DEVELOPMENT OF AUTOMATION SYSTEM FOR RESIDENTIAL COMPLEX FOR THE ELDERLY

Auwalu Saleh Mubarak

Dept of Electrical and Electronics Engineering, Sharda University Greater Noida, U.P (India)

ABSTRACT

The common areas like gym, mess, clinic and fire station, of the residential complex where the elderly people are staying.

In selecting the components careful study is been made, for the PLC we made use of Allen Bradley 1000 series which is fully digital input digital output controller, and in selecting the sensors, digital sensor are been used and while selecting them less false alarm, accurate, efficient, high sensitivity, fast response and also intelligent sensor has been used.

In this paper we have looked at the home automation in two different scenarios. The first scenario is the studio apartment, in which Considering the challenges that the elderly people are facing today like lack of care givers, sickness, high cost of care givers and so on, we the younger ones have an obligation to find out a way to help the elderly by simplifying their lives in such a way that they can live alone without any hassle. One way to do that is by using technology, in which we will automate the houses and also the apartments are automated for energy saving security and safety. And the second scenario is the multi room apartment which same procedure is applied but it has more components and also a PLC with more input/output. A PLC is allocated to each and every house which will serve as the RTU.

For the common areas namely the gym, mess, clinic and fire station they are automated in such a way that there will be security, safety and energy saving. And also each section is controlled by a PLC, because they are located in different places.

The SCADA system has been proposed, the SCADA screens is in a hierarchy whereby from the home screen you can have access to the common areas and the houses. In the houses section you can access the studio apartment or the multi room apartment, if you click on one of them. You can have the list of houses there and from there you can click on any house and see the status of the sensors, alarms and the devices to be controlled, and if any of the sensor is active in any house the window will pop up on the main system for the supervisor to see what is actually happening in that house. A similar menu based procedure of the design is applied to each section.

I. INTRODUCTION

An elderly person is a person who has an age above 60, or we can say a senior citizen is an elderly person, when we say an elderly person according to the WHO is a person whose age is considered to be 65 years and above and according to some sources, an elderly person In some definition of age some people consider it to be the age where by a \person has limited regenerative abilities and are more susceptible to disease, syndromes, and sickness than younger adults. Most of the old people these days are facing challenges, due to low number of care givers way to help the elderly people because if we check almost every family we will see that there is high tendency that there is an elderly person in the family.

As the elderly has done a lot for our generation so we need to find a way to pay them back by try to make their way of living very easy and in such a way that they can live alone without lots of complications, that is by automating their environment so that they don't have to do things themselves and in such a way that they will be assisted easily.

As we all know that due to their condition some might have some difficulties in remembering thing and some might be weak to do some things so we will design a system that will help them with that by automating their homes and environment.

1.2 Building Automation

Automation is derived from two words automatic and motion, when we look at automation in an engineering point of view, we can say that it is a way of controlling some certain process automatically will minimal human intervention or we can say that it is an automatic control of machine processes using some controller to detect errors and minimize the error in order to have a very good output based on the input signals from buttons, sensors or transducers

A building automation system is a system that controls and monitors building services. These systems can be built up in several different ways. In this paper a general building automation system for a building with complex requirements due to the activity, such as a residential complex, will be described. Real systems usually have several of the features and components described here but not all of them. They may also have specific solutions that are not described in this paper.

II. AUTOMATION FOR STUDIO APARTMENT

When we talk of a studio apartment these kinds of apartments typically consist of one large room which serves as the living, dining, and bedroom. Kitchen facilities may either be located in the central room, 1or in a small separate room, and the bathroom is usually in its own smaller room

