

## Applying Bluetooth as Novel Approach for Assessing Student Learning

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### ABSTRACT

*Over the past several years, it can be observed there are many demands to enhance and develop e-learning system which is considered as highly desirable in many institutes and universities. One of the essential parts of e-learning is the assessments in order test student's continuous mutual development who use e-learning. The current electronic examination systems faced certain limitations in privacy and system configuration. Therefore, main objective of this study is to employ Bluetooth as an alternative medium to transfer questions and answers between lecturer and student programs which both will be designed using C# language. The proposed research Bluetooth Assessment System (BAS) is divided into two programs: Student Program (SP) and Lecturer Program (LP), each one of them has its own features and functions. This paper presents the system architecture and computational algorithms for the proposed system, and also illustrates its use for universities and institutions.*

**Keywords:** Electronic exams, Student assessments, Bluetooth; E-Learning, Wireless networks

### INTRODUCTION

Many training centers, institutes and universities need to measure the students' performance and their abilities on understanding whatever is illustrated to them. In fact this measure is considered as an exam that could test the students' understanding and intelligence. The exam can be conducted in such a way that students can easily express the originality of their thoughts [1]. As its obvious there is a demand to create an examination system which is considered as a tool that allows the educators to know their students comprehending and at the same time it allows the students to realize what they understand for the given subject. To translate all these concepts for executing them on computers there is a demand to an interface for the students and lecturers and a link to transfer the information. As such this study proposed Bluetooth technology to take a role as a linker/bridge between the lecturer and student computers [2].

The usage of Bluetooth (a proprietary open wireless technology standard for exchanging data over short distances) is widely used to transfer data on Personal Area Network (PAN) due to the security functions that could be found in this technology and the comfortable configurations that could be available to transfer data as compared with the wire [3]. The main idea of this project focuses on using the features that provided by the Bluetooth and implementing them on the proposed system to offer the design for the examination system. The components of this system are divided into two parts: (1) Student Program (SP) and (2) Lecture Programs (LP), both of these are programmed using the programming language C#.

In fact there are many objectives behind designing this system, first is to provide the efficiency in evaluating the students thoroughly through a fully automated system that not only saves a lot of time but also gives fast results as compared to the classical systems represented by using papers, pens etc. It will be easier for the lecturers to control and monitor the exam events, to type the questions and to check the results later using this system. In

addition one of the significant objectives is to offer the security for the examination system, and that could be performed by hiding all the student computers in front of searching devices in Bluetooth. However, it should be noted that this system is targeted to the educational institutes, universities and schools to improve the procedures of conducting the examinations.

## RELATED WORK

There are many works related with this research in term of examination system. These works presented how to use the computer applications in creating the examination system. Some of these research projects have proposed desktop based application such as Integrated Computerized Examination (ICE) system. It is created by [4] and has four components “Candidate Manager” is the module that delivers the tests to candidates at computer test stations “Test Suite Manager” allows test proctors to monitor and control the delivery of tests to candidates. “Systems Manager” is used by system administrators and network specialists to administer and maintain the system “Test Manager” is the module used for the creation of tests (content, time limits, instructions, and multi-media) and scoring.

Another research project on medical examination is done by [5] whereby they have presented a novel approach to software structure design of a haptic-based simulator for medical examination purposes. Their software has four major components: Image database, Graphic rendering, haptic rendering and Graphic User Interface GUI. There are some projects that falls under the category of web-based systems, the “e-Xaminer” which is an Electronic Examination System done by [6] developed as training system support pilots to improve their skills. This project designed at the Hellenic Air Force Academy in Greece. It involves personalized tests (html pages with forms) for each student, based on parametric problems and questions set by the instructor. Students submit their answers, which are marked via automatically generated scripts; a marking report is generated that can be reviewed by the course organizer.

