“SRS for Clicker System”

Author: Anoop Dobhal
Contact: anoop@cse.iitb.ac.in

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Contents

1 Introduction 1
  1.1 Aim and Objectives 1
  1.2 Existing System: Web Based Clicker System for Akash Tablet 1
    1.2.1 Different modules in AkashClicker 2
    1.2.2 General Constraints or Limitations in AkashClicker 2
  1.3 Problem Statement 2
  1.4 Scope of the Project 3
  1.5 Constraints of the Project 3
  1.6 Assumptions and Dependencies 3
  1.7 Proposed System 3

2 Papers Reviewed 5

3 Algorithm for Recommendation System 7
  3.1 Algorithm for modifying the Parameters 7
  3.2 Scenarios for User Ui 8
  3.3 Scenarios for User Qj 8
  3.4 Tree Representation of Four Cases Discussed for Qj and Ui 9
  3.5 Examples User Attempting Questions 9

4 Programming Tools / Technologies 11
  4.1 PHP and MySQL 11
  4.2 Android Software development 12

5 Methodology 13
  5.1 Process Model: Waterfall model 13
    5.1.1 System/information engineering and modelling 14
    5.1.2 Software Requirements analysis 14
    5.1.3 Software and System Design 14
    5.1.4 Implementation and unit testing 14
    5.1.5 Integration and system testing 14
6 Requirements Gathering and Planning

6.1 Use Case Diagrams and Descriptions .......................... 15
6.2 Feasibility Study .................................................. 15
   6.2.1 Hardware Requirements: .................................. 15
   6.2.2 For Mobile: ................................................ 15
   6.2.3 Software Requirements: .................................. 15
6.3 Flow Chart ....................................................... 15
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Abstract

Nowadays, clickers are called by many names like CRS (Classroom Response System), ARS (Audience Response System), SRS (Student Response System) and many more. Many questions are still in the queue, which are yet to be answered, like, do clickers improve learning?, What type of questions will enhance students participation and improve their knowledge?, etc. This report presents an overview of clickers system, methodologies accepted for improving active participation of students, from the start of hardware clicker’s to software clicker’s implementation in portable devices like tablets, mobiles, PDA, or laptops.

Thus the main objective of this project is to develop an efficient and improved Aakash Clicker System focusing on learning improvement.
Chapter 1

Introduction

Clickers are act as medium of communication between teacher and students. It use infrared or radio frequency technology for transmitting and receiving data. Clickers as previously explained, can be an any portable handheld device like smartphones, tablet, laptops or any hardware are given to all students in the class. The teacher can ask question or post quizzes during class, student then give reponse through their device. The overall feedback is tabulated and displayed on the projector.

1.1 Aim and Objectives

The goals and objectives of the project are as follows:

- Focus on improving learning by understanding student capabilities like IQ level, problem understading etc..
- To Increase students participation in class.
- Develop an efficient and improved solution, which will project ques-tions to users according to user intelligence.
- Develop and system, which will change questions difficulty level accord-ing to users reponse.

1.2 Existing System: Web Based Clicker System for Akash Tablet

The main purpose of web based clicker system is to provide a suitable and easy communication between student and instructor. It can be accessed from the main centre or from any remote centre with ease. Earlier, desktop based version of clicker was dependent on specific hardware and software
to run on some specific system. But, AkashClicker provide a web based interface for active learning regardless of type operating system.

1.2.1 Different modules in AkashClicker

- Admin: It provide facilities to admin for adding, editing, fetching and deleting the information. Also control access permissions like student login and instructor login.

- Raise Hand: This is new facility added in AkashClicker, which provide the facility to ask questions or doubt regarding course. The instructor can reply to doubt by checking the list of student, who pressed raised hand button.

- Polling: Used to conduct questionnaire.

- Question Bank: Provide the facility of adding and searching a questions for conducting exams or quizzes.

- Create Quiz: This module provide the facility of creating quiz by fetching questions from Question Bank.

1.2.2 General Constraints or Limitations in AkashClicker

- Works best in latest version of Mozilla Firefox and Google Chrome.

- Lack in vocabulary of scientific symbols.

- Used for real time response.

- Limited to HTTP/HTTPS.

