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The 21st International Computer Science and Engineering Conference 2017

November 15-18, 2017

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PROCEEDING

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ICSEC 2017

The 21st International Computer Science and Engineering Conference 2017

November 15-18, 2017 Bangkok, Thailand

The 2017 International Computer Science and Engineering Conference (ICSEC 2017) is the premier international conference which is successively scheduled for over twenty years. This year ICSEC 2017 is hosted by Department of Computer Engineering, Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Thailand. The conference aims to be an international forum for presentation of technological advances and research results in the field of Computer Science and Engineering, including various applied sciences of related fields. Four days of the conference contain the interesting talks from famous keynote speakers, high-quality research presentations, and advanced workshop from the international research communities. Accepted papers will be published in the Proceedings of ICSEC2017 and will be submitted for inclusion into IEEE Xplore (IEEE Catalog Number: CFP17IBE-ART (IEEE Xplore compliant) ISBN: 978-1-5386-0787-9). The IEEE provides SCOPUS with all of the IEEE Xplore digital library content so that the bibliographic information (what is seen on an abstract page in IEEE Xplore, including the abstract) can be made visible. Acceptance will be based on quality, relevance, and originality.

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- Internet of Things and Embedded Systems
- IT Architecture and Security
- IT Project and IT Service Management
- Machine Learning and Intelligent Systems

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Final Programme

Wednesday 15 November 2017

Time	Event at KMITL
13.00-16.00	Workshop on Internet Architecture

Thursday 16 November 2017

Time	Event at KMITL
9.00-16.00	Workshop on Internet Architecture
Time	**Event at Swissotel Le Concorde Hotel**
16.00-18.30	Registration at Foyer 3rd Floor
18.30-22.00	Welcome Reception at Poolside, 5th Floor, Swissotel Le Concorde