**Table 1. Summary of Previous Studies**

<i>Properties</i>	<i>Previous Works</i>			
Project	Integrated Computerized Examination	Haptic-Based Medical Examination System	e-Xaminer	Online Examination System
Scope	Civil Services	Medical Examination	Pilot Training	Academic Institutions
Outcome	Used to develop, apply for, administer, and score civil service examinations	Support doctors in decision making	Improve pilot skills	Enhance student learning
Platform	Desktop based application	Desktop based application	Web based application	Desktop and Web based application
Technology	NA	C++	PHP	JSP
Limitation	Lack of issuing of permanent identity card	Pictures of patient's organs are pre-scanned which need to have high-quality images	-	Lack of robust database design

A project had been done by [7] which proposed a question bank that could be used as the databank keeps all the examination questions whether pre-existing or created by user. This

project designed to develop an online Intelligent Question Bank and Examination System (IQBAES), which will make use of open source technology. Finally a web-based examination system was developed with Java Web technologies [2]. In fact, this system provided the functions, including question management, paper generation and test online. Also the combination of client-side programming and server-side programming techniques were used and analyzed.

## **PROBLEM STATEMENT**

Usually the classical examination system represented by writing on papers has many problems; these problems could be summarized as following:

1. Time consuming which can cost lecturers to check the students' answers, represented by the time to prepare, store and remark all the questions and to understand what the student is trying to explain.
2. Sometimes the lack of information about the student (e.g. ID, Full name .etc) in the classical examination system could make the checking of answer complicated, for example it may mistakenly cause some students to forget to write their names in the examination paper, and this would be an extra work to the lecturer.
3. The difficulty to store a copy of student's answers, and record them.
4. Most of previous presented systems are desktop-based application, in fact there is a need to adapt new platform such as mobile which can be implemented easily using Bluetooth technology.

## **METHODOLOGY**

In general many students know how to use computer applications even if they were simple applications, this make the computer solutions more desirable for the learning system. This study first target to use the Bluetooth technology to transfer the data between computers, to assure the security issue this study proposed to define the media access control (MAC) address of Bluetooth adapter of the Lecturer program statically in the Student program which makes it default address to serve two purpose, first to disallow students to send their information and answers to other devices, second to provide the ability to set the property of access to the student Bluetooth to the value "invisible", so to perform this there must be a default address set before the exam begins to assure executing these two objectives, in our proposed project this could be done in the System Configuration window as shown in Figure 1.

Then proposed to generate exam ID assigned for each student and it could be changed in every exam, this ID considered like the exam ticket. When the student signs into the proposed system using the Student program, his/her exam ID will be recognized by the Lecturer program to decide whether the user is allowed to enter the system or not as shown in Figure 2. The lecturer could use the manage exam window to control the exam events, sending the questions to the student , the answers could be sent before the allowed time finished and if it's finished the program will mandatory send the answers to the lecturer program, to store and check the answers easily. Finally this project will provide the facility to the students to have a profile page that allows them to exchange the files between them via Bluetooth.

