MMLSL: Modelling Mobile Learning for Sign Language

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Abstract: *Using mobile technology for Sign language is really valuable, and can improve learners' learning and communication capacity, using the mobile platform applications through the E-learning to enhance, support and facilitate teaching and learning for Deaf people. The proposed MMLSL is using portable mobile devices such as tablet PCs and smart phones through wireless transmission with special equipment that attached to the devices. The main goal of the proposed MMLSL is to integrate text, audio and video with interaction between participants. Mobile application software can educate a distance learner with up to date information with supporting materials, and other types of knowledge and communications.The proposed MMLSL convert the motion of the Sign language into to comprehensible Arabic text that the non-disabled person can understand. The previous technique communication channel links a deaf person to a non-deaf person. The reverse conversion is from voice to comprehensible Arabic text using existing programs such as (IBM via Voice) which support Arabic language. The proposed MMLSL use the Arabic Sign language that is finger spelling which indicate the Arabic letters. The proposed MMLSL has many advantages over normal learning as Helping the disabled to improve their knowledge and facilitate their needs, It motivates student towards learning, M-learning increases knowledge of the students, Because of its portability nature, mobiles are readily available for learners at all times, It allows students to learn anywhere, and anytime which in turn gives unique experience for learners , It is very helpful for learners those who are hesitate or reluctance to normal learning, It helps to focus on individual learners, and encourage them, and This type of teaching-learning method helps to develop self-confidence and self-esteem among hearing impaired children.*

Keywords: Deaf, Mobile Apps, Educational Technology, Instructional Design. .

1. Introduction

The integration of mobile communication and E-learning techniques has generated a new dynamic area that needs further exploration and investigation. This area is forming a new trend, called m-learning. It will lead to a revolution and have a strong impact on education, business and computing disciplines.

The emergence of new technologies within many disciplines, such as Internet, multimedia, databases, and communication, have raised the profile of educational activities and generated new trends within the E-learning process. Recently, the mobility in E-learning has been the topic and objective of several researches works and projects (P. Neubert, 2002).

As technology improved, and demands for mobile learning increased, mobile phones are no longer being designed for calls, instead they are designed for more advanced functions like web browsing, apps, emailing, games and text messages. Moreover, the future of m-learning is looking strong as more and more people are making use of all the extra functionality designed for smart phones such as iPhones.

New kinds of learning are emerging from the Smartphone, in the form of augmented reality, the ability to superimpose graphics, audio and other sense enhancements from the screen on to real environments. These Multi-media can help the people with hearing impairment (Buzzle.com, 2001).

The deaf person is not mentally retarded people, is the only person who is not capable of hearing. They are unable to listen to others and to learn from them, so the lack of ability to speak in a clear and are direct result of it. For that; is not the problem, which prevents deafness from hearing things; but the loss of information and communication provided by hearing.

Until the recent publication of the Unified Arabic Sign Language Dictionary, only numbers and letters (finger spelling) were standardized among the users of the Arabic sign language. Moreover, differences in signs might be found among signers in the same country and sometimes even among signers in neighboring cities. This is because signs are mostly created by the hearing-impaired individuals themselves and are highly influenced by the local environment. An example of this trend is referring to the white color by pointing to one's chest in the Gulf area, which originates from the fact that most males wear a white dress. This dress is not shared by all Arab sign language users. To help the unification of the Arabic sign language, this work adopted signs from the Unified Arabic Sign Language Dictionary (M. Mohandes, S. Buraiky, 2007).

The Arabic Sign language using the Right hand and finger spelling to indicate the Arabic letters will be used in the proposed MMLSL. The Arabic letters are shown as below Figure 1.

Figure 1: Arabic Sign Language

Using mobile technology for Sign language is really valuable, and can improve learners' learning and communication capacity, but is not economical for poor and developing countries. In addition, texting in a foreign language may be difficult if people who are deaf having limited English (Thornton, & Houser, 2005).

Using the mobile platform applications through the E-learning to enhance, support and facilitate teaching and learning for Deaf people. The m-learning process is using portable mobile devices such as tablet PCs and smart phones (iPads and iPhones) through wireless transmission with special equipment that attached to the devices. The main goal of the m-learning is to integrate text, audio and video with interaction between participants. Mobile application software can educate a distance learner with up to date information with supporting materials, and other types of knowledge and communications.