Friday 17 November 2017

Time	Event at Swissotel Le Concorde Hotel					
8.00-9.00	Registration at Foyer 3rd Floor					
9.00-9.15	Opening Ceremony at **Le Lotus I, 2nd Floor**					
9.15-9.20	Group Photo					
9.20-10.00	Keynote Speaker 1 : Prof.Dr. Tatsuji Munaka					
10.00-10.40	Keynote Speaker 2 : Prof.Dr. Prabhas Chongstitvatana					
10.40-11.00	**Break at Foyer, 3rd Floor**					
	Session 1	**Session 2**	**Session 3**	**Session 4**	**Session 5**	**Session 6**
	Room : Ubonchard	Room : Satabud	Room : Boontarik	Room : Patumchard	Room : Bussabong	Room : Nilubon
Session Title	*Software Engineering & Software Development*	*Internet of Things & Embedded Systems*	*Human Computer Interaction & Virtual Reality*	*IT Architecture & Security Parallel and Mobile Comp.*	*Clound Computing Ontology & Semantic Web*	*Machine Learning & Intelligent Systems*
Session Chairs	***Asst.Prof. Dr. Chutimet Srinilta***	**Mr. Sorayut Glomglome**	**Asst.Prof.Dr. Somsak Wailairacht**	**Asst.Prof.Dr. Surin Kittitornkun**	**Dr. Akkarit Sangpetch**	**Assoc.Prof.Dr. Boontee Kruetrachue**
11.00-11.20	*PID 64*	*PID 9*	*PID 29*	*PID 11*	*PID 10*	*PID 6*
11.20-11.40	*PID 104*	*PID 37*	*PID 30*	*PID 12*	*PID 43*	*PID 17*
11.40-12.00	*PID 110*	*PID 45*	*PID 50*	*PID 128*	*PID 89*	*PID 24*
12.00-12.20		*PID 113*				*PID 93*
12.20-13.20	**Lunch at 4th Avenue, 4th Floor**					
	Session 7	**Session 8**	**Session 9**	**Session 10**	**Session 11**	**Session 12**
	Room : Ubonchard	Room : Satabud	Room : Boontarik	Room : Patumchard	Room : Bussabong	Room : Nilubon
Session Title	*Image Processing & Computer Vision*	*Internet of Things & Embedded Systems*	*Human Computer Interaction & Virtual Reality*	*Computer Network & Communication*	*Machine Learning & Intelligent Systems*	*Machine Learning & Intelligent Systems*
Session Chairs	**Assoc.Prof.Dr. Orachat Chitsobhuk**	**Assoc.Prof.Dr. Somsak Mitatha**	***Dr. Chompoonuch Jinjakam***	**Asst.Prof.Dr. Sakchai Thipchaksurat**	**Assoc.Prof.Dr. Boontee Kruetrachue**	**Assoc.Prof.Dr. Kietikul Jearanaitanakij**
13.20-13.40	*PID 16*	*PID 114*	*PID 58*	*PID 18*	*PID 32*	*PID 46*
13.40-14.00	*PID 33*	*PID 124*	*PID 88*	*PID 31*	*PID 68*	*PID 48*
14.00-14.20	*PID 40*	*PID 129*	*PID 90*	*PID 69*	*PID 80*	*PID 54*
14.20-14.40	*PID 52*	*PID 130*	*PID 115-TH*	*PID 71*	*PID 84*	*PID 60*
14.40-15.00	*PID 38*	*PID 138*		*PID 75*	*PID 94*	*PID 67*
15.00-15.20	**Break at Foyer, 3rd Floor**					
	Session 13	**Session 14**	**Session 15**	**Session 16**	**Session 17**	**Session 18**
	Room : Ubonchard	Room : Satabud	Room : Boontarik	Room : Patumchard	Room : Bussabong	Room : Nilubon
Session Title	*Image Processing & Computer Vision*	*Software Engineering & Software Development*	*Database & Information Retrieval & Music Enginering*	*Computer Network & Communication*	*Special Session*	*Machine Learning & Intelligent Systems*
Session Chairs	**Asst.Prof.Dr. Somsak Wailairacht**	**Dr. Rathachai Chawuthai**	***Asst.Prof.Dr. Pitak Thumwarin***	**Asst.Prof. Akkradach Watcharapupong**	**Dr. Sathaporn Promwong**	**Assoc.Prof.Dr. Kietikul Jearanaitanakij**
15.20-15.40	*PID 59*	*PID 35-TH*	*PID 15*	*PID 82*	*PID 14*	*PID 97*
15.40-16.00	*PID 66*	*PID 79-TH*	*PID 36*	*PID 116*	*PID 131*	*PID 100*
16.00-16.20	*PID 72*	*PID 91-TH*	*PID 61*	*PID 120*	*PID 132*	*PID 105*
16.20-16.40	*PID 85*	*PID 76-TH*	*PID 41*	*PID 39-TH*	*PID 133*	*PID 108*
16.40-17.00	*PID 99*	*PID 109-TH*	*PID 106*	*PID 65-TH*	*PID 134*	*PID 118*
17.00-17.20		*PID 27-TH*		*PID 83-TH*	*PID 135*	*PID 122*
18.00-22.00	**Banquet at Salon A, 2nd Floor**					

Saturday 18 November 2017

Time	Event at Bangkok International Trade and Exhibition Centre (BITEC)
10.00-15.00	Technical Site Visiting - Engineering Expo 2017

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Cloud Computing

Internet of Things and Embedded Systems

Human Computer Interaction and Virtual Reality

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Application of microcontroller with cellular network to monitor the temperature inside the Telecommunication exchange building