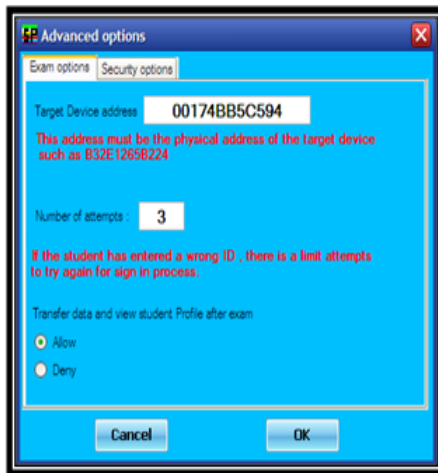


Figure 1. System Configuration

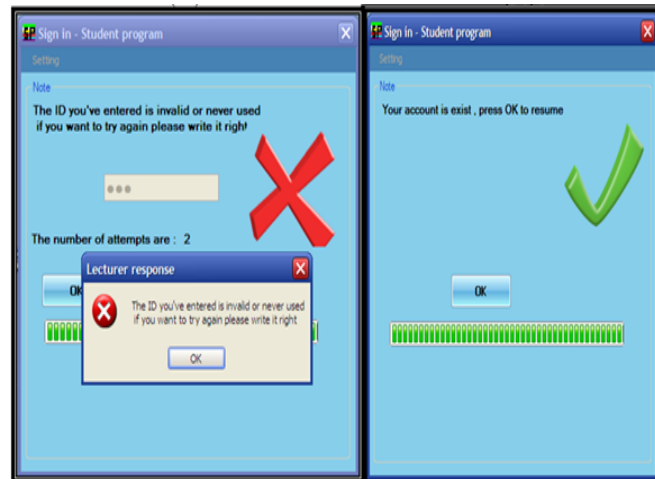


Figure 2. LP response to SP

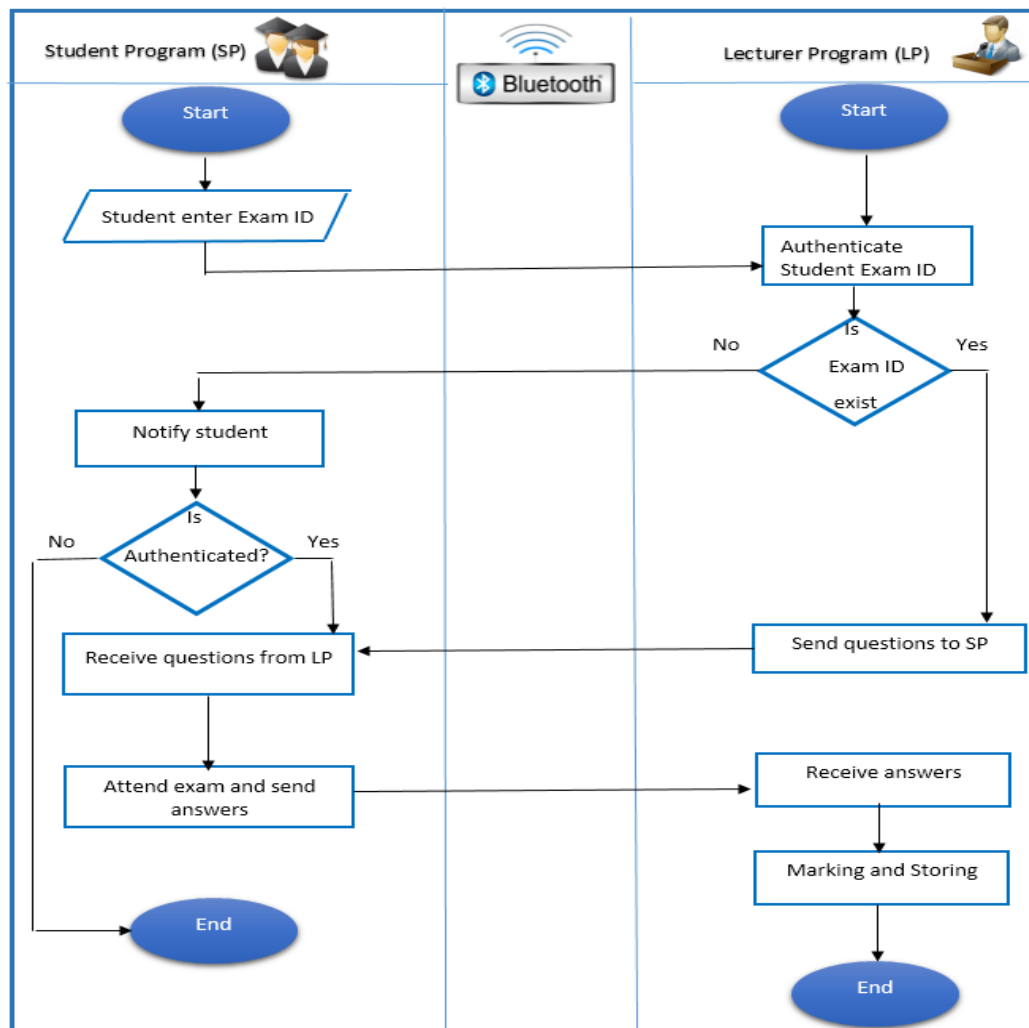


Figure 3. Bluetooth Assessment System (BAS) flow chart

The proposed algorithm for this system is as following (As shown in Figure 3 above):

Step 1: Declare variable found Bluetooth,

Step 2: If found Bluetooth = 0 then Repeat the steps until foundBluetooth <=1

- Step 3: Declare variable examID, auth  
 Step 4: Let LP initialize connection with database  
 Step 5: If examID is exist Then let auth=1  
 Step 6: If auth!=1 Then Step 5  
 Step 7: Load questions from database  
 Step 8: Load answers from SP  
 Step 9: Load marking form in LP

## SYSTEM IMPLEMENTATION

### Lecturer Program

This program is used by the lecturers to run and control the examination system, it can be considered like an interface to lecturers. This program can perform the following functions:

- I. Set and review the exam questions, using a specialized windows are considered as a part of the program, the type of the questions could be multiple choices multiple selection, multiple choices single selection and fill in the blanks.
- II. Allow or deny the students to perform the exam.
- III. Receive the student's answers.
- IV. Check the student's answers.

