



Development of a Notification System for Sending Assignment using Internet of Things Technology

Nattapong Songneam

Abstract: The problem with submitting assignments to teachers is students submit the assignments to teacher, there are a lot of assignments submission per day to teacher, but sometime students cannot hand in their assignment to teacher because teacher teach other section, so teacher cannot acknowledge student submission. According to the problem, researcher has been working on this research. The purposes of the research were to: 1) design the notification system for sending the assignment using Internet of Things technology, 2) develop devices for submitting the assignment and notifying submission information via LINE application using Internet of Things technology, and 3) evaluate user satisfaction in using the notification system for sending the assignment using Internet of Things technology. The population is students and teachers in Phranakhon Rajabhat University. The sample group consisted of 50 people using the purposive sampling. The research instruments were: 1) the notification system for sending the assignment using Internet of Things technology, and 2) the assessment form for user satisfaction in using the notification system for sending the assignment using Internet of Things technology. The results of the research showed that the system functions are working properly. The evaluation consisted of four parts: 1) the system designing had good level ($\bar{x} = 4.12$) and the standard deviation was 0.48, 2) the system usability had very good level ($\bar{x} = 4.52$) and the standard deviation was 0.22, 3) the system benefit had very good level ($\bar{x} = 4.68$) and the standard deviation was 0.38, and 4) the system overview had good level ($\bar{x} = 4.38$) and the standard deviation was 0.56. The results of four parts from the evaluation showed that the system was effective.

Keywords: Notification Send Working System using Internet of Things, Internet of Things, Application

I. INTRODUCTION

Phranakhon Rajabhat University is one of the oldest educational institutions in Thailand. There is a large number of students. The number of teachers in Phranakhon Rajabhat University was less than students. One teacher teaches more than one course. As a result, teachers in the university have to think and assign many tasks to students in order to be in line with the subjects taught. When assignments are assigned, student work pieces must be submitted. It will take several

days to submit all the work to the teacher. Nowadays, many pieces of work are delivered on the teacher's desk. Sometime students not meet the teacher when they submit the assignment, so the teacher did not receive the student's assignment. It may have an impact on the academic performance of the students. [3]

Nowadays, there is the Internet of Things technology. It is the technology that relates to device or various electrical systems in daily life to be connected and developed to be able to control via the Internet [2] for user convenience. There is a constant development of Internet of Things technology. Each type of technology is suitable for different purposes such as the climate, landscapes and everyday life. For example, smart home is a technology that brings an Internet connection to the home devices [9] to control devices such as controlling a light bulb that can be turned on and off, setting the Brightness level can be made via the phone, Checking the cost of electricity consumed from electrical appliances by looking through the application, [11] a security system that can be checked at any time, etc. It can also be used with navigation to various locations such as shopping mall navigation system, temple navigation system, educational institution navigation [12] system, and the navigation system to the parking [8]. The Internet of Things technology is the technology that can be used to the user facilitate as well. [10]

According to the problem, the researcher has developed a notification system for sending the assignment using the Internet of Things technology to be applied to solve the problem of student submission. The researcher applied the Internet of Things technology to solve the problem by developing a smart box which students put their work inside for submission. The research devices are Arduino UNO R3 Board, Node MCU ESP8266 Board, Tower Pro SG NineG Mini Servo Motor Kit, Keypad, and Fingerprint Scanner Sensor JM-101B/AS608. There are used to develop a notification system via the LINE application (LINE notification). Teacher can know the results of student submissions through the LINE application. The system increases convenience for students and teachers in Phranakhon Rajabhat University.

II. METHODOLOGY

A. Population and sample

1. The population is students and teachers of the Faculty of Science and Technology from Phranakhon Rajabhat University.

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2. The sample is students and teachers of the Faculty of Science and Technology from Phranakhon Rajabhat University. The sample group consisted of 50 people, divided into 40 students and 10 professors, using the purposive sampling.

B. Statistics

The statistics used in the research were Mean and Standard Deviation. The criteria used for comparison were divided into 5 levels as follows:

- Average 4.50 – 5.00 = Very good level
- Average 3.50 – 4.49 = Good level
- Average 2.50 – 3.49 = Moderate level
- Average 1.50 – 2.49 = Low level
- Average 1.00 – 1.49 = Very low level

C. Language and Device for model development

1. C language for writing to control Arduino UNO R3 Board and Node MCU ESP8266 Board.
2. The devices consisted of:
 - 1) Node MCU ESP8266 Board,
 - 2) Arduino UNO R3 Board,
 - 3) Bread Board,
 - 4) Tower Pro SG90 Mini Servo Motor Kit,
 - 5) Fingerprint Scanner Sensor JM-101B/AS608,
 - 6) 1602 LCD I2C Interface, and
 - 7) Matrix Keypad 3x4