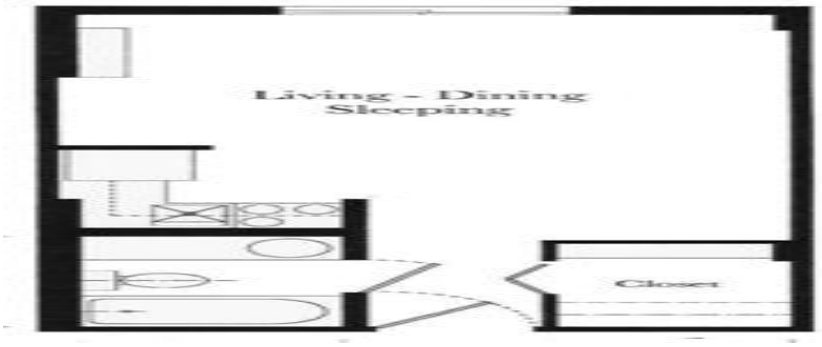


Figure 2.0 Studio Apartment

In the studio apartment we will have to install some sensors like smoke detector, glass detector, water leakage detector, motion sensor, glass break sensor and carbon dioxide detector,. The studio apartment automation will be based on convenience, security and safety. In each and every remote terminal unit panel of every house there will be light indicators that will be indicating the sensors and the equipment that are active at that time, in case if there is a problem the person responsible will go to the affected site directly.

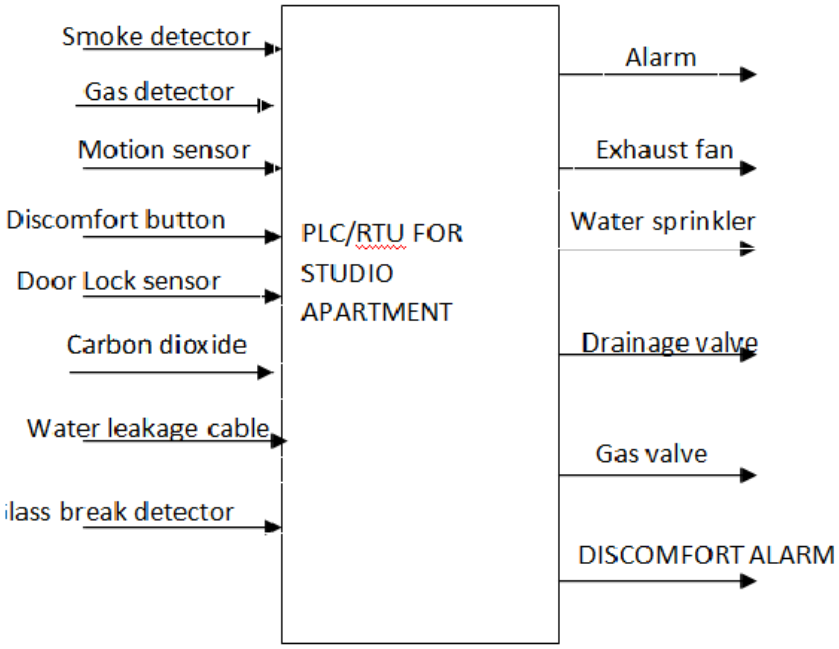


Figure 2.1: The Inputs and Output of the PLC/RTU of the Studio Apartment

Flow carts for the studio apartment

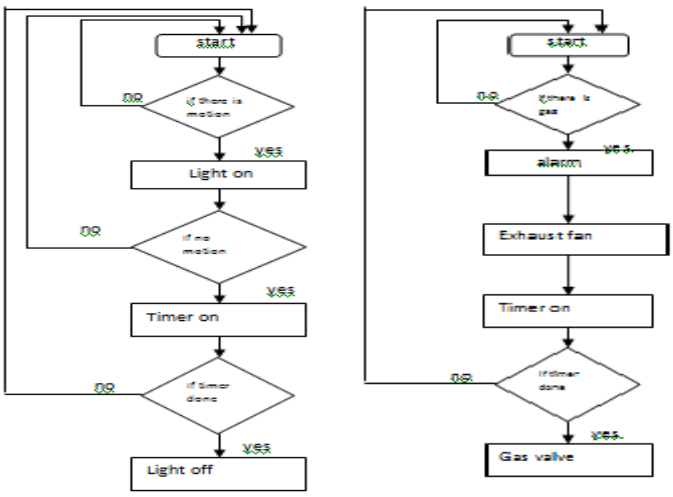
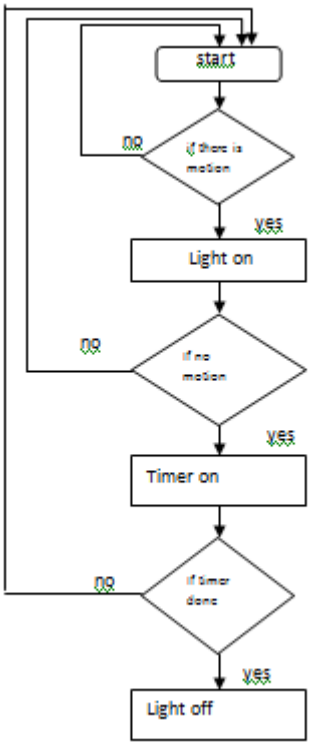