The Lecture program has many windows designed to manage the examination system. First of all the lecturer must sign in into the system by typing the ID and the password as shown in Figure 4. Then the process of preparing questions will involve sending them later to the students as shown in Figure 5. When the exam starts, the lecturer will use the management window as shown in Figure 7 which can be used to manage the entire examination system which can through it allow or deny the student to perform the exam and receive their (students) answers to be checked later in specialized window designed to execute this purpose as shown in Figure 6.



Figure 4. Login form for Lecturer

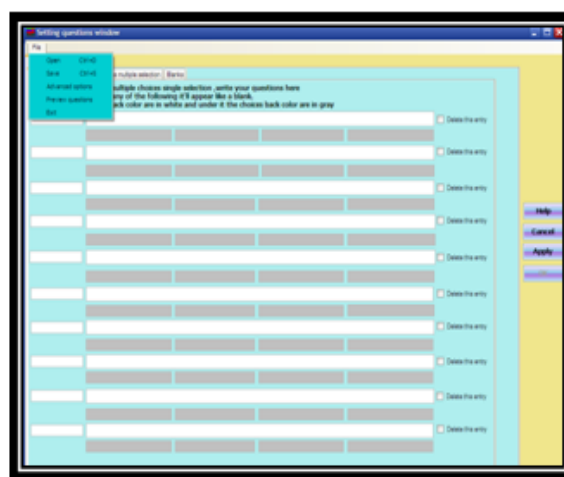


Figure 5. Setting questions window



Figure 6. Answer Marking

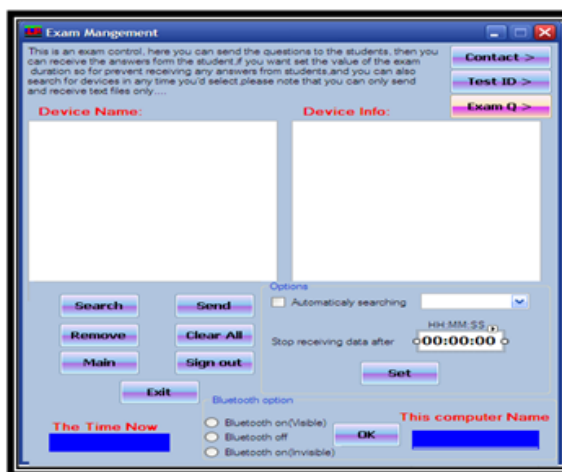


Figure 7. Exam Management

### Student Program

This program is guided to the students to do their exam, this program demands to work simultaneously with the Lecturer program via Bluetooth to assure the procedures of the exam are going on what is to be without any violations. These procedures are summarized by:

- I. Assurance of the identity of student.
- II. Transferring the student information between Student and Lecturer programs.
- III. Transferring the exam questions, answers of the student and results.
- IV. Configure Bluetooth address and setting

The student program has many windows, starting with the login in window as shown in Figure 8 and the test window which provides the ability to do the exam as shown in the Figure 10. When the allowed time to the exam is finished, the student program will send the answers that have been written by the students to the Lecturer program as shown in Figure 11 to calculate them later. Students could also exchange the files between each other after finishing the exam through the Profile window to let the students later know their results after checking them as shown in Figure 9.