D. Material

Internet of Things (IoT) technology is devices or things are connected to everything in the Internet world. It can control the various devices through the Internet network. In this research, the equipment of Internet of Things technology has been used as follows:

1. Node MCU ESP8266 Board

Node MCU ESP8266 is a Node MCU board that consists of ESP8266 which is a WIFI-capable microcontroller. Node MCU operates at voltage 3.0-3.6V. Overall in terms of functionality is similar to Arduino board, but with the difference that Node MCU can connect to WIFI. [1]

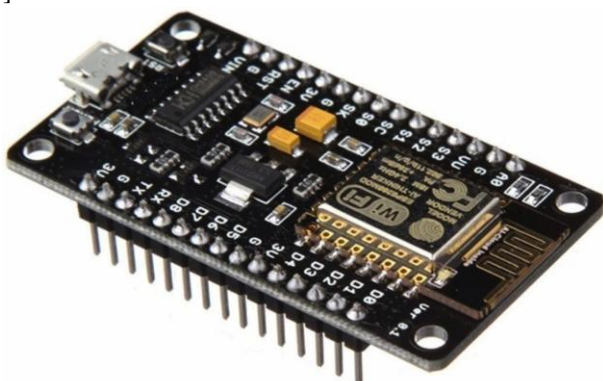


Fig. 1. Node MCU ESP8266 Board

2. Arduino UNO R3 Board

The main equipment used in the system development with the IoT is power supply. It sends data to the device. The circuit to be able to work must have a power supply. The basic power supply consisted of:

GND stands for GROUND, which is the low point

center. There is a reference voltage of 0 V. A device within a circuit that has a complete current flowing to the ground is called a complete circuit.

VIN is an external power supply connector that is supplied to the board. In the case of Node MCU, the USB adapter is plugged into the power supply circuit, so VIN is the voltage from USB 5V.

VCC or VDD is the voltage that is adjusted to suit that circuit. In the case of the Node MCU, use a USB adapter to supply 5V power. Then in the circuit the voltage is reduced to 3.3 v. [6]



Fig. 2. Arduino UNO R3 Board

3. Tower Pro SG90 Mini Servo Motor Kit

Tower Pro SG90 Mini Servo Motor Kit is control devices that consist of electrical control and mechanical. It works with a 360-degree circular rotation, which is suitable for use to determine the direction, speed or rotational force.



Fig. 3. Tower Pro SG90 Mini Servo Motor Kit

4. Fingerprint Scanner Sensor JM-101B/AS608

Fingerprint Scanner is a device used for fingerprint recognition. There is a sensor that is used to detect fingerprints to scan fingerprints. The scanned fingerprint data can be saved in the database for historical purposes.



Fig. 4. Arduino JM One Zero One B AS Six Zero Eight Fingerprint Scanner Sensor

5. 1602 LCD I2C Interface

1602 LCD I2C Interface is a screen display device. LCD stands for Liquid Crystal Display. This type of screen is made up of liquid crystals. It has a light on the back called Backlight. When power is supplied to the crystal will cause the crystal to emit light.



Fig. 5. 1602 LCD I2C Interface

6. Matrix Keypad 3x4

Matrix Keypad 3x4 is a keying device that can input data similar to keyboard. The Matrix Keypad 3x4 is a numeric key type 0 – 9, * and #.



Fig. 6. Matrix Keypad 3x4

E. System Analysis and Design

Development of a notification system for sending the assignment using the Internet of Things technology is applied the Object-Oriented principles to analyze and develop the system. The analysis is divided into 5 diagrams: 1) Use case Diagram, 2) Class Diagram, 3) Activity Diagram, 4) Sequence Diagram and 5) State Diagram. The details of the system design are explained as follows:

1. Use case diagram in the system consist of 3 actors namely general user, member, and admin. General user registers the system and the system records fingerprint,

student ID, and student information, after that general user becomes member. When using the system, member will scan their fingerprint and send the work in the smart box. Admin checks the student information who submitted work via LINE application. Use case diagrams for the notification system for sending the assignment using Internet of Things technology are shown in Fig. 7.

