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Home Automation Control with Web Visualization

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ABSTRACT: The various sensors essential for advanced monitoring and control of various electrical appliances in real time using soft programmable logic controller (PLC) has been accomplished in the present work. The real time system developed is highly productive, logical and robust. The idea of home automation is to interface all the systems and devices to a central controlling device so that they can be controlled from anywhere and react to one another effectively. In this paper we are going to introduce soft PLC technology TWINCAT3. The main asset of TWINCAT3 is our PC will act as a soft PLC.

KEYWORDS: PLC, Sensor, Home automation, TWINCAT3, Ladder Diagram, Web Visualization

I. INTRODUCTION

The work is based on an Automation System where connection is by a Programmable Logic Controller. Implementing a PLC application which can handle various appliances of a home like Lights, Smoke sensor, Water level detector, Home security, gardening system. Now everything is going to be automated using modern control techniques and vogue technology. The appliances can be connected with network grid and accessed using a smartphone. This idea shall lead to the development of smart communities. The work illustrates how PLC's can be used for control and monitoring of lights, sensors, and other electronic appliances at homes, offices etc. Automation and real time monitoring of inputs is easily accomplished. The idea of computerized control and its application saves precious time and manual effort, which can be utilized for better purposes. Home automation provides a more convenient & elegant atmosphere for the family to compliment and match the lifestyle.

II. PROGRAMMABLE LOGIC CONTROLLER (PLC)

The main attributes of programmable logic controller and sensors are presented in this section. A PLC is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. 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.

A PLC is an example of a hard real time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

III MAIN FEATURES

The main difference from other computers is that PLCs are armoured for severe conditions and have the facility for extensive input/output arrangements. These connect the PLC to sensors and actuators. On the actuator side, PLCs operate electric motors, pneumatic or hydraulic cylinders, magnetic relays, solenoids or analogue outputs. As PLCs have become more advanced, methods were developed to change the sequence of ladder execution, and subroutines are implemented. This simplified programming could be used to save scan time for high-speed processes. A small PLC will have a fixed number of connections built in for inputs and outputs. The processor and selection of I/O modules are

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customized for the particular application. Several racks can be administered by a single processor, and may have thousands of inputs and outputs. User Interface PLCs may need to interact with people for the purpose of configuration, alarm reporting or everyday control. A human-machine interface (HMI) is employed for this purpose. A simple system may use buttons and lights to interact with the user. Text displays are available as well as graphical touch screens. BECKHOFF soft PLC TWINCAT3 uses coupler EK-1100 to communicate with input and output devices. Where all the input and output devices are connected to various cards depends on the its analog/digital nature. Cards of CX5020 are assigned different series depending on nature.

1. Ease of Programing
PLC programs are typically written in a special application on a personal computer afterwards it is downloaded on the PLC via direct-connection cable. BECKOFF software itself works as a soft PLC.
2. Comparison
PLCs are well adapted to a range of automation tasks. PLC applications are typically highly customized systems, so the cost of a packaged PLC is low compared to the cost of a specific custom-built controller design. In recent years "Safety" PLCs have started to become popular, either as standalone models or as functionality and safety-rated hardware added to existing controller architectures. These differ from conventional PLC types as being suitable for use in safety-critical applications for which PLCs have traditionally been supplemented with hard-wired safety relays.

IV. BECKHOFF PLC (TWINCAT3)

Figure 1 shows BECKHOFF Coupler CX5020.

Features:-

- i). Analog voltage rating 0-10 volts.
- ii). Current Rating 4-10 Ma.
- iii). DC voltage rating 0-24 volts.
- iv). Communication bus EtherCat
- v). Digital cards of 1 and 2 series.
- vi). Analog cards of 3 and 4 series.



Figure 1. TWINCAT Hardware

V. SENSORS USED

A sensor is a device that measures a physical quantity and converts it into a 'signal' which can be read by an observer or by an instrument. In this project we are going to use different sensors such as Infrared (IR) sensor, Light Dependent Register(LDR) sensor, Gasleak sensor and temperature sensor



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1. IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

2. Temperature Sensors

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling

3. LDR Sensors

A Light Dependent Resistor (LDR) or a photo resistor to is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells

IV. WORKING OF THE SYSTEM

- i). Each sensor is linked to a programmable logic controller (PLC) through a coupler CX5020.
- ii). Real time status of each sensor is monitored.
- iii). In case of any miss-happening, the required precautionary and safety tasks are performed..
- iv). Immediate action can be initiated to avoid any accidents.
- vi). The concerned authorities can also be informed automatically.
- vii). System can take preliminary actions on its own for immediate preventative action.

Software used and Coding Programming Languages

Twincat3 software acts as a soft. PLC. It is programmed using following languages

1. Ladder Programming.
2. Structure text.
3. Functional Block.
4. Instruction List.
5. Sequential Function Chart.

V. CONCLUSION

- 1.Home Automation System will give rise to a standard access method for the home appliances using the Internet protocol.
- 2.Home automation systems involves making homes even smarter.
- 3.More energy can be conserved by ensuring occupation of the house before turning on devices and checking brightness and turning off lights if not necessary.
- 4.The system can be integrated closely with home security solutions to allow greater control and safety for home owners

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