedley, 2002).

- Improve student imagination and creativity (Klopfer & Yoon, 2004).

- Student able to continue learning in anywhere (Hamilton & Olenewa, 2011).

- Prepare a true leaning space that is for different kind of learning method (Yuen et al., 2011).

- Engage, and motivate students to explore class materials from variant aspect (Kerawalla et al., 2006).

Because this technology is potentiated to make interactive environment, can use useful in English learning. Mean time that a lot of scientists have worked on English learning via mobile but Usage of AR have rarely been studied (Kerawalla et al., 2006). For instance, Dede and Mitchell (2009) erected an AR-based simulation (called Alien Contact!) which GPS-user, location detector, on Wi-Fi mobile computer that can math, language, arts and scientific literacy skills to American schools. Unfortunately, Alien Contact had some disadvantages in an educational setting, mainly due to hardware and software problems such GPS error issue and experience information overload. But the results showed that Alien Contact enhanced collaboration among students, raising their understanding and increasing their learning motivation(Dunleavy et al., 2008). Liu et al. (2007) designed a system (called HELLO) with variant of 2D barcodes (i.e. Quick response code) which can be read by PDA camera. Those QR codes included the linked information for students so that they explored the map on the mobile phone while visiting designated learning zones by decrypting QR codes. Then the students sent the information to the main server for retrieving context aware learning material wirelessly. Also with AR, there is a VLP on the learning zone for conversation with, which students feel like talking to a person in the real world but this model needs QR codes for tracking (Liu et al., 2007).

The Proposed Model

In this model it has been tried on learning simple words to children from their around. Because children have strong sense toward recognition and so they could connect to their surrounding; especially they receive more educational data they surrounding in early ages. This model could be considered as an effective in training regarding to mentioned effect in AR for children that the way will be easier after children's acquaintance with words for writing, grammar and conversation. How the model works is that we have uploaded objects in cloud database on internet, and connected metadata containing web page's address with .JSON suffix to this objects. This page contains object name, target ID related to one object in cloud database, object image and the address of web page which is defined for that object. The student puts the cell phone camera opposite the object, if the object has been defined in database, it will be identified, and again if that object would have metadata in cloud database, so the application connects to the metadata immediately, and the object's name will be showed to the child. Then the student will be guided to a made experimental page with clicking on the image; this page include object's name, and various educational examples, and different shapes which is more effective in training. When we start to work with software, the program shows the scan line, and continues to search the image opposite camera, after identifying the object, its English name will be seen at image along with a simple animation in order to persuade the child to play and learn. The application with display of camera image will equip the user with the image of physical world simultaneously, and also the virtual data will appear on the live image of camera, it seems that virtual and real objects are together. Even there is a possibility that the child could click on these data, and guides to the web page of specific object, there can observe original data. For instance when a fantasy clock lies opposite the camera, clock's name and its image will be displayed on the mobile screen, and this data will be kept on mobile's screen if the clock get away. Figure 2 illustrates an example of the AR learning information.
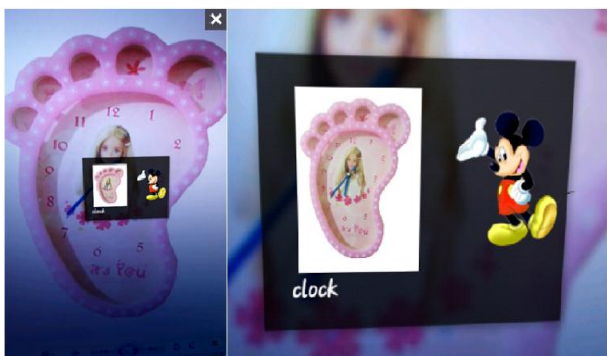
Figure2. An example of augmented reality information

