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Navigation and Controlling System Using PLC and HMI

[1]A.Agalya,[2]Ivan Paul Jesudoss,[3]V.Harany,[4]V.Karthic and [5]S.Mukesh Krishnan
[1]Assistant professor,[2,3,4,5] Student, Department of Electronics and Instrumentation Engineering
karpagam College of Engineering,Coimbatore,Tamilnadu,India.

***Abstract*:** This Paper is to represent the users to find the shortest way to their destination place and power control of various loads in a particular area using Human Machine Interface (HMI) and Programmable Logic Control (PLC). The main objective is to provide offline navigation for the users within the areas such as hospitals, schools, colleges, shopping malls, etc.,

Keywords— *Ladder Diagram, Monitor and Control, PLC,HMI*

I. INTRODUCTION

The theme of this paper is to make the user to reduce his stress and frustration to a great extent as they can know all the locations in the place where they visit for the first time. The best part is that the information can be gained without any internet services. The map of the area is designed using screen editor software and is fed into the Human Machine Interface (HMI).The user location is fixed in the place where the HMI is present and the way to their destination is guided. Our project is user-friendly as like that of Automatic Teller Machine (ATM) and this does not require any computer languages such as C, C++, java, etc., Another objective is to control the power supply to the loads from the desktop using Human Machine Interface(HMI) and Programmable Logic Control(PLC). Its deals with the implementation of ladder diagram to control the ON/OFF status of various rooms to the control room. The programming and the implementation of hardware is simple and easy. And we have controlled the ON/OFF status of the electrical appliances of three rooms from the control room by the use of PLC and HMI.

II. PLC BASICS

Programmable Logic Controller PLC is simply a special computer devices used in industrial control systems. They are used in many industries such as oil refineries, manufacturing industries, conveyor systems etc,.. Where ever there is a need to control devices, we can use the PLC. It provides a flexible way to software the components together. That is dedicated to run one program that monitors a series of different inputs and logically manipulates the O/P to the desired control. They are meant to be very flexible and also providing the advantages of high reliability and no program crashes or mechanical failures, compact and economical over traditional systems. PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise and resistance of vibration and impact. PLC is an example for a hard real time system hence the output results must be produced in response to input conditions with in a bounded to time, otherwise unintended operation will result.

PLC INPUT AND OUTPUT TYPE:

Dc Inputs: DC input modules is available that work with 5, 12, 24 and 48 volts. DC input modules allow us to connect either PNP (sourcing) or NPN (sinking) transistor type devices to them. If we are using a regular switch i.e. toggle or push button, etc,.

AC Inputs: An AC voltage is non-polarized. modules is available that will work with 24, 48,110 and 220 volts. Be sure to purchase the one that fits your needs based up to the input devices (voltage) you will use. AC I/P modules is less common these days than DC I/P modules. The reason being that today's sensors typically have transistor outputs. A transistor will not work with an AC voltage. Most can be used in both DC and AC load. A load is simply a fancy word for whatever is connected to our outputs

Transistor Outputs: It is a important to note that a transistor can only switch the DC current. For this reason it cannot be used with an AC voltage.

III. PROPOSED SYSTEM ARCHITECTURE

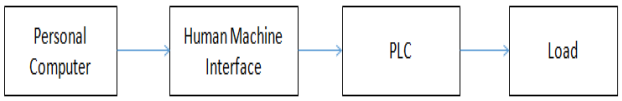

Fig 1: Block diagram

In the personal computer ,the software called screen editor which is used for the offline mapping. In this project we use the options like goto screen, moving sign, password set, time display, date display and day display. The background images are import from the files. The photo of the map is designed in photo shop(ps). Rs 232 cable is used for the interface purposes. The program done in the screen editor is write into the Human Machine Interface (HMI).Options and mapping is display in the HMI. The PLC and HMI are interface by the cable RS 232.The command given in the HMI is transferred to the PLC and then the PLC takes the controlling action to the load.

