The Application Of Smart Devices In Teaching Students With Special Needs

Hüseyin GÖKSU
Computer Engineering Department
Cyprus International University
Lefkosa, Mersin 10 Turkey
hgoksu@ciu.edu.tr

Tolgay KARANFILLER
Computer and Instructional Technology Teaching
Cyprus International University
Lefkosa, Mersin 10 Turkey
tkaranfiller@ciu.edu.tr

Kamil YURTKAN
Computer Engineering Department
Cyprus International University
Lefkosa, Mersin 10 Turkey
kyurtkan@ciu.edu.tr

ABSTRACT
Smart devices such as smart phones and tablets have become part and parcel of our lives in recent years. The effects of these new smart devices can been seen everywhere. Students, especially, use these devices in their daily learning process and the application of these tools will be more and more important in the following years. Therefore, it's very important to keep students' attention continuous with the assist of these smart devices. Smart devices help students to study anytime in anywhere, so students learn whenever they want without any limitations. These roles also help students to keep in touch with their teachers. It will also help them to be integrated in social life more easily. This study is about developing a complete software tool to be used in the education of students who need special education. The software is designed for smart devices such as smart phones and tablets. Students who are mentally handicapped may get benefit of using this software for a complete learning session or as a supporting tool. The software is developed on Android platform. In the current version, the concepts of "less" and "more" are considered. The target students are Turkish students who need special education.

INTRODUCTION
Mobile applications become more popular with the rapid development of mobile technology. The educational software development also benefit from this rapid development of mobile technology. It is possible to support the face-to-face education with the computer aided tools. Moreover, mobile devices such as smart phones and tablets are available today for educational purposes. Thus, there is a need for effective software and tools to make these devices useful for education.

On the other hand, there are students with special needs. These students are educated with special methods. Students with special needs also benefit from computer assisted tools. Therefore, an effective software tool that is applicable in mobile environments like smart phones and tablets should be developed. This paper addresses the problem of mobile solution for students who need special education. Other than the conventional software developed for educational purposes, in this study, the developed software involves teaching methodology dedicated to students who need special education.

This study mainly focuses on students who are mentally handicapped. It is aimed to teach them skills of identifying "less" and "more". This is accomplished by special and iterative methods showing the students different objects in different colors and combinations. Also, the software includes special effects to keep the attention of the students who need special education continuous. There are repeated sections with different images on the same concept. According to the student's response, the sections will be completed and the application will shift to the next sections.

When students run the application, they face with two images containing two different objects but of the same type, the same color and the same size. Firstly, the application teaches based on two images. Then, similar images involving varying sizes, colors and types are displayed in the further sections, in an increasing manner. The sections are repeated four times with different objects and a test session runs after the sections in order to detect if the student understood well or not. If students can give at least tree correct answers, the application will go to the next sections and continue. Firstly, the above steps are followed for the teaching of the notion "less", and then, similarly, the notion "more" is taught.

This study is designed for Turkish students. Hence, it includes audio effects and instructions in Turkish. Although currently the software is using Turkish audio instructions, they can be easily translated to other languages and the software may be available in any language.

There are similar studies in the literature like the study of Lopez A. F. et al. to develop a software in order to support the education of students who need special education in mobile devices based on iOS system, in 2013 (A.F. Lopez et. al., 2013). However, software development for Turkish students who need special education is still not satisfied and this study is motivated by this need.

The structure of the paper is as follows. The next section discusses the literature review about the topic. Then, methodology section explains the methods and algorithms used. Application section describes the actual application developed with its screen shots. Then the paper ends with conclusion and references.

LITERATURE REVIEW

There are related studies in the literature starting from early 2000s that mobile devices and applications become more popular. Besides supporting technologies like smart boards or digital lecture material, complete software solutions dedicated to educational purposes are also introduced to the market. Popular use of mobile devices and personal computers make the educational software developers work on different environments and operating systems. In the last decade, the popularity of mobile devices directed the developers to develop software that is compatible with mobile operating systems. Therefore, with the parallel improvements in educational software development and mobile technology, mobile educational software development is now taking the attention of the researchers. There are significant improvements in the field which are published recently.