The proposed MMLSL will convert the motion of the Sign language into to comprehensible Arabic text that the non-disabled person can understand. The previous technique communication channel links a deaf person to a non-deaf person. The reverse conversion is from voice to comprehensible Arabic text using existing programs such as (IBM via Voice) which support Arabic language.

For technicians also it a challenging task, as they have to keep up their skill for the requirements of the growing market. They have to provide technical support for hands on practice whenever needs, and trained the disabled. It burdens more on the company, as it has to invest money for the research purpose.

Some Challenges in using m-learning for Sign language has some application limitations:

- Small screen and availability of little space made it harder for displaying information.
- Storage capacity of mobiles in general is limited.
- Mobiles need regular charging of battery, and there is a possibility of lost of memory if it has not done properly.
- Mobiles are small sets. So, they may be vulnerable to being misplaced, damaged, or stolen.
- Because of small screens, they may cause strain for eyes, if students used it for long hours.
- It may difficult for physically challenged people to use moving graphics.
- Because of increasing number of users, there is a possibility of degrades of bandwidth.
- Devices may become out of date as technology improves, and new models hit the market.

The proposed MMLSL will use the Arabic Sign language that is finger spelling which indicate the Arabic letters. It has an intention of guiding, and providing an opportunity for hearing impaired students to improve their learning, and communication experiences using mobile technology. At the same time creation of mobile environment for social interactions where students are able to follow the content through their personal digital assistants without affecting time and place.

Generally, students with hearing loss would face great difficulty in acquiring languages, and they have to use aid for hearing. They may face problems while understanding the speech of others and at the same time achieving effective communication through speaking or using signs may not be sufficient for them (Garcia Cabrere, 2002).

So, for acquiring academic and intellectual skills, there is a necessity of developing reading and writing dimensions of oral communication effectively. For the purpose, there is a need for new approaches which could help for developing cognitive, intellectual, academic, social, and emotional skills among hearing impaired children.

Children should not be deprived of m-learning just because they are hearing impaired. They have to get benefit from the technology development, and in turn they have to overcome their feelings of inferiority.

The m-learning for Sign language has many advantages over normal learning.

- Helping the disabled to improve their knowledge and facilitate their needs.
- It motivates student towards learning.
- M-learning increases knowledge of the students.
- Because of its portability nature, mobiles are readily available for learners at all times.
- It allows students to learn anywhere, and anytime which in turn gives unique experience for learners (Shanmugapriya, 2010).
- It is very helpful for learners those who are hesitate or reluctance to normal learning.
- It helps to focus on individual learners, and encourage them.
- This type of teaching-learning method helps to develop self-confidence and self-esteem among hearing impaired children.

2. THEORETICAL BACKGROUND AND RELATED WORK

The first step in the process of developing academic and intellectual skills, there is a need for maintaining writing and reading skills among hearing impaired children. To encourage reading and writing, we need to take environment where these children are familiar and carry out their daily lives into consideration. Evaluation in this environment helps to gain information about their skills, behaviors, and routine activities expected to occur, and the technology needed for assistance.

Generally, each student has different levels of hearing loss. To gain access this dimension, we need to evaluate individual's strengths, special skills, weakness, knowledge, linguistic capacity, and experiences into consideration. It helps to decide the technology needed for the improvement (Smith-Jackson, 2003).

The next step is the implementation of technology for use-centered learning. The devices used in daily life and the training needed for hearing-impaired individual may vary. This should be taken into consideration, and multimedia applications having display opportunities could enhance the learning process.

Many operating systems are available for Sign language, and one such operating system called Symbian can be used for the purpose, which is developed specifically for them. The recent version of the operating system has introduced new 2D and 3D graphics architecture, and its native toolkit would helps to detect the motion of the disabled people and convert it to text (Cem Cuhadar, 2009).

Sign language appeared on the screen could helps to understand the meaning of the object. Using this software, students can send and receive home works, assignments, and

other course activities. They can chat with classmates, teachers, and friends, and could share valuable information. They can play games, send and receive pictures, which could be converted into text by using native toolkit. Here we can opt out for sending audio, which could save bandwidth and time (Colpaert, 2004).

