Smart Exam System using NodeMCU

Bhushan Patel, Dhiraj Gore, Pratiksha Bhadekar, Pooja Tallapallywar, Dr. Vijaykumar Bidave

Department of Information Technology,
Marathwada Mitra Mandal's College Of Engineering, Pune, India

Abstract : ***To determine the time spent on each question by each student in the examination is difficult to obtain, also which question was hard for everyone is difficult to obtain as it requires human interaction. For this work we are proposing a system which is capable of calculating, processing and sending the data to intended user by using internet of things technology. In our system (smart exam system using NodeMCU) student has to touch the sensor and the time to solve particular question will get automatically recorded and will be sent to teacher via e-mail.***

IndexTerms – internet-of-things, sensor

I. INTRODUCTION

Students performance in exams, beside their learning abilities, indicates instructors teaching skills. The dramatically changing world of computing and the rise of the Internet of Things (IoT) is showing a transformative effect on our society , and if that would be well used, it could help massively both, students performance same as instructors.

Studies on test anxiety shows that anxiety is the factor most consistently found to be associated with declines in performance and working under time pressure has been suggested to also have negative consequence, i.e. awareness of time constraints may distract learners from task at hand and so reduce students working memory resources. Therefore, we can infer that, beside all, time factor has an essential effect on student performance, which simultaneously leads to the need of avoiding the negative consequences that may occur.

To make a fair evaluation, considering the average of students, teachers should give a fair needed exam-duration length. That would help teachers assessing in which exact courses students face more difficulties, so that they can help them improve. Even more than just figuring out how much time should be given for an exam. Our smart exam system measures the exact time every single student spends on solving each question, and calculates the average time spent from all the students on the same examination.

In a world of computer systems and mobile devices, it is very important to adopt teaching methods that make the best use of technology, and teachers motivation to use new emerging systems is very important. Hence, the system that we have investigated to use in exams is not something that limits teacher-student interaction as it is often implied, it is actually intended to simply help teachers to get statistics that could take them a big amount of time if not using any kind of technology.

In our project we have used NodeMCU, Mpr121 capacitive touch sensor as a hardware and programmed using Arduino IDE. NodeMCU is cheaper than Arduino Uno and has an in-built WiFi module. Student need to touch the capacitive sensor via inserting conducting device that is, pen. The sensor which we are using is MPR121 which is a capacitive touch sensor. This sensor works when a conducting body like pen, human finger touches the input pins.

When a student touches the input pin which is going to be a question, timer will start that is program will execute and Node MCU will process it. We are using the Arduino IDE for uploading and writing the code in NodeMCU. As the input from sensor goes to Node MCU it executes code which starts the time of a particular question. How much time is spent on a question is calculated by NodeMCU and it is further sent to spreadsheet through pushingbox API. Data can be recorded from the sensor and jot down in spreadsheet using E-mail. For that we require pushingbox account and google account.

The spreadsheet can be assessed by teacher for analysis by email notifications.

II. RELATED WORK

In this paper, a smart exam system is proposed that obtains statistics and sends data to a web application for further processing by using an internet-of-things based technology. The information obtained by the proposed system can even be used to diagnose students with learning difficulties or disabilities, e.g., dyslexia[1]

The hardware used in this paper is Arduino, mpr121 sensor, RFID, ESP8266 WiFi module, conductors. In their system, they have considered a desk that has holes on it at appropriate places and the conductors connected to capacitor sensor(s) are placed in these holes. The exam paper is also customized such that there is a field on the paper aligned with these holes. The paper has small circles on this field with each one corresponds a conductor. The job of the student is only to touch the sensor when he/she starts to solve the question and when done solving the question once again touch the sensor. When the student touches the button with the pen, the capacitor sensor will sense it and send the information to a micro-controller placed underthe desk. The micro-controller has a Wi-Fi module, which can send the capacitor ID and time of touching to a database used by a web-based application.[1]

In this paper, it is proposed that student performance in intermediate examination is associated with students' profile consisted of his attitude towards attendance in classes, time allocation for studies, parents' level of income, mother's age and mother's education. The research is based on student profile developed on the bases of information and data collected through survey from students of a group of private colleges. Student performance depends on different socio-economic, psychological, environmental factors. The findings of research studies focused that student performance is affected by different factors.[2]

III. PROPOSED SYSTEM

The first step in our project is to touch the sensor via inserting conducting device that is, pen. The sensor which we are using is MPR121 which is a capacitive touch sensor. This sensor has 12 output pins which are touch sensitive and 5 input pins which are viz SDA, SCL, GND, VCC. This sensor works when a conducting body like pen, human finger touches the input pins. The communication is done with the help of I2C protocol. In I2C protocol Each I2C bus consists of two signals: SCL and SDA. SCL is the clock signal, and SDA is the data signal. The clock signal is always generated by the current bus master; some slave devices may force the clock low at times to delay the master

sending more data (or to require more time to prepare data before the master attempts to clock it out). This sensor when touched with keys, coins, foil etc generates digital signal which is processed with I2C protocol.