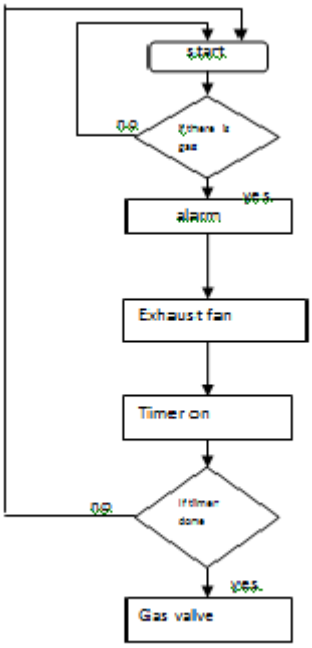
Figure 2.2 Flow Charts of the Studio Apartment Automation

2.1 Automation for Multi Room Apartment

Figure 2.3: Multi Room Apartment

Below are the flow chats of the automation of the multi room apartment.





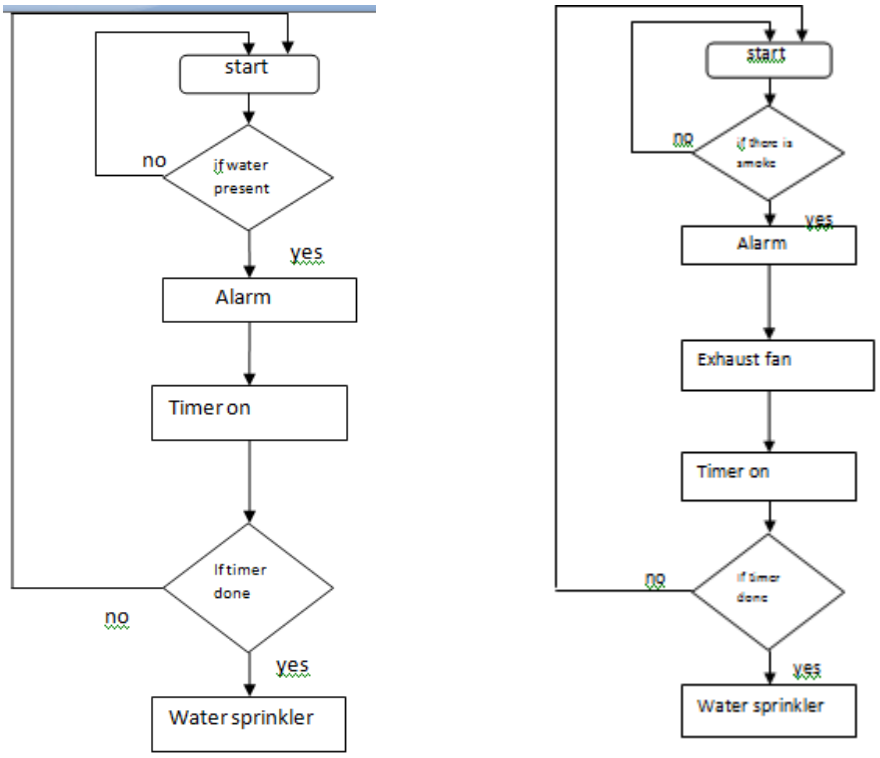


Figure 3.4 Flow Charts for Multi Room Apartment

2.2 Automation for The Emergency Clinic

2.2.1 Motion Sensor

The motion sensor will control the lighting in the clinic, when there is motion in the dining area the light goes on and if there is no motion the light goes off