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***Abstract*—The purpose of this research is to monitor the temperature in the Telecommunication exchange building so as the send a warning message to a cell phone. The research is to measure the temperature in the Telecommunication exchange buildings. That are not mended by anyone and located far from telephone junction head quarter. This research is divided into 3 parts. Firstly, measuring the temperature inside the Telecommunication exchange building and displaying its result on a LED panel. Secondly, processing the temperature measured and analyzing with the Arduino Board. Thirdly, sending of warning messages is done in the following 3 scenarios. When the temperature is lower than 18 Celsius, the system will send a message saying "Temperature over cool". When the temperature is over 30 Celsius, the system will send a message saying "Temperature over level 1". When the temperature is over 35 Celsius, the system will send a message saying "Temperature over level 2" every 30 minutes. The message will be sent using the frequency of 900 MHz to the cell phone of the official overseeing the Telecommunication exchange buildings, so that he can rectify the problem in time before the temperature exceeds the specification on the devices. From the field testing of this system in 5 Telecommunication exchange buildings, the accuracy of the warning message is about 94 percentage.**

Keywords—exchange; warning message; arduino

I. INTRODUCTION

Nowadays, several countries have established new economy models to create wealth in the 21 century. The United State of America launched its new policy "A Nation of Makers", England is enforcing "Design of Innovation", The Republic of China also proclaimed a policy "Made in China 2015", India has established "Made in India", and South Korea has created an economic model "Creative Economy". The Prime Minister of Thailand who hopes to help the people have higher income, has changed the economy model into Value–Based Economy or Innovative Economy following the policy "Thailand 4.0" [4]. This can be achieved with science, creativity, innovation, technology, research and development which will give a comparative advantage in the 5 technology group and the targeted industries. One of the target groups is Digital, IoT, Artificial Intelligence & Embedded Technology. As a result, the development of remote controlling by adapting the equipment to be operated without personnel (IoT: Internet of Think) for use in different organizations has become a necessity in today's world. This will help to reduce the cost for human resource by relying on automation more which will give the organization a higher profile. For Thailand, this could also reduce the middle income trap.

Communicating system in today's world has become essential for living. To help people and organizations or even businesses to communicate well all the time, the system must be stable. Electronics play an important role in communicating systems. To make it works properly all the time, temperature is the key. They must work in proper temperature and environment. The Ambient Operating Condition for Switch Cisco [2] to work properly is in the temperature range of between -5 ºC to 45 ºC. Switch Cisco is an important part of the communicating system in Telephone Organization of Thailand. The network pattern of telephone organization is separated into the main exchange and sub exchanges. The main telephone exchange in Lopburi must be connected to sub telephone exchanges in Khokkratiam, Khokesamrong, Thaklong, and Thawung etc. All sub telephone exchanges in Lopburi were installed in a metal boxes or a container (2.4x6x2.59 m.). To make sure that the communicating devices could work properly and continuously, air conditioners were installed inside. The picture below shows the network between the main and the sub telephone exchanges in Lopburi.

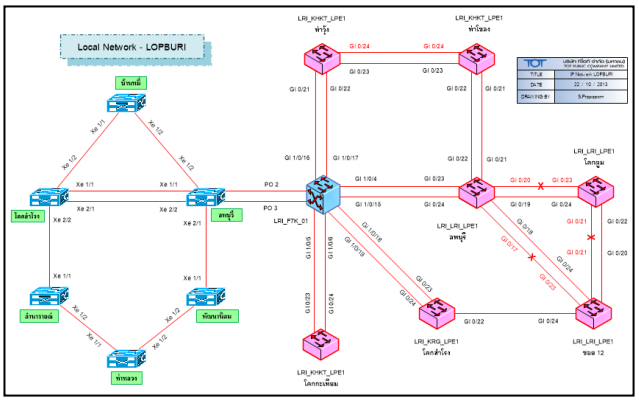


Fig.1 Network between the main and the sub exchanges in Lopburi

Ref: TOT Corporation

As can be observed in the picture, there are no officers in the sub telephone exchanges. Officers in the main telephone exchanges in Lopburi monitor them instead to ensure that they could work without any problems. Most problems in sub telephone exchanges are that the devices could not endure high temperatures as a result of damaged air conditioners. This results in the damage of expensive equipment because of the inability to shut off the equipment in time. As a result, it would take a long time to repair the damaged equipment causing people to become dissatisfied with the low service quality and doubt the reliability of the organization. This in turn results in lower income for the organization. In the event that the air conditioners break down completely or malfunction resulting in a short circuit in the air conditioners which may cause a fire outbreak in the sub exchanges, the resulting damage will be unimaginable.

