

# The Development Of Windows Service Based Data Log System Using Light Dependent Resistor And Thingspeak IOT Cloud Platform

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**Abstract:** Microcontrollers are using in control and information processing; it can be used in wide application such as agriculture, health care, commercial facilities, robotics and education. These micro controllers are computers in chip that comprises of input and output ports, central processing unit, registers and main memory, as well as communication interface such as Ethernet interface, serial interface, High Definition Multimedia Interface, power source and many existing interface that can be found in this type of computer. In this study, the researcher decided to conceptualize an innovative application of this type of computer where it has a potential to use as tracking system in specific individual's activities. Since, some of office people are complaining in CCTV camera about their privacy, this innovative concept of technology is in similar purpose, but, if we will compare the application concept in closed circuit camera, the researcher decided to use visual graph instead video data that is in high exposure. In the first phase, the researcher made a concept on how the simple Light Dependent Resistor will apply in Schools' Office Environment Application domain using microcontroller that was used as data log system and how this can be optimized without forcing the Dean or any designated person in office to operate it in hand due to their busy working hours. In the second phase, the researcher develop the proposed data log system that are acquiring data through light luminance from fluorescent light of deans office and sending it in the IOT cloud platform. The researcher used fuzzy logic theory to model the operation of the proposed data log system. This study used experimental type of research, when the prototype was developed during second phase, the researcher simulated the operation. As the result, the proposed data log system is sending data to Thingspeak IOT Cloud platform, it displays the correct output, which based from the rules and it is in column graph content. The overall result, based on experiment, the proposed data log system is functional.

**Index Terms:** fuzzy logic, unit test. Photo resistor, cloud platform, fuzzy system, fuzzy, sensor device

## 1 INTRODUCTION

### 1.1 Microcontroller Applications

Microcontrollers are using in control, data acquisition and information processing by many experts from health care services [1], farms irrigation system [2], commercial lighting system control [3], manufacturing plant [4], and even in personal use [5].

### 1.2 Microcontroller basic parts, use and operation

This computer in chip comprises of hardware components that facilitate data and signal operations. First component is the input port that is used to acquire external data and for addressing [6]. Sensing devices such as temperature sensors, motion sensor, and light ambient sensor had been using in gathering environmental data since the microcontroller was conceptualized and implemented by many semiconductor experts [7]. Second component is the processor and it comprises of comparator circuit that can compare larger or smaller value. The arithmetic logic unit (ALU) circuit performs mathematical computation from the given numerical data and can perform logical decision making of the machine [8].

For each Processes, the random access memory and register are using to store temporarily the data that to be processed by the processor [9]. After a data processed, it can be received from the register and sends it to output port's controller, these are the computer hardware's fourth component where an individual can interface actuator's and display devices' controller that process and displays information to the users [6]. In Addition, some users are requiring middleware software to communicate on computer-in-chip so most Microcontroller products this year such as Arduino Models, Raspberry Pi has built-in serial interface even Ethernet interface and wireless fidelity serial transceiver to send data to middleware software for information processing, as well as wide area network connectivity and this software can also send data to computer-in-chip for some mechanical actions such as rotating motors and triggering relays and for storing information.

### 1.3 Faculty members' are complaining to CCTV Camera

Despite of microcontrollers' application, regarding to application domain, most faculty members from different university and colleges on NCR even in westernized country are complaining when it comes to the installation and capabilities of closed circuit television camera in their class room and private faculty office. However, closed circuit surveillance camera technology that to be installed in their private office place makes their privacy overexposed. Overexposure is an extent to which, the whole context detail of individual's physical information can be seen in the video content such as face, facial expression, body form, mannerism, body movement and behavior in real time. From this privacy concern faculties are complaining and saying that this technology can be used to monitor and vice them if they are not teaching well in their class or they did something that against from the management; this technology can be used to monitor them if they are in personal office or not and put vice on them. In this situation, trust and dignity to them as academicians are negatively affected.