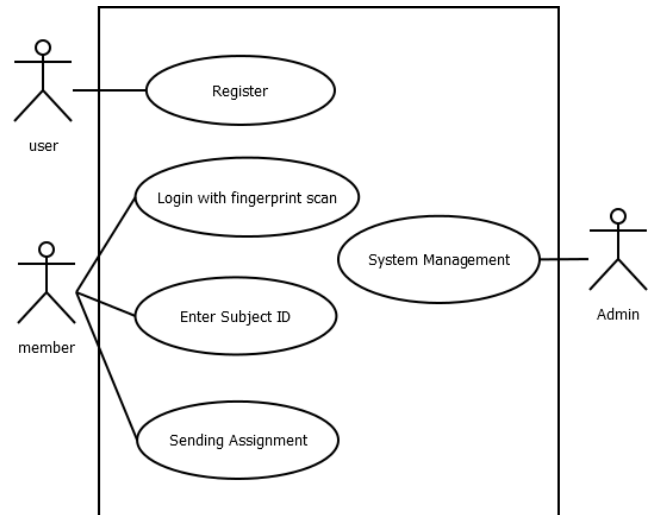


Fig. 7. Notification system for sending the assignment use case diagram

2. State diagram in the system consisted of 5 states and had the following step: First state is login state, user scan fingerprint on the fingerprint scanner. The system checks the fingerprint. If there is not the fingerprint in the system, user must register through the system. If there is a fingerprint in the system, the system goes to the second state. Second state, user input the subject id and the system goes to the third state. Third state, Servo motor opens the assignment submission box for user sending the assignment. Fourth state, the system sends the assignment data to fifth state. Fifth state, the system sends the notification to teacher via LINE application and displays assignment data to user via LCD screen. State diagrams of notification system for sending the assignment is shown as fig. 8.

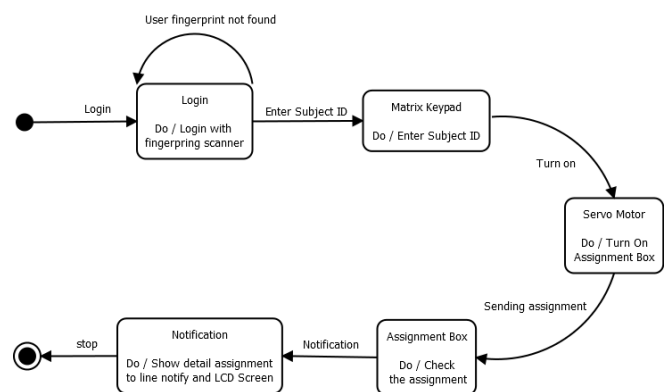


Fig. 8. Notification system for sending the assignment state diagram

3. Activity Diagram in the system is shown the activity of Notification system for sending the assignment. It starts with user scans fingerprint on the fingerprint scanner. If the fingerprint has not been registered, user must register it through the system. If the scan is successful, user input the subject id and then send the assignment through the assignment submission box. After that, the system displays the assignment data via LCD screen on the assignment submission box and sends the assignment data to teacher via LINE notification. Activity Diagram of notification system for sending the assignment is shown as Fig. 9.

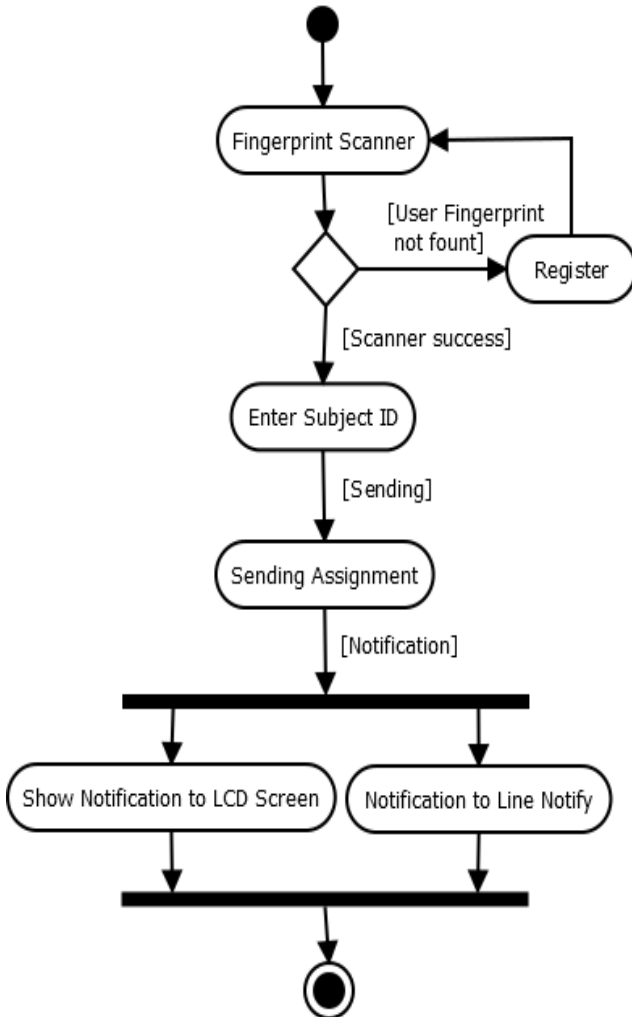


Fig. 9. Notification system for sending the assignment activity diagram

4. Class diagram in the system consists of 4 classes, namely 1) member class which serves to store member information, 2) student class, 3) teacher class, and 4) notification class which serves to store the assignment submission data. Class diagrams for the notification system for sending the assignment using Internet of Things technology are shown in Fig. 10.