In 2009, John Traxler defined the mobile learning as a learning method developed with the support of learning material available for Personal Digital Assistants (PDAs), smart phones and computers capable with wireless connection technology (J.Traxler, 2009). In 2004, Bulun, M., Gülnar, B. and Güran, M. presented a study about the use of mobile devices and educational software on mobile devices. They pointed out the advantages of using mobile devices as a tool to support education (Bulun M. et. al., 2004). In a recent study, Celalettin A. and Berk Ç. contributed on new methods in mobile learning using Quick Response Code (QR code) in 2013 (Celalettin A., Berk Ç., 2013).

Moreover, researchers also worked on the educational software for mentally handicapped or disabled students. These are the students who need special education. In 2012, D.B. Kagohara et. al. reviewed the use of iPods and iPads in teaching programs for individuals with developmental disabilities (D.B. Kagahora et. al., 2012). A.F. Lopez et. al. discussed mobile learning technology base on iOS devices to support students with special education needs (A.F. Lopez et. al., 2013).

In Turkey, also some research activity takes place starting from the early 2000s. A study is done by R.K.Ağca and H.Bağcı about the usage of mobile tools in education. They analyzed the mobile device usage from the student side (R.K. Ağca, H. Bağcı, 2013) . Another significant study is done by Aruk İ. about the usage of information systems technologies in the education of students with special needs. They also developed a sample application (Aruk İ., 2008). This study is also done for the Turkish students who need special education.

METHODOLOGY

This study mainly focuses on teaching "less or more" concept between the objects. The algorithm is based on showing the students different images and explaining "less or more" concept with audio instructions. Firstly, the student will face with two images with same objects, same types, same colors but different sizes. Then, the application directs the student with audio instructions like "this is less" and "this is not less". Then, the application will ask to student “look to screen and choose which image is less”. If the student selects the correct image, the application will pass to the second section which includes the same concepts. That section will be repeated four times. But on the other hand, if student fails to give the correct answer in any part of that section, then the application will turn to the beginning of teaching and the overall process will be repeated. If the student is successful to finish that four repetitions, then two different images of the same objects, same types, same colors but different sizes will be faces and the application will ask to students “look to screen and choose which image is less”. This section will be repeated four times but this time without teaching. If the student scores at least three correct answers out of four, this section will be completed and the application will continue to the next section.

In the next section, the student will face with two images with same objects and same types but different sizes and different colors. This part is different than the previous teaching and testing parts. The method will be the same with previous sections, in same concept. If the student is successful to finish this section, then the application will continue to the next section. The next section includes two images with different objects, different types, different sizes and different colors. Then, the teaching and testing methods will be the same.

Again, a successful result will lead the student to the next section which is in the same concept with previous sections but this time the student will face with three images. Another successful stage will continue to the next section with four images and so forth. Being successful in the last section finalizes teaching "less" notion to the student. Similar approach is followed by the "more" notion.