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#### 1.4 Turning the office light 'ON' and 'OFF'.

When faculty, especially the dean, is going out from their class room or personal office to take some break or they are in other extra curricula activities of the school, they usually leave the fluorescent light turned 'ON', this state of the office environment represents that the designated personnel went out temporarily, and will come back again later as long as the fluorescent light turned 'ON'. Alternatively, when faculty will go out from their class room or personal faculty office before to log-out, they usually turn 'OFF' the fluorescent light [1]. This state of office environment represents that there is no faculty in the office and they will not come back to the office within the day. In addition, most type of light used on houses and schools' office in Philippines is Fluorescent light bulb, which advocates the individual to keep it turned 'ON' if an individual will go out from their room for only about 15 minutes to save energy [9]. In this experimental study, the researcher will create data log system in which microcontroller and photo resistor will apply that can track the schools' dean if they are in office or out without the use of video streaming that affects their overall privacy.

#### 2 RELATED WORKS

Microcontroller was used in smart garden and it is using sensor devices such as humidity, temperature and soil's moisture sensing devices. The operation of this system architecture is that when it exceed the standard value of given parameters, exactly, the humidity, temperature and moisture; it will automatically trigger the terminal of direct current motor to open the faucet to water the plants[10]. Additionally, the common understanding from this system architecture was applied in building system control utilities, exactly, the fire alarm system, in which if it detected a smoke, it will trigger the buzzer that will alarm the people who currently busy in their duty so that they can decide ahead if they go outside of the building or not before the fire disaster will come in [11]. Another application of the common understanding on application from this system architecture was applied in elevator system that uses swipe card, once the user swipes his/her card with identity number, the microcontroller will match that identity number from the identity number stored from database, after the matching process done, and if it is matched, the microcontroller will trigger the rotating machine to pull up the elevator and it will stop the pull up process if it reached the designated floor number [12]. In westernized country, microcontroller was used in street lighting [13] and car park management [14]. Most of these application are using distance approximately sensor, light ambient sensor and wireless programmable controller to collect environmental data that to be processed by the microcontroller. After processing, the information can be shared to the Internet and experienced by switching the street's lights 'ON', or by using mobile phone that gives the user an opportunity to view if the car park is full by means of Google map. For the justification of related literatures and work, sensors are used to sense environmental data and it will process by the microcontroller to generate an information that to be used by the user in their decision making or awareness. Environmental data can be a temperature, weight or fluid force, radio frequency signals, light luminance, textual data, sound, graphics, or video frames.

#### 3 OBJECTIVE

The main objective of this study is to conceptualized, develop and simulate the proposed data log system. Specifically the specific objectives listed below are needed to achieve.

1. To have a tracking system that is functional.
2. To have a tracking system that is less exposure than closed circuit television camera.
3. To have a microcontroller application concept that is general in use as long as it will be implemented, which means it can be used by the office visitors for important work related matters.
4. To prove that the low cost sensor such as LDR 10mm can be used to perform the intended operation of microcontroller that is, for tracking purposes.

#### 4 METHODOLOGIES

Experimental research is used for this study that comprises of series of processes, procedure and test The researcher used Arduino Uno as the special purpose computer in chip that performed logical operation. This logical operation was conceptualized from the Fuzzy Logic Theory. For input sensor, the researcher used LDR as light ambient sensor. This sensor is used to collect data.

##### 4.1 Fuzzy Logic and Truth Table

In fuzzy logic, the model is using if – else if –else structure together the degree of an event, which is to be used to evaluate the rules. If the specific conditions were met, the model will perform specific action based from the formulated rules.

