DEVELOPMENT OF PROGRAMMABLE CONTROLLER FOR BUILDING AUTOMATION SYSTEM

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DEVELOPMENT OF PROGRAMMABLE CONTROLLER FOR BUILDING

AUTOMATION SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal

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(Industrial Electronic) with Honours.

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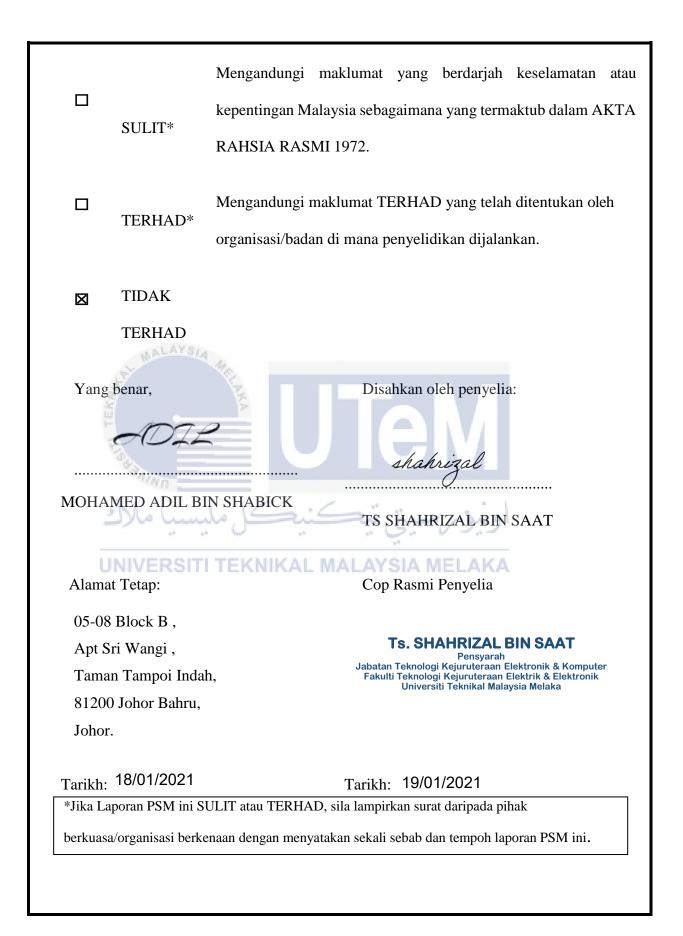**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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I hereby, declared this report entitled DEVELOPMENT OF PROGRAMMABLE CONTROLLER FOR BUILDING AUTOMATION SYSTEM is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to Universiti Teknikal Malaysia Melaka 's Faculty of Electrical and Electronic Engineering Technology (UTeM) as a fractional satisfaction of the prerequisites for a Bachelor's degree in Electronic Engineering Technology (Industrial Electronic) with Honors The supervisory member is as follows:

Signature   : ....shahrizal................................

Supervisor   : TS SHAHRIZAL BIN SAAT

Date   :   19/01/2021

ABSTRACT

The 'Development of Programmable Controller for Building Automation System is primarily designed as a smart advance technology to ease and save time for buildings currently underway. One of the main basic needs of an indoor situation is that it has the option of providing the right warm feeling to fill human desires entirely. Unwanted conditions can cause dissatisfaction in humans and thus influence their behaviours. Therefore, this project will develop a programmable controller for building automation system using esp32.Rtc is used in this project to read the real time. To achieve this project esp 32 was connected with rtc and 4 channel relay with 4 load, when the relay is triggered by the esp32 ,the relay will turn ON the output. This building automation system will help optimize the cost of air-conditioner. As an output of this project, this project is used to on and off output according to the time set. This project aims to help the consumer to be conscious about the power consumption.

ABSTRAK

Pengembangan Pengawal yangDapat Diprogramkan untuk Sistem Automasi Bangunan terutama dirancang sebagai teknologi kemajuan pintar untuk memudahkan dan menjimatkan masa untuk bangunan yang sedang berjalan. Salah satu keperluan asas utama dari keadaan dalam rumah adalah bahawa ia mempunyai pilihan untuk memberikan perasaan hangat yang tepat untuk memenuhi keinginan manusia sepenuhnya. Keadaan yang tidak diingini boleh menyebabkan rasa tidak puas hati pada manusia dan seterusnya mempengaruhi tingkah laku mereka. Oleh itu, projek ini akan membangunkan pengawal yang dapat diprogram untuk sistem automasi bangunan menggunakan esp32.Rtc digunakan dalam projek ini untuk membaca masa nyata. Untuk mencapai projek ini esp 32 dihubungkan dengan rtc dan suis geganti 4 saluran dengan 4 beban, apabila suis geganti dipicu oleh esp32, suis geganti akan menghidupkan output. Sistem automasi bangunan ini akan membantu mengoptimumkan kos penghawa dingin. Sebagai keluaran dari projek ini, projek ini digunakan untuk menghidupkan dan mematikan keluaran mengikut masa yang ditetapkan. Projek ini bertujuan untuk membantu pengguna untuk menyedari penggunaan tenaga.