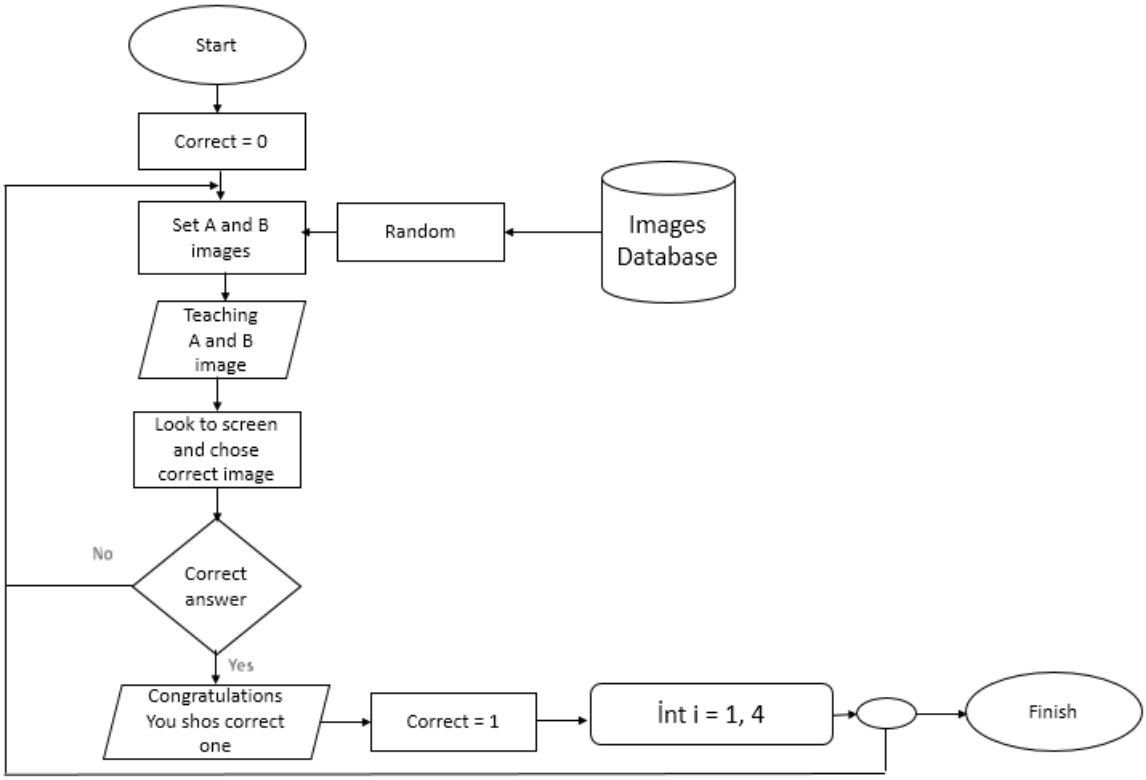


Figure 1. Flowchart of teaching module.

1- Two images two different numbers and colors with objects but with the same type and size
2- Two images with different numbers, type, color and size.
3- Have three images with different object with numbers, types, colors and sizes
4- Four images with objects with different numbers, types, colors and sizes

Figure 2. Pseudo-code for teaching module.

Methodology of teaching other possible notions will be the similar. The corresponding pseudo-code is provided in Figure 2. The flowchart of the overall process is available in Figure 1.

APPLICATION DEVELOPMENT

Currently, there are two main operating systems, platforms, available in the market place. The majority of the mobile devices are running on Android or iOS system. Therefore, in this study, we prefer to use these platforms. Android platform is more suitable for free application development, that's why we first focus on developing this educational mobile application on Android platform. The development of the iOS version of the software is one of our future work.

The mobile application is developed on Android Studio, based on java programming language. It is planned to run on devices which use android operating system. Devices with the installed version of at least Android 4.0 (Ice Cream Sandwich) operating system will be compatible.

The algorithm mainly depends on visual inputs to the student, and assuming that the student (a potential user) has special needs, we employ a repetitive structure in order to teach the student slowly and efficiently. The flowchart of the algorithm is shown in Figure 1. As it is seen from Figure 1, looping structures that show different images to the student to teach the less or more objects in the scene, the application includes an image database. a sample instruction used for comparison is shown in Figure 4. Sample images are presented in Figure 3. In total, we employ 64 sample images currently. The screenshots of the actual program are shown in Figure 5.

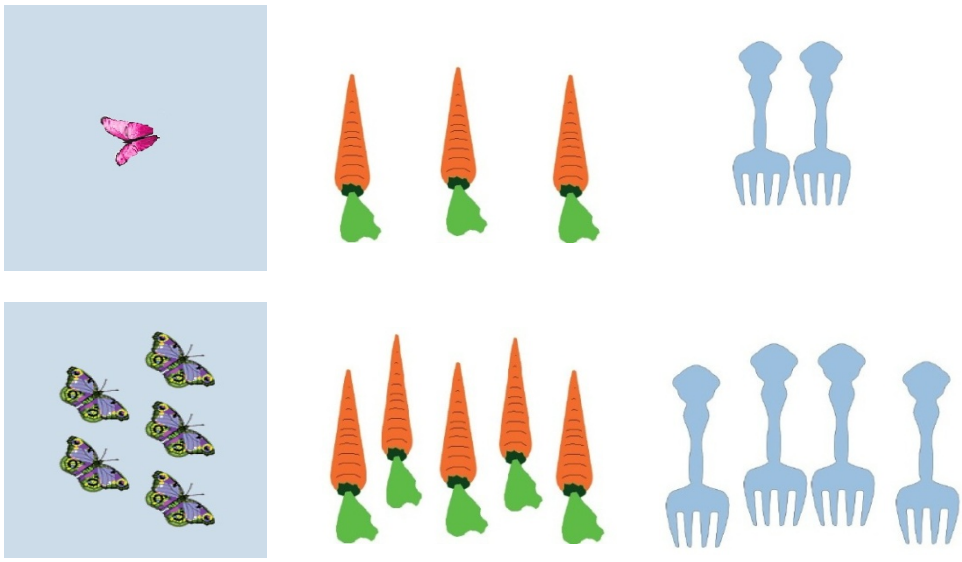


Figure 3. Sample images.