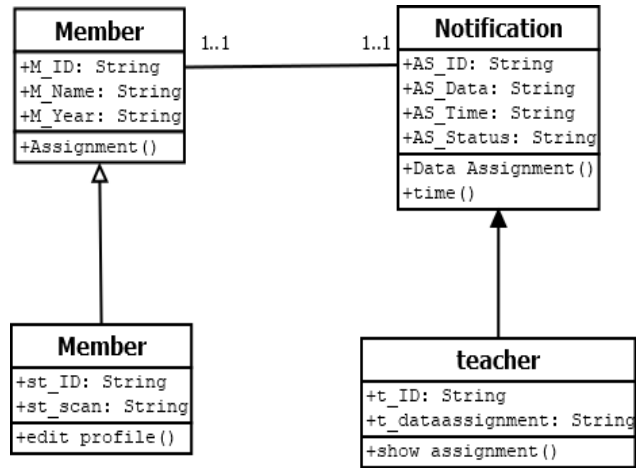


Fig. 10. Notification system for sending the assignment class diagram

5. Sequence diagram in the system consisted of 3 tasks: 1) user logs in by fingerprint scanning, 2) user input the subject id, then the box will open for user send the assignment, and 3) the system displays the assignment data to student via LCD screen and sends the assignment data to teacher via LINE notification. Sequence Diagram of notification system for sending the assignment is shown as Fig 11.

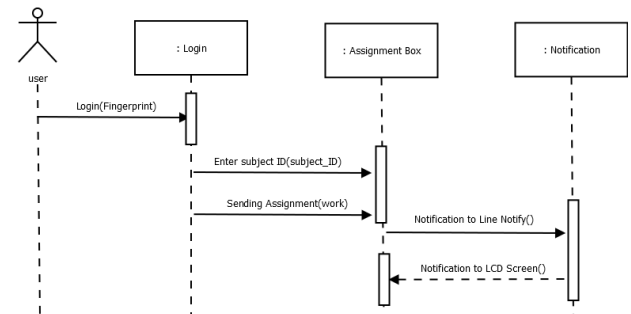


Fig. 11. Notification system for sending the assignment sequence diagram

6. The system structure of the notification system for sending the assignment using Internet of Things technology is illustrated in Fig. 12.

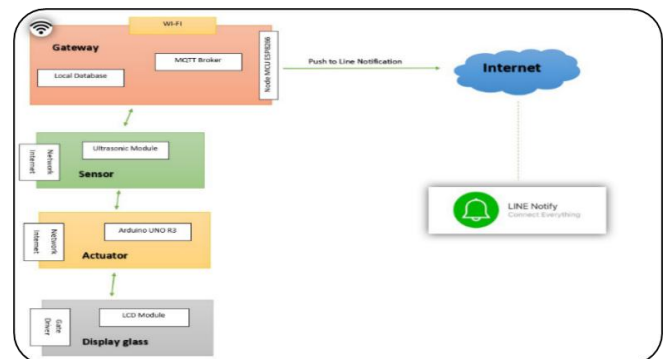


Fig. 12. Notification system for sending the assignment structure

From Fig. 12, member user sends the assignment via the notification system for sending the assignment using Internet of Things technology. Admin is responsible for managing the system. The system checks and displays user information via LCD. Then, the system sends data to the board to control the Servo motor to open the smart box for user sending the assignment and sends notification to LINE application.