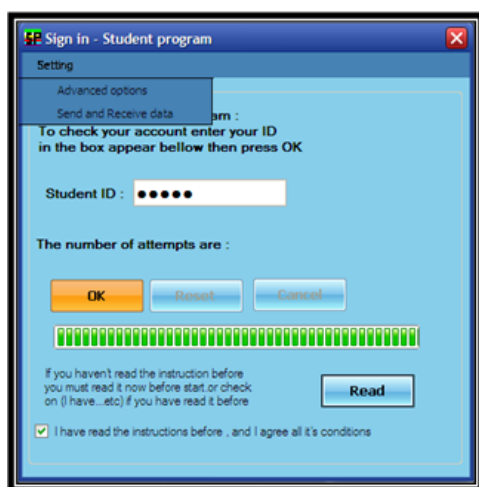


Figure 8. The startup of student program

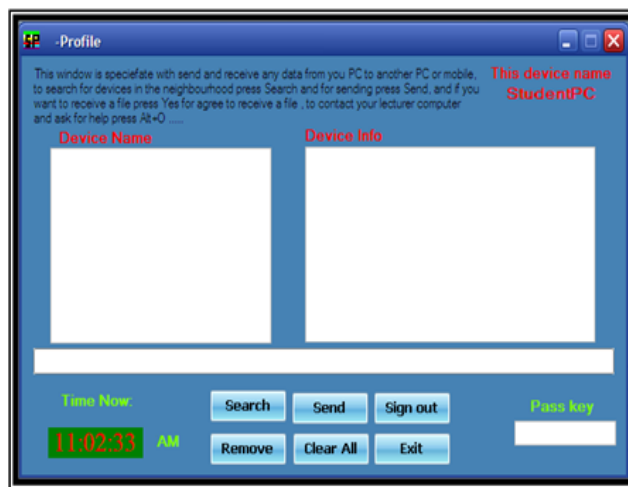


Figure 9. The profile window



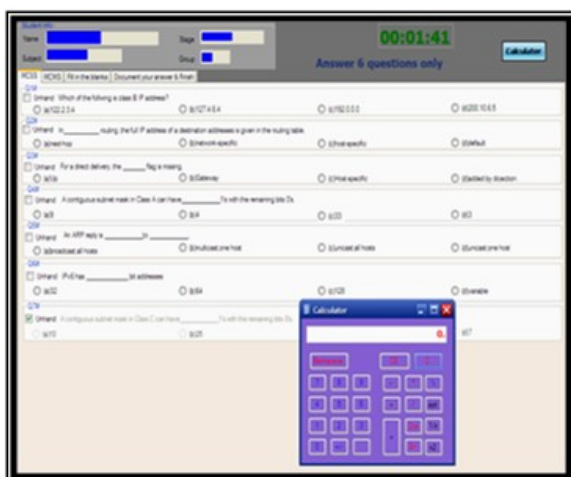


Figure 10. The test window

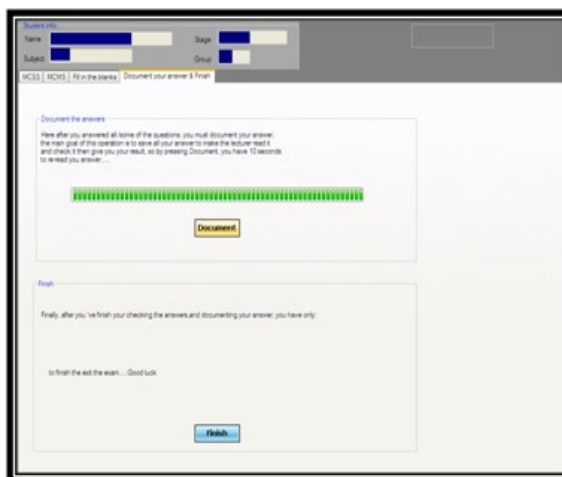


Figure 11. The procedure of sending answers

## CONCLUSION

This project employed Bluetooth technology to design and implement a remote examination system which could provide security and flexibility to the proposed system. Most of the classical examination systems done using papers and pens are time-consuming and lack of accuracy. The proposed research divided the system into two parts: one is considered as an interface to the student to do the exam and this program has many features that simulate the classical system by adding extra functions and another program which is considered as an interface to the lecturers to set the exam question, monitor the exam events and check the students answer. The proposed system presented the examination system as an executable project programmed in C# language. Further work is in progress to test the system with face recognition technology and to incorporate computer vision so as to see if this technology could further enhance this system.

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