Multimedia environment helps to provide multiple representations of concepts for students those who are facing hardship of hearing. It improves learning capacity of students with a range of strengths and other needs. It can bridge communication gap, promote skill development, and at the same time encourages students for more discover (Garcia Cabrere, 2002).

As technology improves, new software is hitting the market to ease m-learning for hearing impaired children. Many companies were improving their technologies for making the learning experience more enjoyable. In an effort, engineers at the University of Washington have recently developed new software (Mobile ASL), which transmits American Sign Language over cellular networks. In this device students can use both hands for communication as the device has a front facing camera sits up.

Computer vision and gesture recognition are two rapidly advancing sects of computer science. They aim to allow computer systems to identify visual queues and objects. ASL-to-Text is a video interface program that uses image processing and machine learning techniques to transcribe the beginning of the American Sign Language (ASL) alphabet into English text, taking in visual queues and identifying their English meaning. The goal of our program is to ease communication between Deaf communities and hearing communities by allowing the ASL user to sign and the English speaker to see the textual meanings of those signs. In the future, we plan to increase the amount of letters that the program can process and implement a video-chat interface so that ASL-to-Text can be used for its intended purpose (Caitlyn Clabaugh, 2010).

Gloves and cameras can be analogous to a debate over using a mouse or keyboard to enter information into a keyboard—both are just input devices; it is the software that must make sense of the movements. A neural network is a computer program that "learns by example" instead of following a traditional algorithmic approach. Neural network was the driving process for a system in which capture was done using a VPL Data Glove connected to a DECtalk speech synthesizer via five neural networks to implement a hand gesture to speech system. This system recognized a hand shape "root word" and then added an ending to the word based on which of the six directions the hands moved. These "signs" were gestures, not ASL vocabulary. The five networks were strobe time, root word, ending, rate, and stress (B. Parton, 2005).

Automation of the Arabic Sign Language Recognition using the PowerGlove is a system to recognize isolated signs from the Arabic sign language using an instrumented glove and a machine learning method. Signs from different aspects of life are chosen from the Unified Arabic Sign Language Dictionary that is adopted by all Arab countries. The results obtained are promising even though a simple glove with limited sensors was utilized. system consists of an input device, a computing machine that performs data acquisition and processing, the recognition algorithm, and a sound generator. The input device used for this work is the PowerGlove, which is a low cost instrumented glove originally designed by the Mattel company

to be used as a controller for Nintendo gaming machines (M. Mohandes, S. Buraiky, 2007).

Sign Language Translation System/software that translates text into sign language animations could significantly improve deaf lives especially in communication and accessing information. In the last few years the usages of technology have increased rapidly. One of the most popular technologies is the invention of mobile devices. The most common application is mobile phones for voice transmission, but systems for data transmission are also available. The Wireless Application Protocol (WAP) is an open, global specification that empowers mobile users with wireless devices to easily access and interact with information and services instantly. Previous text-to-Sign Language projects have made limited progress by restricting their output to the PC base – thus avoiding important animation issues and mobilizations of people. This paper introduce Arabic Sign Language Translation Systems (ArSL-TS) Model that runs on mobile devices (Sami Halawani, 2008).

An Image Processing Technique for the Translation of ASL Finger-Spelling to Digital Audio or Text describes the ongoing development of an image processing technique for the translation of American Sign Language (ASL) finger-spelling to text. This work is focused on a complete technological approach to the translation of ASL to digital audio and/or text (Chance Glenn, 2005).

3. PROPOSED MMLSL & METHODOLOGY

The proposed MMLSL simulating various types of input/output methods such as the special needs devices that attached to mobiles, texting using mobile Keyboard, voice converting to Arabic text and motion recognition for Sign language. The conversion of the input/output data helps the learners who are disabled to perform the learning process easily. Devices that can be attached to mobiles are Braille keyboard, voice-text converter and motion detector for Sign language with the application of auto correction and dictionary. Figure 2 shows the system components and the various types of input/output data.
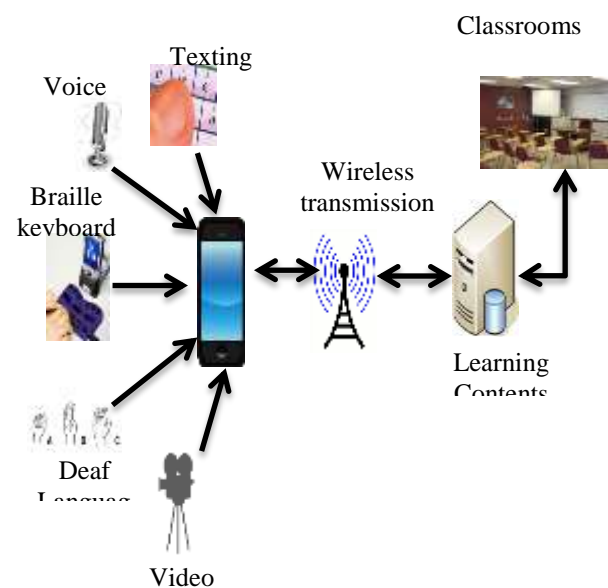