2.2.2 Smoke Detector

The smoke detector will control the exhaust and the water sprinkler in clinic, if the smoke detector is active then an alarm will sound, exhaust fan will be on and also a timer will be active, if the time is done then the water sprinkler will be active.

2.2.3 Water Leakage Detection Cable

If the water leakage cable is active then it will start a counter if after some certain time the water still flows without any action or deactivation of the sensor then the water drainage valve will open and the water will drain

III. AUTOMATION FOR THE COMMONAREAS

3.1 Automation for the Gym

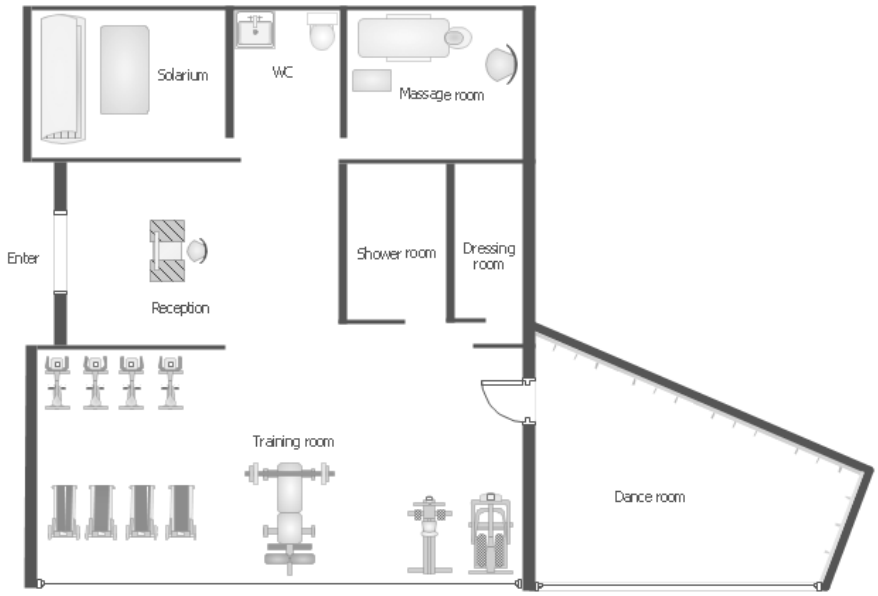


Figure 3.1 Gym Plan

The gym is a place where physical exercise and training takes place and also some physical and mental therapy, in this particular paper we will automate the gym in the complex such a way that there will be convince comfort and security and safety.

