Ubiquitous Clicker application for Heterogeneous Devices in a Distributed Environment

M.Tech. Project Stage-2 Report

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Abstract

In distance education, Clickers, or Student Response Systems are used for improving student-teacher interaction in face-to-face class rooms. In this report we describe the extensions to existing Clicker application for conducting on-line quizzes, to work seamlessly not only with android devices but also with other devices like laptops, tablets, PCs, smart phone with other OS like windows, iOS. Along with this we describe the enhancements to user interface for handling scientific mathematical expression.

Keywords-Distance education, clicker application, client-server, Central server, TCP/IP, Distributed Environment, Virtual Scientific Keyboard
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Chapter 1

INTRODUCTION

ClickerV4 is a distance education application, which was developed by IIT Bombay in 2009. This system provides us with high quality and low cost education facilities. ClickerV4 is an application based system. Currently clickerV4 application works with android devices like Tablets, Smart-phones, as developers had focused only on android devices. But in future other better, reliable and cheap technology would be available. In future, a system might fail due to reasons like system constraints, cost effectiveness etc. So ClickerV4 applications needs improvement for longer time period. Now we have added important features such as conducting on-line quiz to work seamlessly with other devices and handling scientific mathematical expressions. ClickerV4 application has many feature like quiz, poll and raise hand. So in this report we are discussing about on-line quiz, which we can conducted at local class-room and remote class-room. The current ClickerV4 application is an Android app based system. So our aim is to make it a web based system which will be accessible from any device like laptops, tablets, smartphones and PCs.

1.1 Problem statement

This kind of system provides high quality and low cost education facility. Existing system supports only android platform such as tablet and smartphones with Android operating system, both devices do connect through using infrared or radio frequencies based wireless technologies. So while participating in a quiz a student may face problems, which the instructor conducts. An instructor may also face similar problems while setting questions and answers for the quiz. Now our aim is to enhance the existing capabilities of the system so that students who dont have access to Android apps may also participate. For this, we extend the system to work in a web-based environment. In this way the students can participate in the quiz form different devices using as laptops, tablets, iPods, Clicker using a web based interface. Another limitation in the existing system is that the instructor cannot use scientific notations in question. As it is essential in almost all major fields, we have provided support for using scientific notations for the questions and an-
The answers of the quiz. This is done by using LaTeX [7] for any text box. It is an open-source JavaScript display engine for LaTeX. When the instructor wants to scientific characters, they can write as latex passion in the question or the answer text box, then it will displayed on student browser, while setting questions by instructor, they can also preview questions for conforming that. It is write expression or not.
Distance education is providing high quality and low cost education to growing number of students using new and better technologies [6]. A similar solution was implemented by University of Oklahoma, College of Pharmacy for a dual classroom environment. According to their study, students and faculty members felt that the immediate feedback and automated response of the system was good. A student response system was developed by the Indian Institute of Technology Bombay in 2009. The system was intended to be used first in IIT-Bombay lectures, and then to be extended to all colleges and schools across India. They developed open source software and easily available hardware components. A workshop was conducted by IIT-Bombay and 473 participants across India from 22 remote centers joined the workshop. The lectures were delivered from a lecture hall in IIT-Bombay. The lectures were broadcasted through EDUSAT, a satellite dedicated to the education sector by the Indian Space Research Organization (ISRO).

In this URL [3] discussing web class-room Response System, often called clickers, it promote active learning in a class room. These are several names for such systems including Student Response System, Audience Response System, Personal Response System etc. In class room, clicker provides a mechanism for students to participate interactively in learning activities anonymously and to express their own ideas without pressure. There is no hardware requirement and hence practically of no cost. It is designed and development by teachers and education research for improving learning. This is a free web clicker system. Free web based clicker system that works on any Internet accessible device which can be smart phone, ipods, pcs, or laptop with working browser. Teacher can create an account to conduct class and smart voting.

In this paper, Tokiwa [8] had been tyred to improve and maintain the quality of the distance learning systems. Tokiwa had established the stable distance learning system. Student can share picture, image and audio sound without any uninterrupted. Tokiwa introduced RFID T-age as a system to complement distance education. RFID is similar to the attendance managing system. The
purpose this system to satisfy the teachers desire to know the name of the student in remote class-room. In 2006 tokiwa also used ICT for improve teaching method. Initially attempted the trail run of active learning. It system also support the heterogeneous device.

In this paper, Catherine Crouch and Eric Mazur [2] analysed physics learner decreasing day by day. In this paper presenting the result of ten years of teaching. Peer instruction modifies to the traditional lecture format, include questions designed to engage students and uncover difficult material. Peer Instruction engages students during class through activities that require each student to apply the core concepts being presented, and then to explain those concepts to students. We find in both the algebra and the calculus-based introductory physics courses. That our students grasp of the course material improves according to a number of different measures. After some time in 1993 and 1994 find the set of Concept Tested and the in-class questioning/discussion strategy. In 1996, they introduced free-response reading assignments. They have replaced reading quizzes with, Web-based assignments designed to help students think about the reading. Peer Instruction has been successfully adopted by hundreds of instructors at other institution in over world and our communication with them indicates that one of the reasons for this widespread adoption of adapting PI to the local context.