- It requires an Internet browser to fetch Clicker Web Application through url on AakashClicker and at the remote centers.

1.3 Problem Statement

In a large or even small classroom, there are different kind of students. They have different scale of learning depend upon there nature and past experience. So dividing students into category of learning power is difficult task for a instructor. There were lots of up and downs were implemented and optimised for improving learning in effective manner but still best response yet not accquerd. Still students are not able to understand the problems. One solution to the problem is to use Recommendation System, as recommendation system is implemented in varieties of social world sites, there is convergent focus of applying recommendation system in learning through use of clickers in classrooms.
1.4 Scope of the Project

- To provide better learning environment in classroom.
- To provide means to change current clicker system learning environment beyonds only tabulating students responses and displaying results.
- To provide users to give responses according to their intelligence level.
- To provide system to change questions difficulty level according to users response.

1.5 Constraints of the Project

- To adjust the pace of presentation and explanation strategies according to student feedbacks.
- Bandwidth management problem as numbers of user increases.
- Maintaining each student data can create extra load on server.
- What types of question formats will help student in greater extent?

1.6 Assumptions and Dependencies

- The Smartphone or tablet on which the clicker application runs, should support WiFi.
- The user should have a stable internet connection with a minimum bandwidth of 128kbps to view and give responses.

1.7 Proposed System

How can recommendation system can be applied:

- First same kind of question will be given to all students.
- Then students responses and some kind of feedback is collected at instructor side.
- Based on data collected at instructor side, our recommendation system will give easy or tough question.
- Those students, who solved the early problem, we will recommend tough question to them and those students, who were not able to solve the early question will by recommended by easy question.
• Our system is based on Rasch model (is a psychometric model for analyzing categorical data, such as answers to questions on a reading assessment or questionnaire responses, as a function of the trade-off between:
  
  – The respondent’s abilities, attitudes or personality traits
  – The item difficulty. For example, they may be used to estimate a student’s reading ability

• Maintaining two variables Qi and Ui, Qi is question difficulty value for each Qk question and Ui is user intelligence value for each user Ui. the values of this variables will be change according to user responses.
Chapter 2

Papers Reviewed

There are a lot of changes happen in pedagogical construct, such as the timing of feedback, affordances and limitations of traditional CRS, moving from current generation to next generation of CRS. In this chapter we give a brief survey or research related to clickers. Most of the literature survey lights on Pedagogical Theory and Implementation.

Roy P. Pargas (2006) [6] describes a Web based tool: MessageGrid, which is a two-dimensional grid like structure for posting queries. Any one can post or reply to queries. Later they added feature of clicker for conducting quizzes and questionnaire. It also supports ink-based animated software for writing hand written response or queries. Roy P. Pargas et al. (2006) also presented an approach to teach algorithm and data structure course by using a web-based tool called by MessageGrid.

Scott Teel et al. (2012) [8] also presented a web-based student response system using existing user portable devices, a wireless network and a cloud-based backend server and a database. So eliminating additional cost of hardware and installation overhead. It also supports text and image for questions. Instructor use google doc for adding questions and later invoking web-based php script for adding question from google doc to MySql database.


Joana Cruz e Costa et al. (2008) describe a browser based CRS, where
student application was implemented using J2ME and instructor application implemented as dynamic web page.

Monika Andergassen et al. (2013) [1] presented similar approach, a browser-based mobile clicker, which is a platform independent tool operated via any internet-enabled device. It also supports spatially distributed communication. The system was developed over package called XoWiki content flow available in XoWiki framework. The main key of this approach is that, at different state we can present different content to different kinds of users.

Matthias Hauswirth et al.(2009) [2] implemented software clickers in java, that support richer problem types other than only multiple choice. Their system was a Java based Classroom Response System for Teaching Java, in which problem is defined as Syntax, Types, Coding and Control Flow. They represent the Solve and Evaluate Approach in which students who solved their problem can evaluate problems of other students.

Robert Law (2013) presents an ongoing project based on quick response (QR) codes and google forms for generating rapid response polls and quizzes. The process is followed by installing google app on user mobile phone. The key components of this system are QR codes, Google spreadsheet, bar code reader, Google form and Google Scripts. This system have no cost overhead.
Chapter 3

Algorithm for Recommendation System

Qi is difficulty score for question Qk
where

\[ 1 \leq k \leq n \]  \hspace{1cm} (3.1)

n is total number of questions

Ui Every user in the system assigned with a number Ui, this parameter
is user intelligence, more the number, he/she is more capable of solving
problems. Value of this parameter varies between 0 and 1.

