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PLC Based Home Automation

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***Abstract* - With the rising power of technology, it is able to accomplish things at a much quicker rate. By simply at the touch of a button access to large amounts of information due to the capability of computers and the Internet. Not only has technology given us more information, but it also has given us the ability to communicate, organize, and manage our time. This paper gives the solution for controlling the home appliances with the less man power in a different way by using programming logical devices (PLC). The numerous benefits of today's home automation solution include safety and security, energy savings, money savings, convenience and control. It improves the daily life of seniors and disabled by offering voice control and safety items.**

Keywords: PLC, Home Automation, programming logical devices.

I. INTRODUCTION

A PLC based home automation system with DTMF control focuses on controlling home electronic devices whether you are inside or outside your home. Home automation gives an individual the ability to remotely or automatically control things around the house. A home appliance is a device or instrument designed to perform a specific function, especially an electrical device, such as a refrigerator, for household use. The words appliance and devices can be used interchangeably. Imagine you forgot to turn the lights/fans off once you leave the house or want to turn on the AC before getting home so that you can enjoy the pre-cooled environment. Automation is today's fact, where things are being controlled automatically, usually the basic tasks of turning on/off certain devices and beyond, either remotely or in close proximity. Automation lowers the human judgment to the lowest degree possible but does not completely eliminate it. Due to the many inputs and outputs that can be handled by a PLC, it is an ideal device to use in homes where a lot of appliances are used.

A) Automation

Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching in telephone networks, steering and stabilization of ships or aircraft and other applications with minimal or reduced human intervention. Alternatively, automation can be defined as the delegation of human control functions to technical equipment for increasing productivity, better quality, increasing safety in working conditions, reducing manpower and cost.

B) Domotics

Home automation, also known as domotics, is the residential extension of building automation. It is automation of the home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, security locks of gates and doors and other systems, to provide improved convenience, comfort, energy efficiency and security. Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

II. LITERATURE SURVEY

1. PLC - A PLC or Programmable Logic Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact.

2. DTMF -Dual-Tone Multi-Frequency signaling (DTMF) is used for telecommunication signaling over analog telephone lines in the voice-frequency band between telephone handsets and other communications devices and the switching center.

3. Fire Alarm System - An automatic fire alarm system is designed to detect the unwanted presence of fire by monitoring environmental changes associated with combustion. In general, a fire alarm system is classified as either automatically actuated, manually actuated, or both. Automatic fire alarm systems are intended to notify the building occupants to evacuate in the event of a fire or other

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emergency, report the event to an off-premises location in order to summon emergency services, and to prepare the structure and associated systems to control the spread of fire and smoke.

4. Security Alarm - A security alarm is a system designed to detect intrusion – unauthorized entry – into a building or area. Security alarms are used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders.

5. Sensors - A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument.

6. SCADA - SCADA (Supervisory Control and Data Acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world.

III. SYSTEM DESIGN

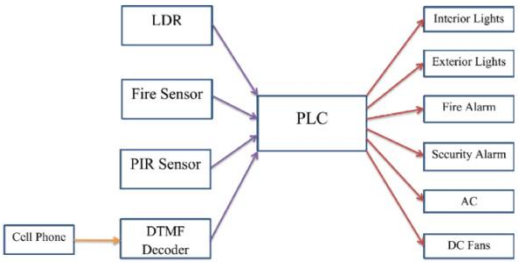

Figure 1: Block Diagram

The PLC lies at the center of the system, controlling the function of all devices connected to it.

The exterior lights will be connected to an LDR (light dependent resistor) as well so that they turn on automatically during dusk and turn off automatically during dawn.

A fire/smoke detector will detect the possibility/ occurrence of a fire and will sound the fire alarm. This will also switch off all the other devices except the interior lights, fire alarm and the PLC itself in order to reduce the risk of an electrically induced fire.