The model Architecture

The structure of the model is that the user lies the mobile's camera opposite the object, and searches for the object in database with the help of application program which is in touch with specific SDK (Software development kit) of AR technology. After identifying the object, it's data will be displayed for the user through the mobile's screen. Also the cloud database and images of reference object will be organized online by a tool that is called target manager. Figure 3 shows the architecture of model.
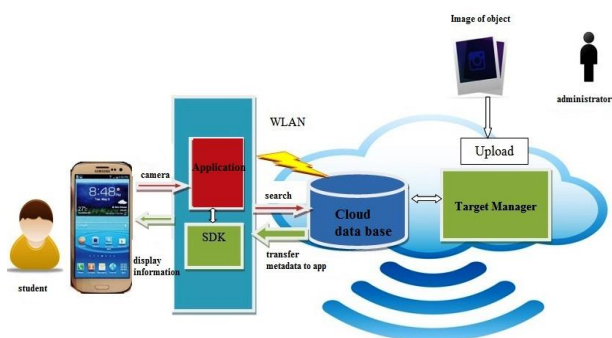

Figure 3. The architecture of model

These models of smart phones have two applications, first they use as an input device for importing the object s image in environment and second as a device for displaying data on the screen are used. Smart phones are class of handheld displays and use video-see-through techniques to overlay graphics onto the real environment and employ sensors, such as digital compasses and GPS. The tool connection to the internet in smart phones could be Wi-Fi and in external environment could be 3G. But we use from Wi-Fi for connection to the internet, because this model is an indoor system. Also the object tracking is according to the visual tracking and marker-less. In vision-based tracking, computer vision methods compile the information which received from camera. This way works on edges of subjects, these points makes vertical line which shapes the subject.

MATERIALS AND METHODS

In order to assess this model, and the amount of influence of new models of learning, some object in data base along with their metadata uploaded, then 20 students with different ages were asked to work with this software, and learn object 's name using this application. After explanation of software and work with model, questionnaire survey was given to twenty students to get their points. A five-point Like-scale was used for all questions: (1 denotes strong disagreement, and 5 denote strong agreement).

Table 1. Items of questionnaire

	Item
A1	Interest about mobile or tablet
A2	Interest about learning via mobile or tablet
A3	Interest about learning life-site things
A4	Interest about learning through books
B1	Simplicity of software usage
B2	Excitement of software
B3	Adding new staff to software
B4	Adding games, animation and...to app
C1	Willing to learn English through app
C2	Willing to learn other via this app
C3	Willing to use the app after class
D1	Motivation rising to learn
D2	improve to learn new words
D3	improve to practice dictation(writing)

A one-sample t-test was applied to analyze the answers to the questionnaires to determine the degree of satisfaction. This questionnaire contains different parts for students' feeling assessment and their performance: part A is related to interest, part B is related to how to use model, part C is for their attitude toward the model, and part D is for effectiveness of model. The questions about the experiment included:

- How do you like playing game with tablet or mobile?
- How do like learning English via tablet or mobile?
- How do you like knowing name of around things?
- How it is easy to work with software?
- How do you prefer to learn English through books or leaflets?
- Is this software interesting for you?
- Do you like to learn more than the name of staff via this software as examples, pronunciations, etc?
- Do you like to pictures, animations or ... be added to software?

- Do you like to learn other thing with this software as like history...?
- Do you like to use this software after classes?
- How much this software does help you to learn more?
- How do you think about affect this software to remember words?
- Do you think you can dictate word easier?
- Do you feel this software interested you on learning language?

Summary of items of questionnaire from twenty students seen in table 1:

RESULTS

When students filled out the questionnaire that were different ages, and with SPSS, A one-sample t-test was applied to analyze the answers to the questionnaires to determine the degree of perceived usefulness, ease of use and attitudes toward the use of the model.

The tables shows the student's ideas then the model. For example, as shown in table 2: The responses to item A1 indicated that most students would like to play with cell phone or tablet (m=4.00) and Responses to item A2 (m=3.65) indicated most students liked using the cell phone to learn life-site thing, and item A3 (m=3.95) indicated most students would like to learn the words of object around. Low average that is related to A4 (m=2.40) shows that students are not interested in book and Pamphlet training, and welcome to the educational aid.