From the research of electronically controlled water distributing in agriculture research [3], the solenoid valves could be set to turn on by setting it at 50% of humidity and turn off by setting it at 80%. The result showed that they could control humidity quite well. By comparing the growth of long beans grown traditionally and electronically. Electronical water control could control water distribution and humidity in soil properly. It made long beans grow better. The research also showed that it was better to grow plant with the help of electronics.

From the research about automatic watering system through wireless sensor network [4], the system could work through obstacles in the range of 20-120 meters. In the range of 140-200 meters, the system could not work properly. The soil moisture measurement could work at 10 to 80 humidity levels. At the 90 level, the sensor could not work well. However, in the absences of any obstacles, the sensors could work properly.

From the research about Internet of Things: watering coriander with alert from LINE application [5] which involves 2 steps. The first step is to set the system to water 3 times a day under normal working conditions. The next step is to set it to send a message to agriculturists via LINE when it detects 90% of relative humidity which meant it is raining. The system has a program to activate the watering process 30 minutes after the rain for another 20 minutes to wash away raindrops on coriander leaves. The result from the data collected showed that it could work accurately 96.66% of the time.

From the introduction mentioned above, the idea to study about the temperature of Switch Cisco and communicating devices in communicating system using data sheet was born. The devices could operate normally at temperatures between -5 ºC to 45 ºC. The height should not be more than 5,000 feet (1500 M.). HUMIDITY WAS BETWEEN 10% to 95%. In this research, Digital relative humidity & temperature sensor was used to input unit to the main processor with an Arduino board with a control program to monitor temperature and humidity according to the specified temperature range. The part of the system responsible for displaying the results will inform the person in charge of the telephone sub exchanges by means of sending messages to the person's cell phone informing the person of the status of the various sub exchanges so that the person in charge can know whether the various sub exchanges are operating properly or not by being updated with the environmental temperature and humidity of the container where the telecommunication equipment are installed. When any sub telephone exchanges is detected to have a higher temperature than those specified, the person in charge can take timely corrective measures to prevent any losses or damages and to uphold the reliability of Telephone Organization Thailand in Lopburi. This research is aimed to develop temperature and humidity monitoring system in the sub telephone exchanges in Lopburi.

II. PROCESS AND PROCEDURE

The Research alerts temperature Switching Center through mobile phone text messages. And this Research have components hardware, software and process operations. The design and selection of equipment for the Research.

A. Components of the Research

For this research, designed to separate the three parts that is designed structural component parts. Control Circuit Design and programming control. The details of the program based on next topic.

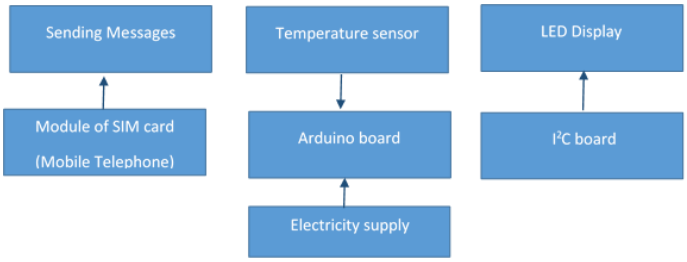


Fig. 2 Block diagram of component system

Figure 2 shows the block diagram components of all research. This research will see the Arduino board. The equipment used to process the project. And are connected with the devices working in different parts of the project.

- Arduino board

  The Arduino board is the main processing equipment working with both transmitter and receiver. The Arduino board uses 3.3 volts to 5 volts for input and output. The Arduino board is well known and developed using the "C" language.

- Temperature sensor module

  The module is connected to the Arduino board through a 4.7 KΩ resistor. It is connected as a Pull up resistor in order to stabilize the voltage. One pin of the 4.7 KΩ resistor is connected to a 5 V_{DC} power supply which is connected to the 5 VCC pin on the Arduino board. The other pin of the 4.7 KΩ resistor is connected to the pin 2 of the Arduino board which is the data pin of the board.