PLC control panel block diagram:

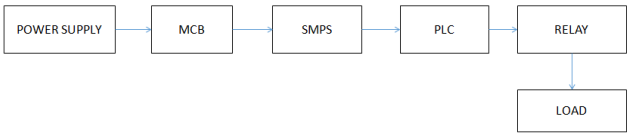

Fig 2: PLC control panel

The terminal of the power supply is phase, neutral and earth. The output power is 230v.Phase of the power is connected to the miniature circuit breaker which is single pole. Switched mode power supply(SMPS) in which 24v dc output is produced. 24v dc is given as a input the PLC. Output of the PLC is connected to the relay. Relay is acting like a switch. Selective switch is used as a input to the PLC. When the switch ON the output is get enable.

Control Panel with PLC

With invention of programmable controllers, much has changed in how a process control system is designed. Many advantages appeared. Typical example of control panel with a PLC controller is shown. Put simply, this means that there is no any positive or negative. AC voltage can be quite dangerous to work with if we are careless. Typically, ac input Change in operating sequence and application of a PLC controller to a different operating process can be easily accomplished by replacing a program through a console or using a PC software (not requiring changes in wiring, unless addition of some input or output device is required).commonly, the AC voltage is being switched through a limit switch or other switch type. If your application is using a sensor it probably is operating on a DC voltage.

Relay Outputs

Once of the most common type of outputs is relay.

Fig 3: PLC-dvp 14ss211

The Configuration of PLC is:

POWER SUPPLY: 100 to 240 VACINPUT, 24 VDC Output
INPUTS: 8
OUTPUTS: 6
OUTPUT TYPE: Transistor.
DATAMEMORY(C):8K Words

Fig 4: Miniature circuit breaker(MCB)

A Miniature Circuit Breaker (MCB) is a small circuit breaker that is used for residential and industrial applications As every circuit breaker, it has both a switching function (it allows the connection or disconnection of the circuit where it is installed) but also a protection function (it must interrupt the circuit in the event of over currents (overloads and short-circuits) so that further damage in the installation are prevented).

Fig 5: Switched mode power supply(SMPS)

For several years the world of power supply design has been seen a gradual movement from the use of linear power supplies to the more practical switched mode power supply S.M.P.S. The linear power supply contains a mains transformer and a dissipative series regulator. This mean the supply has extremely very large and heavy 50/60 Hz transformers, and it also poor power conversion efficiencies, they both have serious drawbacks. Typical efficiencies of 40% are standard for a linear. This compares with efficiencies between 70 and 80%, currently available using S.M.P.S. designs. Further more, by employing high switching frequencies, the size for the power transformer and associated filtering components of the S.M.P.S. is dramatically reduced from comparison for the linear. For example, an S.M.P.S. operating from 20kHz produces a four times reduction in component sizes, then this increases to about eight times at 100kHz and greater than this. This means an S.M.P.S. design can produce compact and light weight supplies. This is no essential requirement for the majority of electronic systems. The supply must slot into the ever shrinking space left for it from electronic system designers.