DEDICATION

To my beloved parents Mr Shabick & Ms Noorjahan. My talented supervisor TS

Shahrizal bin Saat and my beloved siblings. Thank you

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First of all, I would like to thank and praise Allah the Almighty, my Creator, my Sustainer for all that I have received from the beginning of life. I wish to extend my gratitude to the Universiti Teknikal Malaysia Melaka (UTeM) for providing the research forum. I would also like to express my appreciation and gratitude to all those who gave me the opportunity to finalize this report. A special thanks to my supervisor , Mr. Shahrizal, who helped us to stimulate feedback and encouragement, has helped me organize my project, particularly in writing this study. Particular thanks go out to parents whose financial assistance and encouragement helped keep our growth on track. I would appreciate the guidance provided by other supervisors as well as by the panels, particularly in our presentation of the project, which improved our presentation skills through their comments and tips.

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CHAPTER 1

INTRODUCTION

1.1   Background

1.1.1 Building Automation System

Building Automation System (BAS) is a modified, modernized, smart electronic gear system that screens and controls mechanical frameworks and lighting frameworks in a structure. The highlights of the control framework are characterized by the building computerization. The control framework is an automated, smart organization of electronic devices engineered to screen and control the mechanical and lighting frameworks of a structure. AS Centre Utility retains the structural environment within a predefined go, offers habitat-based lighting, screens system execution and gadget disappointments, and furnishes email and material notifications to construct workers. A structure constrained by a BAS is often referred to as a clever basis for the structure..

1.2 Problem Statement

One of the main basic needs of an indoor situation is that it has the option of providing the right warm feeling to fill human desires entirely. Unwanted conditions can cause dissatisfaction in humans and thus influence their behaviours. In this way at the moment it is extremely important to focus on the warm temperature conditions of the structures especially working in the brutal hot and sticky climatic feel such as mosques where complete filling of the inhabitants is necessary during the top long stretches of supplications and so on. Comfort levels are achieved in most of today's buildings through

complex air conditioning systems, but this could result in the thermal comfort problems that can occur because of the building's daily operations. Mosques are the place that is important to admirers. Consequently a cautious evaluation of mosques is necessary for warm temperatures and vitality needs. To date, only a few studies have been conducted to meet these needs for mosques. consequently, there is a need for precise investigations that can be useful in checking the warm temperature and vitality use of mosques in order to monitor precisely the warm conditions in such structures during the time frame of the inhabitants with the aim that a productive cooling framework can be designed for the inhabitants.

1.3 Objectives

After studying the above problem statement, the key objectives of the lead of PSM are:

   i.   To develop building automation system focusing on air conditioning and lighting Control system.

   ii.   To optimize the cost of electricity usage in building such as mosque by controlling timing for electrical load to switch ON and OFF at specific time set..

1.4 Scope of Research

The scope of this project is mainly introducing smart advance technology to cut cost and save the usage of electricity in mosque. Electricity usage for mosque as an example, air conditioning and lighting are major contribution for electricity bill in every month. This project proposed to develop a programmable controller focusing to control air conditioning system. User will be able to set time to switch on and duration for every specific period. Electricity usage for every month will be log to databased system for

monitoring purpose. This project will use microcontroller as a main controller and integration with temperature and humidity sensor. User will be able to update or configure time and duration to switch on the air conditioner using smart phone apps via Bluetooth.

1.5 Expected Results

The air-conditioner will be turned on by timing set by the users. There will be also timers set to the air-conditioner to make sure it will be switched on by the time the prayers start. All the air-conditioner will be connected by relay switch to the timer. All the air-conditioner will be set by the time the users wants to be switched on .This will help the mosque to save electricity bills and make the mosque to be more comfortable during prayers.

1.6 Thesis Outline

As per the objectives discussed and the methodology suggested previously,there are totally 5 chapters in this thesi.The first chapter will discuss abou the content analysis,research problem and aims of the thesis.The next chpater will start with a brief overview of the current enegery efficiency and sustainability issues and chalanged in today's building autimation system.Chapter 2 also will have past related article on building automation system with IOT.Next,in chapter 3 the methodology that has been developed to create a programmable logic controller for building automation system.In chapter 4 a case study will be perfomed by using the devopled models.The last chapter will discuss the conclusion and achievementd of the project and suggest area of future works.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter mainly focuses on the information and theory, previous research and comparison between methods used by the researcher. This chapter concerns the "Development of IOT Based Programmable Controller for building automation system. PLC based building automation system is a project intended to cut cost the electricity usage in building and houses.