Initial Values
A new user or new question is assigned with unbiased 0.5 values. Based on
the questions taken the parameters are expected to go UP or DOWN.

3.1 Algorithm for modifying the Parameters

Pi = Probability that user will answer the question correctly, as a function
of (Ui and Qj)
if( Ui taken Qj )

\[ P_i = \frac{e^{U_i - Q_j}}{1 + e^{U_i - Q_j}} \]  \hspace{1cm} (3.2)

if( correct )

\[ U_i = U_i + (1 - U_i) \times (1 - P_i) \]  \hspace{1cm} (3.3)

\[ Q_j = Q_j - Q_j \times P_i \]  \hspace{1cm} (3.4)

else

\[ U_i = U_i - U_i \times P_i \]  \hspace{1cm} (3.5)
\[ Q_j = Q_j + (1 - Q_j) \ast (1 - P_i) \] (3.6)

### 3.2 Scenarios for User Ui

1. if the users is highly expected to answer correctly (pi is larger, so 1-pi is smaller), then he/she answers correctly. no surprise, add little intelligence to his bucket

\[ Ui + (1-Ui) \ast (1-Pi) \]

2. if the users is not expected to answer correctly (pi is smaller, so 1-pi is larger), then he answers correctly, it is a surprise, add intelligence parameter is tuned much

\[ Ui + (1-Ui) \ast (1-Pi) \]

3. if the users is highly expected to answer correctly (pi is larger, so 1-pi is smaller), then he answers wrongly, it is surprise, penalize intelligence parameter

\[ Ui - (Ui) \ast (Pi) \]

4. if the users is not expected to answer correctly (pi is smaller, so 1-pi is larger), then he answers wrongly, no surprise, penalize little

\[ Ui - (Ui) \ast (Pi) \]

### 3.3 Scenarios for User Qj

1. if the users is highly expected to answer correctly (pi is larger, so 1-pi is smaller), then he/she answers correctly. no surprise, add little intelligence to his bucket

\[ Qj = Qj - Qj*Pi \]

2. if the users is not expected to answer correctly (pi is smaller, so 1-pi is larger), then he answers correctly, it is a surprise, add intelligence parameter is tuned much

\[ Qj = Qj - Qj*Pi \]

3. if the users is highly expected to answer correctly (pi is larger, so 1-pi is smaller), then he answers wrongly, it is surprise, penalize intelligence parameter
\[ Q_j = Q_j + (1-Q_j)*(1-P_i) \]

4. if the users is not expected to answer correctly (pi is smaller, so 1-pi is larger), then he answers wrongly, no surprise, penalize little

\[ Q_j = Q_j + (1-Q_j)*(1-P_i) \]

### 3.4 Tree Representation of Four Cases Discussed for Qj and Ui

According to responses of user Ui(user intelleigence) score will change for that particular user. Same in case of Qj(question difficulty score) will change as responses from user collected. Score of Qj and Ui normalised in equations so that value will not fall outside. Figure 5.1 shows the tree representation of scenerios discussed for QJ and Ui.

\[ 0 < value \leq 1 \] (3.7)

![Figure 3.1: sequence of correctness](image)

Figure 3.1: sequence of correctness

Figure 5.1 gives insight into scenarios explained in section 1.2 and 1.32, where all the four cases represented as tree structure.