Figure 2: System components

The m-learning has been considered as a very interesting, challenging and useful topic nowadays. The need of this discipline is increasing the importance of distance learning cannot be neglected since scattered learners can reach educational services more easily. The benefits, values and

challenges of the mobile learning will be debated to provision the system. The m-learning has several forms, such as the Virtual learning environments (VLEs), Content delivery and live time training. In the proposal, a generic system architecture called m-learning will be designed to offer learning services and deliver information to scattered end-users. The conversion between the multimedia types such as text, audio and video will be used to ease and accelerate the process.

The implementation will involve the network and the security connection between the components. The network and the security connection will ensure that the correct information is delivered to the appropriate user. Moreover the availability of the system will be assured. As part of the system, an application will be designed for the portable mobile devices.

The rapid growth in mobile technology, as well as the complexity and versatility of its network systems, creates a great challenge for m-learners, and software developed for one type is usually not compatible with other types of phones. To keep up with the industry's trends, m-learning system needs to be upgraded frequently, and it costs more.

The shortage of funding may hinder the effort of improving a mobile learning infrastructure, and could prevent small universities from implementing their mobile learning projects. For technicians, it is important to keep up with new mobile technology, and for that they need to provide technical support for hands-on practice in labs which burden more on research for companies (IGI Global, 2011).

Because of their small size, mobiles are also vulnerable to being damaged, misplaced or stolen. As the mobile devices feature small screens, they may cause eyestrain for students when they use for long periods of time. Stinking battery life of mobile device is one more disadvantage in m-learning, as learners have to worry constantly about charging because of its limited battery life (M/Cyclopedia, 2005).

Future learning is now focusing on learning beyond traditional classroom and curriculum, and in turn, m-learning has created a new dimension in education. M-learning has become a common practice among universities and schools, and is very popular among students. It goes beyond the limit of computer desks, classrooms, and campuses. In addition, more and more courses have adopted the m-learning platform to enhance learning. The 3G mobile network has adopted IP technology, and a 3G mobile device can access the Internet. The forthcoming 4G mobile network will be the all IP-based network, and the trend indicates that the mobile network technology is moving towards to the all IP-based wireless network. The trend indicates that the computer technology will be more and more integrated into the mobile network.

The new function of the m-learning is to recognize the Sign language and convert it to understandable Arabic text. Figure 3 shows how the mobile camera recognizes the Sign language motion, processing the pictures through mobile application and converts it to comprehensible Arabic text.

Figure 3: Converting Sign Language to Text

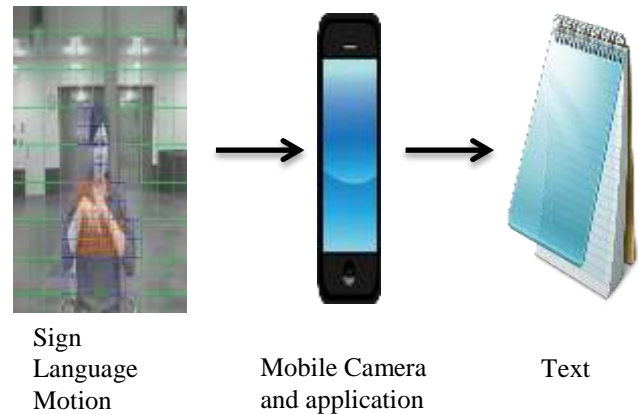Sign Language Motion   Mobile Camera and application   Text

Figure 3 shows the communication channel from Deaf person to Non-deaf person. The reverse conversion is from Non-deaf person to Deaf person can be used by a program called (IBM via Voice) which support Arabic language.