When a student touches the input pin which is going to be a question, timer will start that is program will execute and Node MCU will process it. The NodeMCU is based on the ESP32 microcontroller that boasts Wifi and low power all in single chip. It has 128kb memory and 4mb of storage for programming with 12 GPIO (General Purpose Input Output) pins. It has built in wifi module which handles the bottle neck of connecting externally wifi module to microcontroller. We are using the Arduino IDE for uploading and writing the code in Node MCU. As the input from sensor goes to Node MCU it executes code which starts the time of a particular question.How much time is spent on a question is being calculated by Node MCU and it is further sent to spreadsheet through pushingbox.

Pushingbox is an API where data can be recorded from the sensor and jot down in spreadsheet . Most of the time, data from a sensor in IoT application needs to be recorded. This data logging is important for later statistical analysis now known as data analytics. We have used Node MCU google spreadsheet data logger for our system. For that we require pushingbox account and google account. First create a blank spreadsheet with name smart exam. Then we need to create a google form with input parameters like Student ID, Question No, Time Spent with short answer as the input field. Then press on the preview button and copy the newly generated link from the address bar. Then inspect each field short answer of the form and copy the "Entry.some_random_number" and paste it in notepad. Now link this form with earlier created spreadsheet with any name say "smart exam". Now we need to configure pushingbox account where we need to login with the same google account and then create a service with name "smartexam". After that paste the url which we have copied earlier and paste in url section and let the method be GET and click on submit button. Now go on my scenarios where we have to add a scenario a window will pop-up click on add an action then copy the code which contains entity from the notepad and submit it. This step is carried out depending on the parameters required, in our case we require three. The job of pushingbox api is just to read data from google form and put this data in spreadsheet.

When the student starts to solve the questions he/she touches the sensor, program execution starts timer begins, we have used millis() to start the timer for that particular question data is sent to pushing box service which then sends data to google spreadsheet. Then this spreadsheet is sent to teacher for analysis by email automatically. The spreadsheet consists of 4 columns which are Timestamp, Student ID, Question Number, Time Spent. Data in these columns will get automatically feeded when the student touches the sensor. This spreadsheet data will be sent by mail to respective teacher.

AbbreviationsandAcronyms

I2C	Inter-Integrated Circuit
SCL	Serial Clock Line
SDA	Serial Data Line
GPIO	General Purpose Input Output

IV. SYSTEM ARCHITECTURE

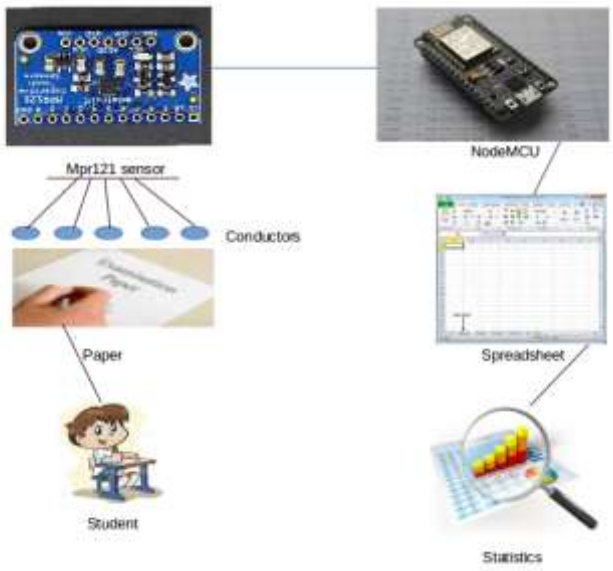

Fig.1 Smart Exam Architecture

V. RESULTS AND DISCUSSION

We conducted an experiment with an exam consisting of 10 questions from different subjects. The experiment involved 1 student and the question type had to be mixed so that we could get more efficient results in terms of time accuracy. We use ten conductors to record the time of a question. Student who is involved in the experiment is asked to touch the respective conductor of a question he solved. After the exam time is over, the time student spent on each question will be recorded to the system in spreadsheet and mailed to respective teacher as shown in figure 2.