Table 3 shows student's ideas after using the application and user interface model. The responses to item B1 indicated that most students believed that the model is easily used (m = 3.90). Responses to item B2 (m=3.55) indicated that the system functions were attractive for them. The high-level average of B3, B4 (m=4.00) shows the student's interest in increase educational and other pictures and attractive animations and games in the model that this leads to high amount charisma of model.

Table 4 illustrates the output of a research on learning methods and fame of models. This numbers shows the willing of student to use this application. Responses to item C1 (m = 3.45) indicated that most students would like to use the model in learning English. Responses to item C2 (m = 3.95) indicated that most students would like to use the model in other courses. The responses to item C3 (m = 3.45) indicated that most students liked using the application to learn after class.

Table 5 represents the application effect on the students and their feeling after using the model. Response results of item D1 (m = 3.45) indicated that the model can increase the motivation for learning words and object around them. Results of items D2 (m

= 3.30) represents the increase of learning of words and D3 (m= 2.35) indicated that the model can enhance learning of words' spelling. If D3 average will be low than two previous ones, it can be due to lack of practicing of writing in this application. If there will be playing with words and their writing along with cards in next versions, so satisfaction would be more. Also synonyms and educational sentences as well as object's data can be considered as student's abilities, and augments the effectiveness of the model.

Table 2. Result of A

	Item	Std. Deviation	Mean	t
A1	Interest about mobile or tablet	.79472	4.0000	22.509
A2	Interest about learning via mobile or tablet	.67082	3.6500	24.333
A3	Interest about learning life-site things	.82558	3.9500	21.397
A4	Interest about learning through books	.59824	2.4000	17.941

Table 3. Result of B

	Item	Std. Deviation	Mean	t
B1	Simplicity of software usage	.64072	3.9000	27.221
B2	Excitement of software	.75915	3.5500	20.913
B3	Adding new staff to software	.91766	4.0000	19.494
B4	Adding game, animation and pictures to software	.56195	4.0000	31.833

Table 4. Result of C

	Item	Std. Deviation	Mean	t
C1	Willing to learn English through app	.75915	3.4500	20.324
C2	Willing to lean other via this app	.68633	3.9500	25.738
C3	Willing to use the app after class	.68633	3.4500	22.480

Table 5. Result of D

	Item	Std. Deviation	Mean	T
D1	Improve motivation rising to learn	.68633	3.4500	22.480
D2	Improve to learn new words	.65695	3.3000	22.465
D3	Improve to practice dictation (writing)	.81273	2.3500	12.931

Advantage of the model

Regarding to mentioned effect AR in education, this model could be a helpful one for children, and make the way easier in writing, grammar and conversation. It can be said that, this model could benefit from 2 models due to using combination of augmented reality technology with mobile learning:

- Small size and portable of learning tool that is supposed to use smart phone as learning tool.
- Portability in physical and conceptual space of learning environment.
- Learning second language with no time and place limit(any time and from any place).
- Usability for kinds of children training.
- Learning according to conditions and place spontaneously.
- Motivating children to use from technology.
- Ability for developing the model (increasing educational data, using from play cards based on AR).
- Increasing child's self-learning.
- Using the model for children with motivation limitation in order to train at home.

CONCLUSION

In this model has been tried to start learning simple words around the child that due to having high-level influences in training, this model could be a helpful one for children and make the way easier in writing, grammar, and conversation, Even this kind of training could be used not only for learning second language but also for other skills training to children. For example by this model, we can train citizenship skills to children in each place or such models could be used for historical place even for children. But there is an important point which we should pay attention to it, in such researches the children should be under the parent's and teacher's supervision, because long term use of these technologies leads to harmful effects on people's health specially on children; even if this technology will be used for educational objective. Because children will entertain with technology tools, they will keep out from real world, and cannot grow socially.

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