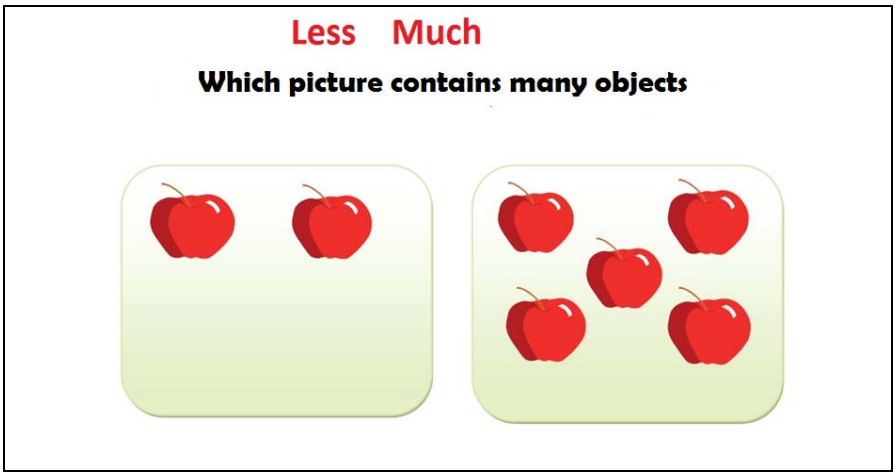
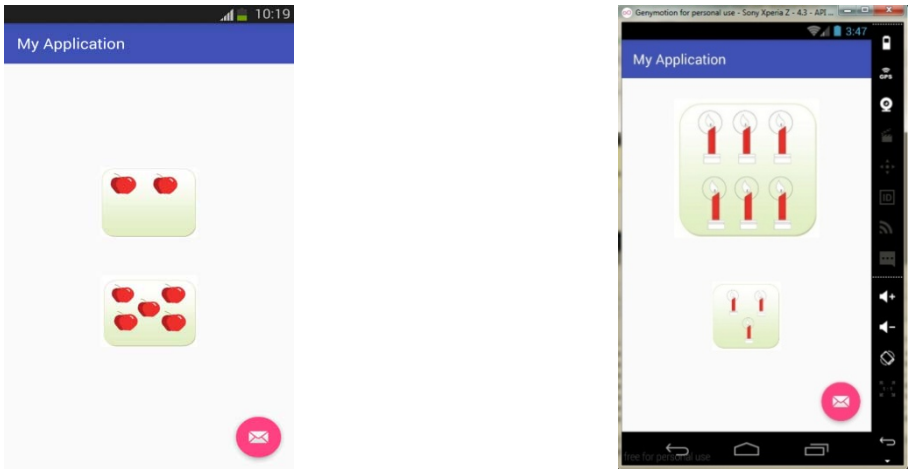


Figure 4. Instructions used for "less or more" comparison.

The application also includes audio to direct the student through the images. Currently, the application teaches the concepts of "less or more" to the students. Development of the next module that teaches the students to put the images in the ascending/descending order according to the number objects in the scene is under study now.

Test phase of the application is planned after completing the next module. We plan to test the application on students who need special education at 'Lefkoşa Özel eğim ve İş eğitim Merkezi'. The test stage will include teaching the "less or more" and "ordering" concepts to selected students and then evaluate their ability.



(a) (b)

Figure 5. Screenshots of the application developed: (a) images including apples (b) images including candles.

CONCLUSION

A mobile application is designed and implemented for smart mobile devices. The application design is aimed to be used in teaching students with special needs. The application is designed to serve Turkish students with special needs. We focused on the teaching of the concepts "less or more" to the students with special needs. The next module to be implemented will focus on teaching the students to sort the images according to the number of objects in the scene. The application has been developed on Android platform and preliminary outcomes are presented. The evaluation of the application is planned to be done after including the design of the next module.

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