In this paper, Mary Jo Garcia Biggs [1] examined student psychosocial learning environment in a distance education classroom. Distance Education Learning Environments Survey that was distributed as a pre-test/post-test to three sections of the same course taught in three distinct formats. Web-based tool specifically designed to assess the learning environment using a new technique and technology. These kind of system provide excellent opportunity to improve his/her learning quality. All student utilized the Distance Education Learning Environments Survey. It is call validated instrument for post-secondary distance education. It was the first instrument of its kind and significant for utilization on a global scale. Twenty-six students enrolled in the master of social work program at Texas State University-San Marcos were administered. It was started in January 2005. More specifically, students were enrolled in Social Work. The topics of discussion focus on interviewing, assessment, and planning skills. Those students enrolled in traditional, distance and hybrid instruction courses were included in the sample. Data was collected and analyzed on the 34 web-based statements in which students responded.

In this paper, Patrick J. Medina [5] introducing and discuss distance and co-located education placing a mouse on each student desk in a class-room and connecting those mice to a single computer. In this system communicate via standard telephone network. Teacher has two display field and class-room also has to display for video replace by video. Such a system should allow for back channel for communicate to student to teacher. Med application describe that how they reflected class-room observation. Basically goal of this system is increase
student engagement. The MED application based on multi mouse implementation, is virtual space share between teacher and student. In this system having many important feature which is Cursor.

**Identity**: Each participant represent on the virtual blackboard by unique cursor.

**Student list**: Teacher can see performance of student and teacher also calculate student's activity.

**Rising Hand**: Student can ask questions during the class-room and his/her request display in the small virtual flag.

**Activity**: Student can easily involve in the during the lecture. MED is based around on four activity whose order and frequency

- viewing a lecture slide
- multiple chose question
- binary question and shared keypad input. Here describing how the design support design goal. These kind of system supports indivisible student performance and teacher can able to find and see the his/her individual activity. Multiple student are able to give answer simultaneously during an active class-room. Teacher also can do those who answer in an efficient manner by scanning the student list.

In this report, Roger C. Lowery [4] discusses about student-response Systems. These kinds of technologies are mostly used in higher education. Student response system technology has been developed in to three generation. First generation came out as commercial versions. These are hardware devices used in the class-room. Second generation of systems use infrared and radio-frequency wireless. And last and third generation are Web-based systems. Student-response hardware, software, and textbook bundling options are rapidly evolving. Purchasers and adopters are faced with keeping track of multiple variables. However, costs are coming down and new or improved features are constantly appearing.
Chapter 3

Proposed Architecture and Design

Clicker application complement all tasks discussed in chapter 1 and in systems which works in any devices for any environment. This kind of system will reduce learning cost and also student will not have to face device constraint because system supports any kind of devices such as smartphones, PCs, laptop, iPods. Web-based systems do not require a classroom projector and screen questions and/or images can be transmitted directly to each students cell phone, PDA, or pocket/notebook/laptop PC. The existing system does not support writing long scientific equations. Now, some modifications have provided support for using scientific notations for the questions and answers of the quiz. This is done by using latex for any text box. Our application will run on the Application layer of the OSI model. It will communicate with the user devices via the physical layer. Communication is in HTML and XML, HTML for the display browser and XML for quiz data from the server side. In the proposed system, if user requests using an unique URL(http://localhost:8080/clickerv4), then our system automatically understands which type of device is requesting for quiz, then our application provides supporting browser. Because every device has different screen size, our application is able to decide that which type of screen should be provided for user.

3.1 Advantage of Web Base ClickerV4

- To provide better online quiz environment in classroom.
- ClickerV4 is professional easy to use online quiz.
- It allows to creation of quizzes of user defined times.
- It can work on any device.
- Now we can write scientific mathematical expressions.
- Results are calculated instantly.
- ClickerV4 is online. There is no need to install any software for instructors or students.

- It supports any type of devices. So that student can use like smart-phone, tablet, PC, laptop etc.
Chapter 4

Approach and Implementation

4.1 Approach

Initially the system was an application based system. While using that system some constraints come up, like device constraints each and every student should have android device. It is a drawback of clickerV4. So I converted web based system, because web based technologies supports any type of device like to a smart-phone, tablet, PC, laptop etc.

System has login page for Admin and Instructor then I added one more module in existing system for login of students on the same url. Instructor would provide user-name and password each and every student, registered by the instructor. After successfully authenticate next module is displayed, which contains Instructor ID, Course ID and Quiz-name then student has to choose, a quiz. When students select a quiz and enter corresponding information, then other questions module are displayed. When ever quiz submitted by student or time complete, then result is instantly calculated and shown to student.