The intruder detector, basically the PIR sensor, mounted at a window, will be triggered if the LOS (line of sight) of its detection breaks and will trigger the security alarm. The PLC will also be programmed in a way that when the intruder detector is triggered, the interior and exterior lights will flash on/off so that people can raise an alarm.

A cell phone will be connected via a 3.5mm audio jack to the DTMF decoder circuit, on which when pressed a number on its dial pad, will send a DTMF signal to the circuit, which in turn will be sent to the PLC in order to control the interior lights, exterior lights, fans and the AC (emulated by an LED).

In addition to all the automata, all devices will be connected to their manual on/off switches respectively, with the alarms being connected to a reset switch and the PLC itself being connected to a start/stop switch, all of these placed on a control panel.

A SCADA Program will then be written to monitor all the processes.

IV. FLOWCHART

A) Interior Lights Control

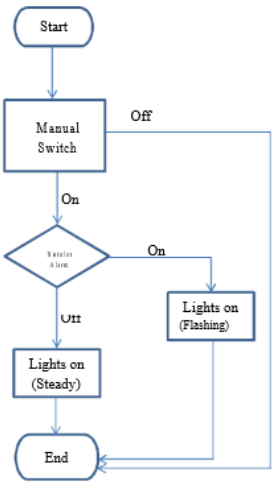

Figure 2: Flowchart of Internal Light Control

B) Exterior Lights Control

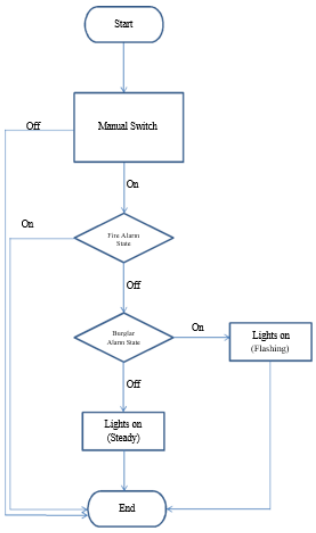

Figure 3: Flowchart of Exterior Light Control

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C) Fire/Smoke Alarm

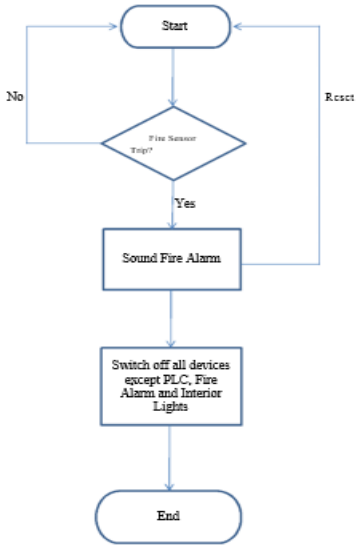

Figure 4: Flowchart of Fire/Smoke Alarm

D) Intruder/ Security Control

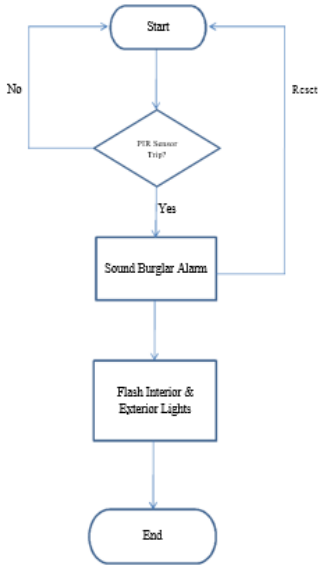

Figure 5: Intruder/Security Control

V. CONCLUSION

This project aims to automate the basic necessities required in a generic home using a much simpler system-a PLC, rather than using complicated microcontrollers.

Also, adding more modules to the expansion slots of a PLC doesn't need to reprogram the PLC from scratch, as would what be required if one was using microcontrollers/embedded systems.

Also, the complete process can be monitored using SCADA, which is proprietary software that is provided with each PLC.

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