The average of solving-time for each question and the average of each student spent solving the whole exam will be calculated by the examiner separately. In a future developed system these data can be recorded real-time while the student is solving the exam, probably using a Digital Pen.

In our experiment we observe that the system works successfully. We received relevant data and computed statistics as shown in Fig. 3 and Fig. 4.

Timestamp	Student Id	Question no	Time
01/06/2018 00:31:28	Student1		
01/06/2018 00:31:28		6	
01/06/2018 00:31:29			0.44
01/06/2018 00:33:28	Student1		
01/06/2018 00:33:28		7	
01/06/2018 00:33:28			0.59
01/06/2018 00:34:04	Student1		
01/06/2018 00:34:05		8	
01/06/2018 00:34:05			0.51
01/06/2018 00:34:51	Student1		
01/06/2018 00:34:52		9	
01/06/2018 00:34:52			0.57

Fig.2 Data in spreadsheet

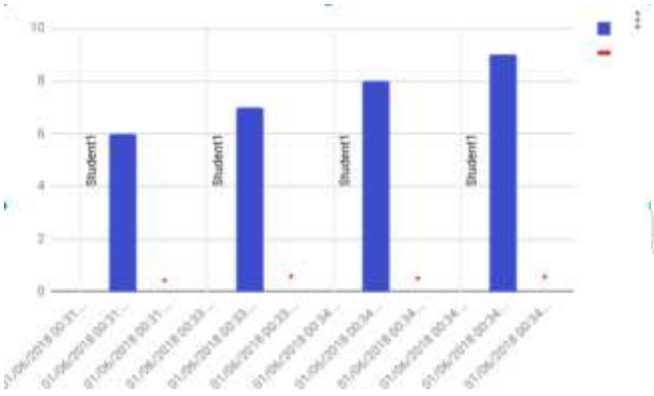

Fig.3 Statistical analysis using bar-graph

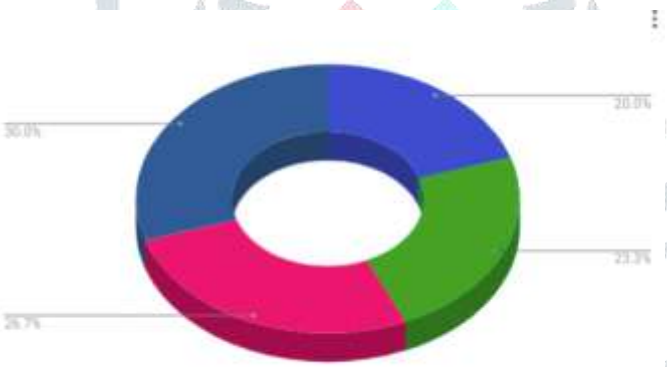

Fig.4 Statistical analysis using pie-chart

VI. CONCLUSION

The system helps to assess right examination time by obtaining statistics about how much time is spent on each question for each student during the exam may be very beneficial for teachers. It is designed to be easily used by the students and notified to teachers by e-mail. Since the statistics will be done by the system, the teacher understands, and if needed, apply changes to next exams.

REFERENCES

[1] Azra Xheladini and Sertan Deniz Saygili Computer Eng. Dept., Sakarya Uni. Sakarya, Turkey "An IoT-Based Smart Exam Application" 2017.
[2] Tahir, Syed, and S. R. Naqvi. "Factors Affecting Students' Performance." Bangladesh e-journal of sociology 3.1 (2006).
[3] Kortuem, Gerd, et al. "Educating the Internet-of-Things generation." Computer 46.2 (2013): 53-61.
[4] Cassady, Jerrell C., and Ronald E. Johnson. "Cognitive test anxiety and academic performance." Contemporary Educational Psychology 27.2 (2002): 270-295.
[5] Saha, Himadri Nath, et al. "Recent trends in implementation of Internet of Things—A review." Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2016 IEEE 7th Annual. IEEE, 2016.
[6] Schreiner, Keri. "Uniting the paper and digital worlds." IEEE Computer Graphics and Applications 28.6 (2008).
[7] Schulz, Renée, Ghislain Maurice Isabwe, and Frank Reichert. "Investigating teachers motivation to use ICT tools in higher education." Internet Technologies and Applications (ITA), 2015. IEEE, 2015.
[8] C. Ricketts, S. J. Wilks, (2002), "Improving Student Performance Through Computer-based Assessment: insights from recent research"
[9] Russell, M., Haney, W. (January 1997) Testing Writing on Computers: An Experiment Comparing Student Performance on Tests Conducted via Computer and via Paper-and-Pencil Volume 5 Number 3, ISSN 1068-2341.