### 3.5 Examples User Attempting Questions

Case1: let Ui=0.5, Qj=0.7 and Pi=0.75 then
if(correct)

\[U_i = 0.5 + (1 - 0.5)(1 - 0.75) = 0.625\]  \hspace{1cm} (3.8)

\[Q_j = 0.7 - 0.7 \times 0.75 = 0.175\]  \hspace{1cm} (3.9)

else

\[U_i = 0.5 - 0.5 \times 0.75 = 0.125\]  \hspace{1cm} (3.10)

\[Q_j = 0.7 + (1 - 0.7) \times (1 - 0.75) = 0.775\]  \hspace{1cm} (3.11)

Case 2: let \(U_i=0.5\), \(Q_j=0.7\) and \(P_i=0.25\)

then

if(correct)

\[U_i = 0.5 + (1 - 0.5)(1 - 0.25) = 0.875\]  \hspace{1cm} (3.12)

\[Q_j = 0.7 - 0.7 \times 0.25 = 0.575\]  \hspace{1cm} (3.13)

else

\[U_i = 0.5 - 0.5 \times 0.25 = 0.375\]  \hspace{1cm} (3.14)

\[Q_j = 0.7 + (1 - 0.7) \times (1 - 0.25) = 0.925\]  \hspace{1cm} (3.15)

As we see, all the values are normalised, and scenarios for \(Q_j\) and \(U_i\) are giving exact defined results.
Chapter 4

Programming Tools / Technologies

4.1 PHP and MySQL

PHP is a server-side scripting language.

- What is PHP?
  - PHP stands for PHP: Hypertext Preprocessor
  - PHP is a server-side scripting language, like ASP
  - PHP scripts are executed on the server
  - PHP supports many databases (MySQL, Informix, Oracle, Sybase, Solid, PostgreSQL, Generic ODBC, etc.)
  - PHP is an open source software
  - PHP is free to download and use

- What is a PHP File?
  - PHP files can contain text, HTML tags and scripts
  - files are returned to the browser as plain HTML
  - PHP files have a file extension of ".php", ".php3", or ".phtml"

- What is MySQL?
  - MySQL is a database server
  - MySQL is ideal for both small and large applications
  - MySQL supports standard SQL
  - MySQL compiles on a number of platforms
  - MySQL is free to download and use
• **PHP + MySQL**
  – PHP combined with MySQL are cross-platform (you can develop in Windows and serve on a Unix platform)

• **Why PHP?**
  – PHP runs on different platforms (Windows, Linux, Unix, etc.)
  – PHP is compatible with almost all servers used today (Apache, IIS, etc.)
  – PHP is FREE to download from the official PHP resource
  – PHP is easy to learn and runs efficiently on the server side

### 4.2 Android Software development

Android software development is the process by which new applications are created for the Android operating system. This kind of application usually developed in java programming language using "android development kit" like android SDK.

• **Android SDK**
  – Include set of development tools
  – These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials.
  – Android applications are packaged in .apk format

• **Why Android**
  – Runs on different platforms (Windows, Linux, Unix, etc.)
  – FREE to download from the official android resource
  – It is easy to learn and runs efficiently on the server side
Chapter 5

Methodology

5.1 Process Model: Waterfall model

The waterfall model suggests a systematic, sequential approach to software development that begins at the system level and progresses through analysis, design, coding, testing, and support. Figure 5.1 illustrates the waterfall model for software engineering.

The various activities in different stages of the waterfall model can be explained as follows:

![Waterfall Model](image)

Figure 5.1: waterfall model
5.1.1 System/information engineering and modelling:

In this we establish the purpose of the project and its aim and objectives. We begin establishing requirements for the system by defining the problem statement, analyzing the existing system and its disadvantages and how the proposed system will be more effective and efficient. The feasibility of the proposed system is studied. In general various requirements that affect the system are gathered.

5.1.2 Software Requirements analysis:

The nature of the programs to be built is understood. In this stage we establish the information domain, functionality, behaviour, and performance of the system. Requirements for both the system and the software are documented.

5.1.3 Software and System Design:

In this stage we focus on data structures, software architecture, interface representations and procedural detail. The same is shown with the help of H.I.P.O. chart, procedural design and UI Design.

5.1.4 Implementation and unit testing:

In this stage the code for the system will be developed. The coding will be done in two stages. In the first stage the GeoTracker website will be developed and in the second the mobile GeoTracker application.

5.1.5 Integration and system testing:

Once the code has been generated test runs are conducted to check the functionality of the system. The reported errors will be corrected.
Chapter 6

Requirements Gathering and Planning

6.1 Use Case Diagrams and Descriptions

6.2 Feasibility Study

6.2.1 Hardware Requirements:

6.2.2 For Mobile:

6.2.3 Software Requirements:

6.3 Flow Chart
References