Below are the flow chats of the automation of the gym

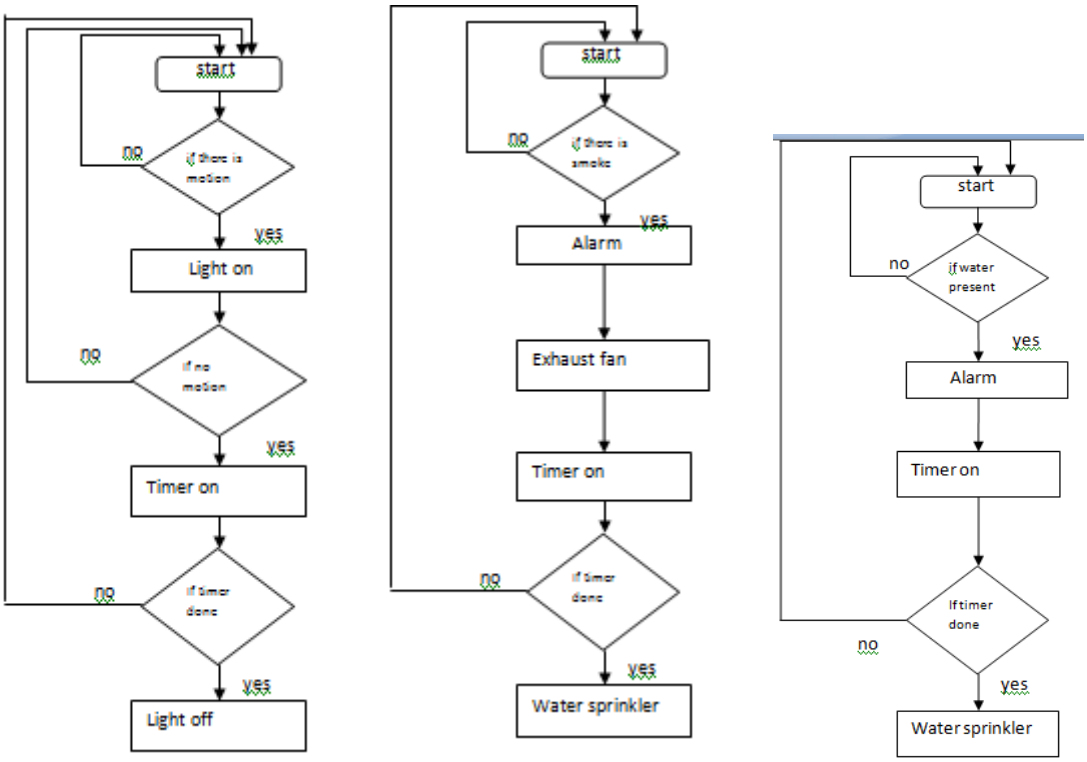


Figure 3.1 Flow charts for Gym Automation

3.2 Scada System

Supervisory control and data acquisition (SCADA) is a system in which the automated processes will be monitored and controlled on a computer or human machine interface, it allows the person in control to monitor every activity and have full report of it. The SCADA is made up of three levels, the master terminal unit, the remote terminal unit and the field devices.

The SCADA software varies based on the PLC manufacturer though there are open source software's but we are going to use wonder ware intouch for this paper. From the software we will be able to access the remote terminal units through the SCADA screens and also get reports of all that is happening.

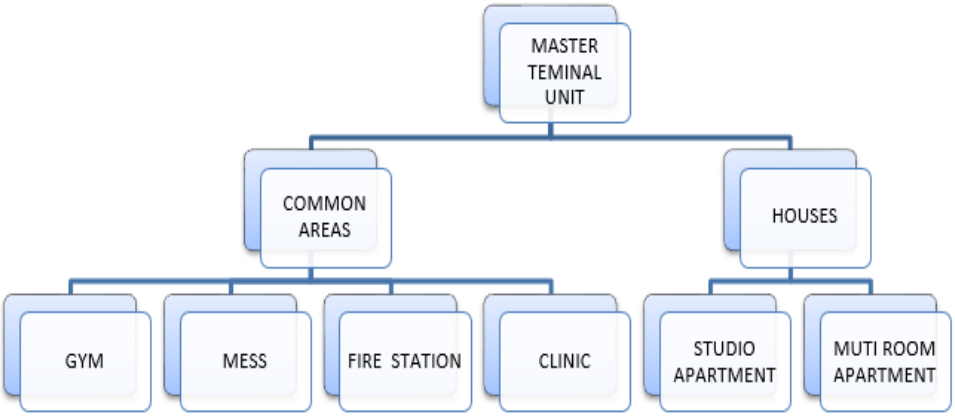


Figure 3.2 The Overview of the SCADA System of the Paper.

IV.CONCLUSION

As stated in the papers, it is very important to automate the residence of the elderly, because most of them are fund of falling sick at any time, so we need to find a way to help them out as they have done alone for us, because without them we would have not been here today, so it's good to find a way to help them.