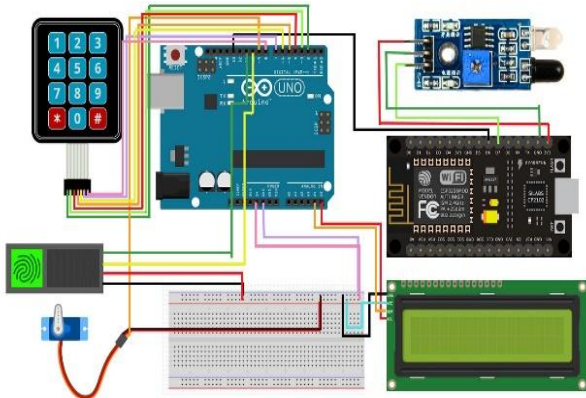


Fig. 13. Circuit Diagram

III. RESULTS

A. Context of user sending the assignment and the equipment

According to the study, almost all students send their work in A4 paper form. The smart box for sending the assignment is made in the right size. It is set the device for recording the fingerprint and student information and it is set LCD screen to display. If the information is correct, the Servo motor opens the smart box for student sending the assignment.



Fig. 14. The device for sending the assignment

B. Application screen design

The notification system for sending the assignment using Internet of Things technology is an application for monitoring student submission. It sends the student submission information such as student ID, student name, and the assignment name to notify teacher through LINE application.



Fig. 15. Notification of the assignment submission via LINE application

C. User satisfaction evaluation

The evaluation of the notification system for sending the assignment using Internet of Things technology from the sample group were 50 people consisted of students and professors in Phranakhon Rajabhat University were compared the criteria is shown in Table 1.

Table-1: User satisfaction evaluation

No.	Topic	System Performance Evaluation Results		
		\bar{x}	S.D.	Remark
1	System Design	4.12	0.48	Good
2	System usability	4.52	0.22	Very Good
3	System benefit	4.68	0.38	Very Good
4	System overview	4.38	0.56	Good
Total		4.43	0.41	Good

According to table 1, the evaluation consisted of four parts: 1) the system designing had good level ($\bar{x}=4.12$) and the standard deviation was 0.48, 2) the system usability had very good level ($\bar{x}=4.52$) and the standard deviation was 0.22, 3) the system benefit had very good level ($\bar{x}=4.68$) and the standard deviation was 0.38, and 4) the system overview had good level ($\bar{x}=4.38$) and the standard deviation was 0.56. The total of four parts from the evaluation had good level ($\bar{x}=4.43$) and the standard deviation was 0.41.

IV. CONCLUSION AND DISCUSSION

According to study of context of students sending the assignment and teachers collecting the assignment, almost all the students send the assignment on the teacher’s desk without certain time of submission. Based on student submission behavior, researcher studied and created a model of the smart box for sending the assignment. There are set the Arduino UNO R3 Board and Node MCU ESP8266 Board to supply the electrical power to Tower Pro SG NineG Mini Servo Motor to open the smart box.



Fingerprint Scanner Sensor, Arduino JM One Zero One B AS Six Zero Eight, records student ID information. Fingerprint Reader Sensor sends notification via the LINE application. The devices are powered by a power bank which is consistent with the research of T, Malayawet and author [5] that has been researched on home security alarm system via Android application by detecting the cause of the danger that will occur in the home with electronic circuits and microcontrollers. When an accident occurs, it sends the notification to user's mobile application.

The notification system for sending the assignment using Internet of Things technology is an application for monitoring student submission which is used by teacher of Phranakhon Rajabhat University. Teacher can be informed of student submissions by notification via LINE application. The system will send the student information and submission time. This is consistent with the research of T, Malayawet and author [4] that has been research on home security alarm system via Android application by detecting the cause of the danger that will occur in the home with electronic circuits and microcontrollers. When an accident occurs, it sends the notification to user's mobile application.

The evaluation of the notification system for sending the assignment using Internet of Things technology from the sample group were 50 people consisted of 40 students and 10 professors using the purposive sampling. The evaluation consisted of four parts: 1) the system designing had good level ($\bar{x} = 4.12$) and the standard deviation was 0.48, 2) the system usability had very good level ($\bar{x} = 4.52$) and the standard deviation was 0.22, 3) the system benefit had very good level ($\bar{x} = 4.68$) and the standard deviation was 0.38, and 4) the system overview had good level ($\bar{x} = 4.38$) and the standard deviation was 0.56. The total of four parts from the evaluation had good level ($\bar{x} = 4.43$) and the standard deviation was 0.41 showed that the system functions are working properly. This is consistent with the research of T, Malayawet and author [7] that has been research on home security alarm system via Android application which is all system functions can work efficiently.

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Nattapong Songneam, received his Philosophy of Doctor in Information Technology (2002) from Rangsit University, M.Sc. in Computer Science from Rangsit University, and B.Sc. in Computer Science from Rajabhat Songkhla, Thailand. Now he is an Instructor at the Department of Computer Engineering, Faculty of Engineering, Mahidol, Thailand. His interests are in internet of things, artificial intelligence, pattern recognition, image retrieval, speech recognition, fuzzy system, and swarm intelligence.