- Sending messages

  In this research, there are actual messages send to the official in charge of the telecommunication building through a cellular phone network. This is done through writing the function “Send SMS” using C language in the Arduino board.

- Power supply

  In this research, the power supply chosen is the 12 volt Switching Power Supply. The power supply is reduced to a 5 volt power supply through a Regulator Circuit on the Arduino board.

- LED Display
  The LED display shows the result of the Arduino board. It is connected to the Arduino board through an I^2C board which sends an output signal to the LED display. The I^2C board uses 2 control bus namely the SBA bus and SCL bus. The 2 bus control the brightness and contrast of the LED display.

B. Algorithms of the system

Step 1: Start program

Step 2: Temperature reading

Step 3: Temperature and humidity display

Step 4: Checking for temperature < 18^{o}C

Step 4.1: If true, send SMS “Temperature over cool” and repeat Step 2 and resend SMS at 30 minute intervals.

Step 4.2: If false, go to Step 5

Step 5: Checking for temperature > 30 ^{o}C but not exceeding 35^{o}C

Step 5.1: If true, send SMS “Temperature over level1” and repeat Step 2 and resend SMS at 30 minute intervals.

Step 5.2: If false, go to Step 6

Step 6: Checking for temperature > 35^{o}C

Step 6.1: If true, send SMS “Temperature over level2” and repeat Step 2 and resend SMS at 30 minute intervals.

Step 6.2: If false, go to Step 2

III. RESULT OF THE EXPERIMENT

This unit talks about the result of the experiment which consist of the interfaces and the results of the experiment carried out by the researcher.

A. The Interface for temperature sensor

The interface for the temperature sensor consist 4 pins. The first pin is connected to the 5 volt VCC source through a resistor to help stabilize the voltage. The second pin is connected to the second pin of the Arduino board which control the data. The third and fourth pins are grounded according to figure 3.

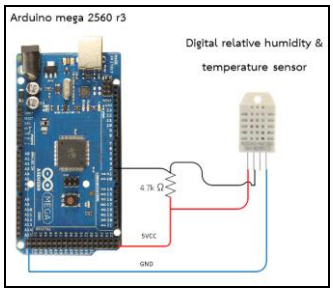


Fig.3 Show the connection between the temperature sensor and the Arduino board

B. Sending messages

The sending of the messages are written in the C language specifying the function “Send SMS” through the Arduino board to be send to the official overseeing the telecommunication building. This is done through a SIM card in the range of 850/900/1800/1900 MHz according to figure 4.

Fig.4 Show the SIM card used with the Arduino board

C. Electrical source

The electrical source used is the 12 Volts, 1 Amp Switching supply which is sufficient to power the Arduino board according to figure 5.

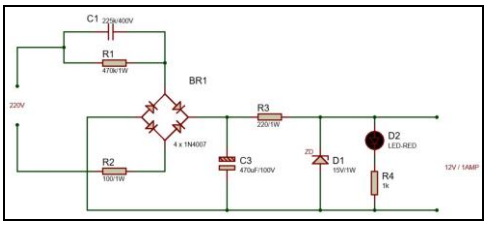


Fig. 5 Show the circuit design for the 12 Volts, 1 Amp Switching supply

D. Displaying the result through a LED panel

The LED panel chosen to be used in the research is a 20 character, 4 line LED panel because it can display the result accurately. This panel is connected to the Arduino board through the I2C board according to figure 6.