4.2 Steps of Creation of Online Quiz

Here, we will look at various technologies/techniques that are used for implementing online quiz student utility web application.

4.2.1 Web Application’s Modules

Here are listed of all modules of web application along with corresponding responsibilities.

- Authentication Module:- This clickerv4 has 3 types of users they are Admin.
  Instructor.
  Student.

Now in the database we have only one user Admin, Admin has all the privileges. So in this system admin has default user name and password.
• When instructor want to use clickerV4 for conducting online quiz, then
admin adds instructor and provides instructor ID to instructor. Similarly
the instructor can add a student, who wants to participate in online quiz.
Instructor can add questions one by one as well as choose files as template
for questions.

• We have successfully added latex for scientific expressions and make it
compatible for both touch screen devices as well as non-touch devices.

• Local MySQL Database Authentication: Instructor and Student are au-
thenticated from local MySQL database.

4.3 Steps of Creation of Online Quiz

This section explains in detail about implementation of various modules that
are mentioned in above section. It explain how all modules work together.

4.3.1 Authentication Module

This url:-http://localhost:8080/clickerv4 provides login page. It is common for
Admin, Instructor and Student. Using login page instructor can conduct online
quiz and student can give the online quiz. Login page contain two fields namely
user-name and password, that user-name and password authenticate with local
database, there is a store of all existing user-name and password.

Figure 4.1: Serving Multiple Users
4.3.2 Student Login Page

When student login with his/her username and password, then student get studentquiz.jsp. It is contain three fields, which is Instructor ID, Course ID and Quizname. If instructor create quiz and add quiz questions for conducting the quiz, that time instructor have to enter all these information, information store in corresponding table. So we can authenticate user with existing recorde.

![Image of Student Quiz Login Page](image)

**Figure 4.2: Student Quiz Login Page**

4.3.3 Online Quiz Page

After authenticate Instructor ID, Course ID and Quizname student can get quiz questions corresponding instructor ID, Course ID and Quizname.

![Image of Online Quiz Page](image)

**Figure 4.3: Online Quiz-1 Page**
4.3.4 Quiz Result Page

When student submits the answer then result.jsp page is displayed. After submission final result are calculated instantly to find his/her performance. Result.jsp page contains student quiz percentage, how many right answers are there and how many total number of questions.
4.4 Latex Configuration

Latex is used to type mathematical symbols and scientific symbols along with text allowed by normal keyboard. The existing clicker application system does not have support for scientific symbols or mathematical expressions. Now extending the system, we have successfully added a latex configuration specifically for scientific expressions and made it compatible for both touch screen devices as well as non-touch devices. It consists of symbols including Greek letters, binary operation symbols, relation symbols, arrow symbols, geometric, trigonometric, logical, and other mathematical symbols.

Now currently existing system has the feature of adding scientific or mathematical expressions in questions and options fields. When the instructor wants to scientific characters, they can write as latex passion in the question or the answer text box, then it will displayed on student browser, while setting questions by instructor, they can also see mathematical expression help of preview button, it is write expression or not. It would help the instructors in creating mathematical questions, generated questions for setting up an on-line quiz.
Figure 4.8: Latex Configuration in Question Field

Figure 4.9: Latex Configuration in Option Fields
Chapter 5

Tools and Technologies

There are too many Java technologies, but most of web developer use jsp and jQuery for multi-browser JavaScript library designed. Web development tools allow developers to work with a variety of web technologies, including HTML, CSS, JavaScript, and other components that are handled by the web browser.

5.1 Tools and Technologies Used

• Latex- Simply includes latex library in text fields.

• JSP - Used to control web pages content via servlets.

• jQuery - A multi-browser JavaScript library designed to simplify the client-side scripting of HTML.

• ActionScript - An object-oriented language and a dialect of ECMAScript (Similar JavaScript) developed by Macromedia Inc. but now owned by Adobe Systems.

• MYSQL: - Open source relational database. management system based on the structure query language (SQL), which is used for adding, removing, and modifying information in the database.
Chapter 6

Conclusion and Summary

6.1 Conclusion

In this report, we described the design and architecture of existing student response system. We developed analyzed and tested the Clicker android application by conducting a live quiz inside IITB network. We found many features which could be implemented for improving the quality of Clicker application.

Following Improvements Made:

- Clicker application should be seamless with other devices.
- Clicker application is able communicate via wireless as well as LAN.
- Need to enhanced the user interface for handling scientific mathematical expressions.

New Features Added:

- We have developed a web version to make it accessible from anywhere and from any device like laptops, tablets, PCs, smartphones with any OS like iOS, Windows and Android.
- We have Integrated and enhanced the user interface for handling scientific mathematical expressions.
References


[3] http://webclicker.org/home/contact/. A free web clicker system. that can flip your classroom and have students voting in less than one minute at zero cost, June 2014.