Each section is taken and automated in a way that there will be convenience, energy saving, security and safety, careful study has been made to find the best field devices that will cut cost and high efficiency, accuracy, intelligent and to avoid false alarms and other factors In the design the automation of the houses based on different scenarios for example the studio apartment and the multi room apartment and also the common areas which comprises of different sections like the gym, hall, clinic and the control room. The automation in this section is made to ensure that there is convenience, energy saving, security and also safety of the elderly in the complex In this paper SCADA system, has been discussed. It overview and how it will look like for this paper. With the SCADA system the supervisor will be able to monitor and control some certain processes and have history of the activities.

REFERENCES

[1]. M. Thuillard, P. Ryser, and G. Pfister, “Life safety and securitysystems,” *Sensors in Intelligent Buildings*, O. Gassmann and H.Meixner, Eds. Weinheim, Germany: Wiley-VCH, 2001, vol. 2,pp. 307–397

[2]. WOLFGANG KASTNER, GEORG NEUGSCHWANDTNER, STEFAN SOUCEK, AND H. MICHAEL NEWMAN"Communication System For Building Automation" proceedings of the IEEE, VOL. 93, NO. 6, JUNE 2005

[3]. http://profhkverma.info/

[4]. http://www.dastec.com/index.php/opc-product-sheets/20-allen-bradley-df1-opc-server

[5]. Vijay S Deshpande, Amint S. Vibhute Prof. Smitha P and Amol K Choure "home automation using PLC and SCADA"Multidisciplinary Journal of Research in Engineering and Technology, Volume 1, Issue 1 (April 2014) Pg. 111-118

[6]. Pingze ZHANG Changzhou Institute of Mechatronic Technology, Changzhou, Jiangsu, China 964899781@qq.com

[7]. An overview of continuous monitoring and control system for three phase induction motor based on Programmable Logical Control & SCADA Technology .volume 4,Issue4, July- August (2013) pp.188-196

[8]. PLC principle and application by John W.Webb.

[9]. Sridhar raja .D, Suresh Kumar"PLC application in automated building management system" *International Journal of P2P Network Trends and Technology (IJPTT) – Volume2 Issue1 Number2–Feb 2012*

[10]. http://upcommons.upc.edu/ Modular Home Automation Systems for Senior Citizens masters thesis

[11]. Juan P. Garcia-Vazquez, Marcela D. Rodriguez and Angel G. Andrade . Ambient Information Systems for Supporting Elder's Independent Living at Home . IWANN 2009, Part II, LNCS 5518, pp. 701–704, 2009

[12]. Juan Pablo Garc´ıa-V´azquez and Marcela D. Rodr´ıguez . Ambient Information Systems to Support the Elderly in Carrying out their Activities of Daily Living . [March 2010]

[13]. Washington State University . Project Casas [March 2010]

[14]. Caio Augustus MoraisBolzani, CristianMontagnoli and Marcio Lobo Netto .Domotics Over IEEE 802.15.4 - A Spread Spectrum Home Automation Application . IEEE Ninth International Symposium on Spread Spectrum Techniques and Applications, 2006

[15]. F. L. Lewis Wireless Sensor Networks Smart Environments: Technologies, Protocols, and Applications. 2004

[16]. American Journal of Engineering Research (AJER) **"** *Healthcare in home automation system with speech recognition and mobile technology"* ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-03, Issue-05, pp-262-265 www.ajer.org

[17]. www.vedaanta.com, March 2015) WHAT IS SENIOR LIVING?

[18]. P. W. J. M. T. A. FTSE, "SMART TECHNOLOGY FOR HEALTHY LONGEVITY: Report of a Study by the Australian Academy of Technological Sciences and Engineering," Australian Academy of Technological Sciences and Engineering, Melbourne Victoria 3004 Australia, 2010. A. Sinclair, "Vision of Smart Home The Role of Mobile in the Home of the Future," GSMA, London,

[19]. M. Hager, "Home Automation: Aging in Place," Aging in Place, 2014. [Online]. Available: http://ageinplace.com/at-home/home-automation-for-aging-in-place/.