The proposed MMLSL will follow the steps shown in the below Figure 4 which recognize the Arabic Sign language and to convert it to Arabic text. The Arabic Sign language is the unified Arabic Sign language using finger-spelling and right hand.
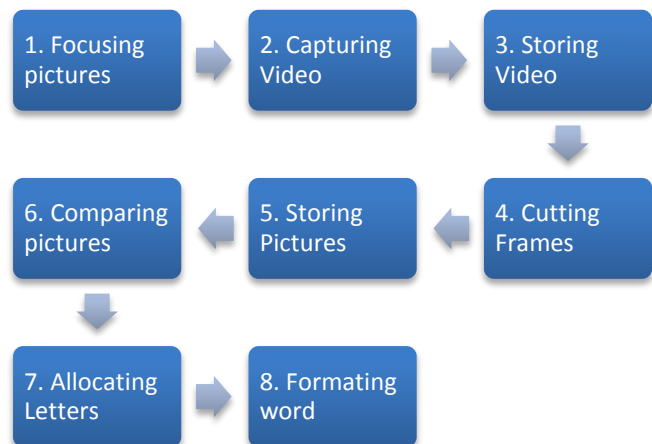

Figure 4: The proposed system Methodology steps

As a pre-request the disabled must ware any black glove and use green background. Moreover the proposed system is working only for Apple smarts phones. The software will use the entire built in library in Xcode programming language.

1) Focusing Pictures: the first step is to adjust and focus the camera lens and to avoid the darkness pictures or the shadows reflection.
2) Capturing Video: the video will be captured for 30 Seconds by the front camera of the smart phone.
3) Storing Video: the captured video from the previous step will be store in the phone memory.
4) Cutting Frames: the stored video will be cut into sequential frames and converted to pictures.

5) Storing pictures: saving all the queuing pictures into the phone memory, convert it to Black and White and applying edge detection, cropping and resizing. The image processing can be done by calling the Xcode function CGContextSetShouldAntialias. Figure 5 shows a comparison of aliased and anti-aliasing drawing (developer.apple.com).

6) Comparing Pictures: in this step, comparing the stored pictures with database pictures using Xcode Graphics Contexts and pixels comparison using Xcode OpenCV library (developer.apple.com) (Yoshimasa Niwa, 2009).

7) Allocating letters: the successes compared pictures will point to an Arabic letter.

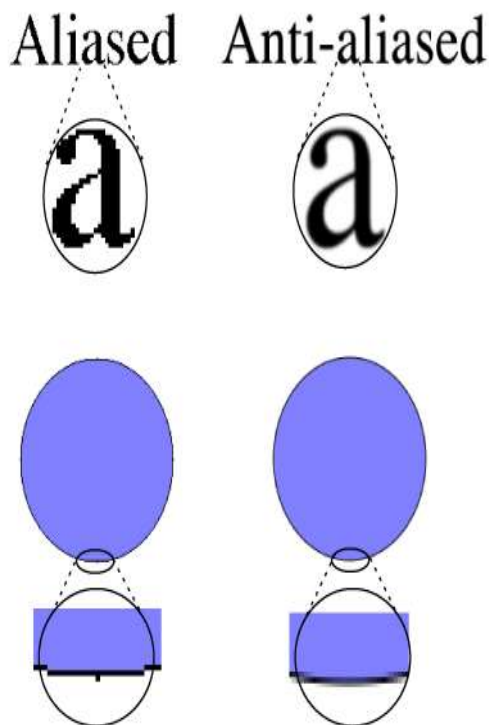8) Formatting word: at the final step, collecting the Arabic letters to complete a comprehensible Arabic word.

Figure 5: A comparison of aliased and anti-aliasing drawing (developer.apple.com)

4. CONCLUSION

Using mobile technology for Sign language is really valuable, and can improve learners' learning and communication capacity, using the mobile platform applications through the E-learning to enhance, support and facilitate teaching and learning for Deaf people. The m-learning process is using portable mobile devices such as tablet PCs and smart phones through wireless transmission with special equipment that attached to the devices. The main goal of the m-learning is to integrate text, audio and video with interaction between participants. Mobile application software can educate a distance learner with up to date information with supporting materials, and other types of knowledge and communications.

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