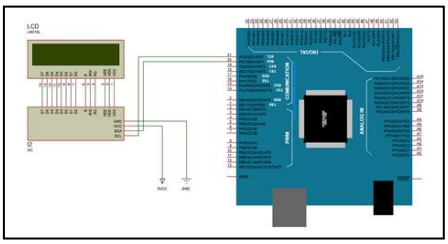


Fig.6 Show the connection between the LED panel and the Arduino board

E. The results of the experiment carried out by the researcher

The result of the experiment for sending a warning message to the official in charge of the telecommunication building is recorded according to the table 1

TABLE 1 shows the messages that the official received according to the value specified

Temperature Reading	Display on the LED panel	Message received by the official
19 to 30ºC	Shows the humidity and temperature measured	No message sent
30 to 34ºC	Shows the humidity and temperature measured	Temperature over level 1
35ºC and above	Shows the humidity and temperature measured	Temperature over level 2
18ºC and below	Shows the humidity and temperature measured	Temperature over cool

F. The result collected from the testing the temperature sensor

In this experiment, the researcher has tested the temperature sensor at varying temperatures. The results are recorded as in figure 7 and 8.

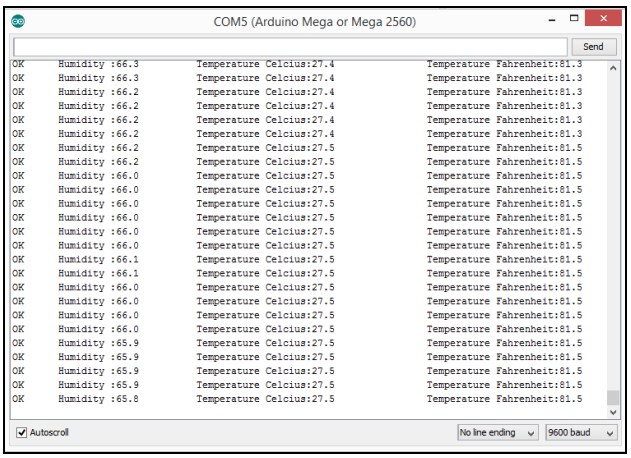


Fig. 7 Show the result of the experiment recorded by the temperature sensor at varying temperatures

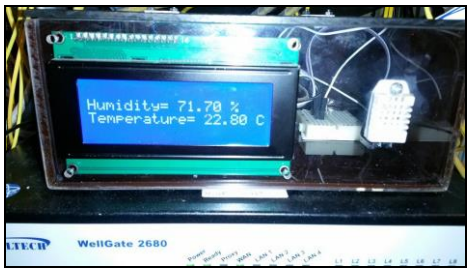
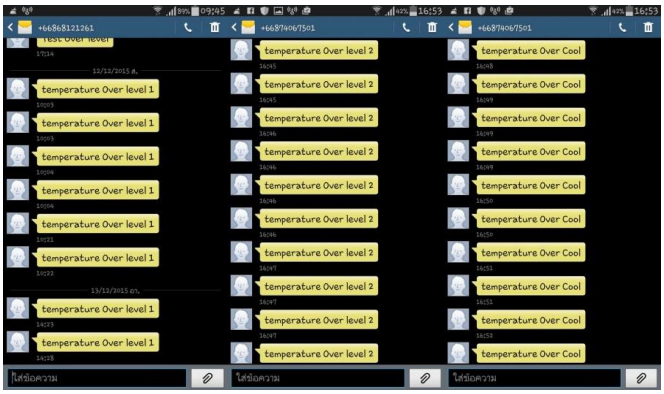


Fig. 8 Show the actual display on the LED panel

G. The result collected from the messages received by the official

This experiment aims to test the efficiency of the ability of the module to send the correct messages to a single official. The messages received on the mobile phone of the official are shown in figure 9.



(a) (b) (c)

Fig. 9 Show the actual messages from the mobile phone of the official.
(a) When the temperature is between 30 to 34ºC
(b) When the temperature is 35ºC and above
(c) When the temperature is 18ºC and below

H. Checking the operational readiness of the system

In this research the operational readiness of the system could be checked by making a phone call to the system to determine if the system is working properly or not. If the system is working properly, there will be a ringing tone. The display panel on the system will also display a message as in figure 10.