**TABLE 1**  
**TRUTH TABLE OF RULES FOR THE PROPOSED**  
**FACULTY'S SMART OFFICE**

Light Ambient	Expected Output
Vce < 100	"The Dean is out"
Vce => 100	"The Dean is in"

The researcher used a truth table to enlist all possible combination based from One (1) input sensor using the formula  $2^n$ , where n represents the number of sensors that sense environmental data, and the constant Two(2) represents the binary output these are '1' and '0'. The first value '0' from binary output represents a textual message from table 1. This is, 'The Dean is out'. The second value '1' from binary output represents the textual message from table 1. This is, 'The Dean is in'. The first case from table 1 states that if the room light luminance is below One Hundred '100', it means 'the dean is out', while equal or greater than One Hundred of light luminance, means, 'the dean is in'.

##### 4.2 SOFTWARE ARCHITECTURE

For software architecture, the researcher used Arduino IDE to upload the firmware that comprises of instruction that was based from basic fuzzy logic from table 1 using simple conditional statement and relational operators. After the computer instruction coded, the researcher uploaded it in Arduino Uno R3. In order for the data from Arduino to send it in IOT cloud platform, the researcher decided and used the 'Thingspeak' service. This IOT cloud platform is hosted by Mathworks and it is open-source. To optimize this Information Technology infrastructure, the user needs to sign-up their

account to receive the write-key and read-key that to be used in middleware scripting and to be able to create a channel that stores data. The purpose of using this platform is to store the sent data and transform it into visual graph, so that, end users will easily understand what the Two (2) values from table 1 represent. Before, sending the data to this platform, the researcher decided and created a middle ware using python 2.7.10, the created script is responsible for acquiring data from arduino and sending it in the said IOT cloud platform, since, this case, involves serial communication from machine to machine and web connectivity, the researcher used Two (2) python libraries, these are serial.py and httplib2.py, due to the issues from esp8266 configuration. For optimization, without forcing the end user to operate it by hand, the researcher used utility software for the proposed data log system called 'AlwaysUp', this utility software converts the python script as windows service, which means every time the deans will open their office desktop computer the python script will run automatically without double clicking it, so that if the script runs and the microcontroller is connected in dean's desktop computer, the proposed data log system will send data to IOT cloud platform as long as there is Internet connectivity in the dean's office and the Desktop computer is turned 'ON'. The dean's office visitor such as working student and co-faculty can use Thingspeak mobile app for them to view the channel status if the dean is in or out from their personal office, so their time cannot be wasted.

#### 4.2 Test Case

This subsection shows the test case, which the researcher performed during the microcontroller was executed. The researcher enlisted 10 cases to evaluate the operation's validity of the computer instruction that can detect room temperature and room light ambient. This test case comprises of, data room ambience light as input and a terminal monitor that displays textual message.

**TABLE 2**  
TEST CASE RESULT FROM ARDUINO UNO THAT USES LM35 AND LDR 10mm SENSORS

light	Expected outcome
45	"The dean is out"
45	"The dean is out"
103	"The dean is in"
140	"The dean is in"
140	"The dean is in"
143	"The dean is in"
132	"The dean is in"
42	"The dean is out"
42	"The dean is out"
43	"The dean is out"

In table 2, Ten out of Ten cases are correct, which signifies that the operation of the model is valid and consistent, overall, the first component of the system that to be developed in the future is functional. And, since, the output information content from Thingspeak is visual graph, hence it is much less in exposure.

#### 5 CONCLUSION

The functional system quality criteria is very important to test when it comes to control system design. Test case technique is a method that can be used to simulate the required outcome of the system based on the rules that was formulated and

entered during requirement elicitation. Truth table is another important technique that can be used to determine different possible combination; it made the conceptualization of outcome more efficient. The researcher used only One (1) sensor and generated a Two (2) cases. The concept of this application can be implemented in microcontroller application design and since the main function of this concept is for tracking purposes. The researcher learned that this concept is general in use, which means that this can be applied in any personal offices such as doctor's clinic, manager private office room, and any signatory personnel, so that they can be track by their visitors if they are in office or not without the extent that the information is overexposed in comparison to closed circuit television camera.

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