2.2 Related Previous Works

2.2.1   "Building Management System using PLC" by P.Vivekanandan , v D.L.Prakash, J.Anith(2015)

This article was written in 2015 by a group of researchers (P.Vivekanandan, D.L.Prakash, J.Anitha), from Anand Institute of Higher Technology, Kazhipattur-603103. This paper introduces a PLC-based BMS focused on implementing Security features in industries that combine effectively with Programmable Logic Controller assisted by SCADA end monitoring and control. This project was accomplished by using PLC and SCADA Interface Mounted in the control room to erect special purpose sensors in the Industrial field and track their changes. It is possible to lift such warning signals based on the contact between field sensors and the Programmed PLC module and to preserve the safety and security of the Industry.Since the advent of SCADA (Supervisory Control And Data Acquisition) the task of monitoring and managing the entire process

and confining it to a restricted control room has become possible. SCADA is a software package that integrates a range of facilities including popup alert, background files, graphical representations, animations . Internal control of light, external control of light, water level control , fire detection are the general parameters being controlled. The water level is tracked using leads in a tank. Thus a control signal is sent to activate the motor when the water reaches low level and as soon as the water approaches high degree another signal will be sent to stop the motor. Next, the building's external lights are automatically switched on / off depending on the light intensity. The LDR is used for the sensation of external light intensity. If the light intensity is below all the lights are automatically switched on. Next, when the fire breaks out, temperature increases and a thermistor detects this. The change in temperature is causing a change in thermistor resistance. Using comparator and relay a control circuit is constructed. The conditioned signal is forwarded to the PLC. An alarm is used to alert the surrounding persons of the fire. Finally, when the person enters the building the IR sensor detects the person and every load is automatically turned on according to the person entering the building. The load 1 is switched on for ten people and the second load is switched on for more than 10 people as well as more than 20 person load 3 is switched on automatically. If nobody enters it means that loads are not switched on.[1]

2.2.2 "Design and Prototype Implementation of SMS Based Home Automation System" by H. ElKamchouchi and Ahmed ElShafee. (2012)

This article describes a profitable, flexible and safe home automation system in development . Prototype of implementation of SMS-based basic home automation system and the design is presentenced in this article .The main aim is to identify and enforce an

inexpensive and free software home automation system capable of controlling and automating most household appliances by an easily manageable way of running and maintaining the required secure home automation system. Poor care, and trouble in securing. System has two modes of operation. First is Passive mode, in which the system checks for alarm status non-stop and a SMS containing alarm status and current date / time will be sent to the user if system detects any changes, and it will be saved to the user list saved in system eprom. Second is Active mode, in which device activated by GSM modem when it receives SMS, device authenticates SMS that contains a valid password (saved in system eprom) that it replied with alarm status. The device design and architecture is examined, and prototype demonstrates the basic level of home appliance control and remote monitoring. Finally , the proposed device has greater performance and high security than the commercially available home automation systems.[2]

2.2.3 "IOT Based Smart Security and Home Automation System" by Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana(2016)

This article focuses on the development of a smart wireless home protection device that transfers notification to the owner and raises alarm in the event of any breach using the Internet. This work gives a profitable, simple idea for home automation systems and home security. Attempts are being made in this project to solve the problems that the current home cctv system faces in delivering situation-related information to users while they're away from home. The motion sensor is mounted onto a Texas frame with a wireless in-out pin. The panel is powered from an external 12V battery or 12V adapter. The home appliances are linked via relay to the mains, which in turn connects to another digital pin on the wall. The board is designed to have Wi-Fi access to the local area. Voice calling functionality should be available for cellular phones. The PIR sensors are mounted

to a building's entrances. These sensors sense human activity, as explained above. Signal detecting their presence is microcontroller input trigger. Customers who may or may not be present at the building may receive a voice call on their mobile phone (whose number is predefined in the program) signaling that 'Intruders are in the House. To switch on the lights and alarm at home to warn the intruder, the user will be able to press '1' from the smartphone keypad. Additionally, if the user discovers that his building is not secure, he can send an SMS to the police department concerned explaining his situation. After a fixed delay in time the module turns the alarm off and lights off. The call will be reactivated once the module detects any unnecessary movement and the user receives the call again.. [3]

2.2.4 "IOT based Monitoring and Control System for Home Automation" by Pavithra & Ranjith Balakrishnan . (2015)

The aim of the project is to use raspberry pi as a network server and Wi-Fi as network. The main objectives are the construction and implementation of a cost-effective and free home automation software system. This paper is a system in which Android's smartphone combines a controlled and continuous control software for controlling different home appliances. The Infrared Sensor (IR) is a low-cost infrared object detection device that we can use IR LED's to install at home. Upon light detection it becomes activated. The sensor sends a signal to raspberry pi upon identification. Using the raspberry pi app, you can turn the light on / off using Wi-Fi setup and IOT description. The PIR sensor is used for sensing human presence and therefore the fans are turned ON / OFF. By creating web servers on personal computers , tablets or we can develop a mobile app, the lights and fans can be controlled. Eventually, when an accident occurs, the fire alarm system is switched on and a warning alert is sent directly to the cell phone