Fig. 10 Show the telephone number used to call into the system

I. Statistic showing the result of the experiment

The result shown in table 2 to 6 are actual results that are collected that the researcher has received prior permission to carry out the experiment from TOT Lopburi. The researcher installed the system in five specific telecommunication buildings and consolidated 10 results from each exchange.

TABLE 2 shows the actual data collected at the telecommunication exchange on Soi 12

No	Temperature	Sensor			Message			Error		%
		1	2	cool	1	2	cool	1*	2*	
1	30°c	✓			✓					
2	32°c	✓			✓					
3	34°c	✓			✓					
4	36°c		✓			✓				
5	38°c		✓			✓				
6	41°c		✓			✓				
7	42°c		✓			✓				
8	20°c									
9	18°c			✓			✓			
10	16°c			✓			✓			
Percentage accuracy										100%

TABLE 3 shows the actual data collected at the telecommunication exchange on Kooktoom

No	Temperature	Sensor			Message			Error		%
		1	2	cool	1	2	cool	1*	2*	
1	30°c	✓			✓					
2	32°c	✓			✓					
3	34°c	✓			✓					
4	36°c		✓			✓				
5	38°c		✓			✓				
6	41°c								✓	
7	42°c		✓			✓				
8	20°c									
9	18°c			✓			✓			
10	16°c			✓			✓			
Percentage accuracy										90%

TABLE 4 shows the actual data collected at the telecommunication exchange on Lamnarai

No	Temperature	Sensor			Message			Error		%
		1	2	cool	1	2	cool	1*	2*	
1	30°c	✓			✓					
2	32°c	✓			✓					
3	34°c	✓			✓					
4	36°c		✓			✓				
5	38°c								✓	
6	41°c		✓			✓				
7	42°c		✓			✓				
8	20°c									
9	18°c			✓			✓			
10	16°c			✓			✓			
Percentage accuracy										90%

TABLE 5 shows the actual data collected at the telecommunication exchange on Taloung

No	Temperature	Sensor			Message			Error		%
		1	2	cool	1	2	cool	1*	2*	
1	30°c	✓			✓					
2	32°c	✓			✓					
3	34°c	✓			✓					
4	36°c		✓			✓				
5	38°c		✓			✓				
6	41°c								✓	
7	42°c		✓			✓				
8	20°c									
9	18°c			✓			✓			
10	16°c			✓			✓			
Percentage accuracy										90%

TABLE 6 shows the actual data collected at the telecommunication exchange on Noongmoung

No	Temperature	Sensor			Message			Error		%
		1	2	cool	1	2	cool	1*	2*	
1	30°c	✓			✓					
2	32°c	✓			✓					
3	34°c	✓			✓					
4	36°c		✓			✓				
5	38°c		✓			✓				
6	41°c		✓			✓				
7	42°c		✓			✓				
8	20°c									
9	18°c			✓			✓			
10	16°c			✓			✓			
Percentage accuracy										100%

Remark 1*: Error form Communication System 2*: Error from Sensor

From the experimental results table, it was found that the temperature alarm system of the cellular telephone exchange through the mobile phone message. It is extremely stable and it can detect different temperatures, which is still able to work, and it is a very minor error. The design incorporates a temperature sensor outside the box to provide the best possible ambient temperature.

IV. DISCUSSION

The result of the research on the application of microcontroller with cellular network to monitor the temperature inside the Telecommunication exchange building is in harmony with a research on the efficiency of electronic equipment for controlling water distribution in agriculture both in the area of the electronic circuit that could control the distributing of water effectively and the watering of the agricultural crops which is in line with the research on Internet of Things: watering coriander with alert system using LINE application.

The application could work properly without any problems. From the research about automatic watering system through wireless sensor network, the system worked well especially through obstacles in the range of 20-120 meters. In the range of 140-200 meters, the system could not work properly. The result of the experiment showed that the sensor could not operate well with 90% or more of humidity. The research on the Application of microcontroller with cellular network to monitor the temperature inside the Telecommunication exchange building excelled in the area of communication. It is effective and no problem was encountered in the humidity sensors operating in normal room temperature.

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