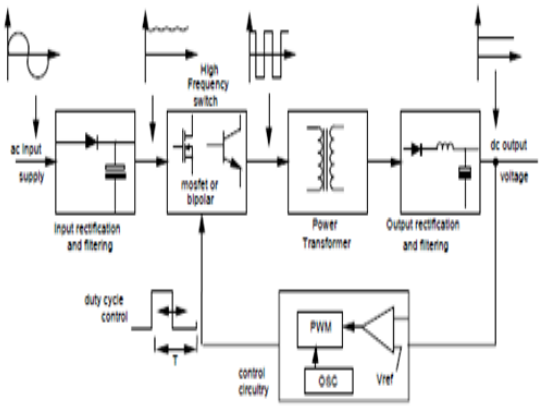

Fig 6: Block diagram of SMPS

The unregulated dc was fed directly to the central block of the supply, the high frequency power switching section. Fast switching power semiconductor devices such as MOSFETs and Bipolar is driven on/off, and the switching input voltage across the primary power transformer. The drive pulses is normally to fixed frequency about 20 to 200kHz in variable duty cycle. since, a voltage pulse train of suitable magnitude and the duty ratio appears on the transformer secondary. This voltage pulse train are appropriately rectified, and then the smoothed by output filter, which is are either a capacitor / inductor arrangement, depending upon the topology uses. This transfer of power has to be carried out of the lowest losses possible, to maintain the efficiency. Thus, optimum design of the passive and the magnetic components, and the selection of correct power semiconductors are critical. Regulation of the output to provide a stabilized dc supply is carried out from the control or feedback block. Generally ,most of S.M.P.S. systems operate on a fixed frequency pulse width modulation basis, where the duration of the on time of the drive to the power switch are varied on a cycle. This compensates of changes in the I/P supply and O/P load. The output voltage are compared to the accurate reference supply, and error voltage produced by comparator are used by dedicated control logic to terminate the drive pulse to the main power switch at the correct instance. Correctly designed, this will provide a very stable dc output supply.

Fig 8: Human Machine Interface

III SIMULATION OUTPUT

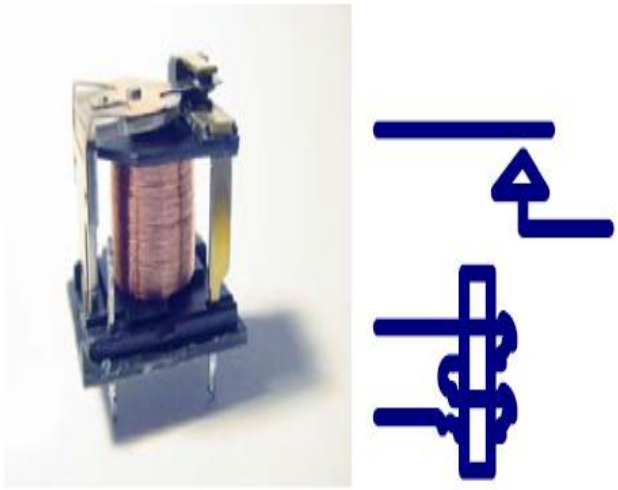

Fig 7: Relay

A relay is an electrical switch that used an electromagnetic to move the switches from the off to on position instead of a human moving the switch. It takes the relatively small amount of power to turn on a relay but the relay can control something that draw much more power. Ex: A relay is used to control the air conditioner in your home. The AC unit probably runs off of 220VAC at around 30A. That's 6600 Watts The coil control the relay that only need a few watts to pull the contacts together.

The Human-Machine Interface is quite literally where the human and the machine meet. Its the area for human and the area of the machine that interact during downloading programs to HMI for the given task.

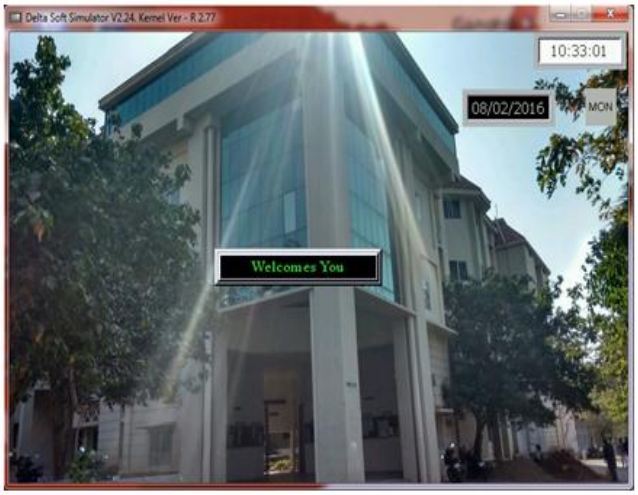

Fig 9: Screen 1

Fig 10: Screen 2

Fig 11: Screen 3

Fig 12: Screen 4

Fig 13: Screen 5

Fig 14: Screen 6

Fig 15: Screen 7

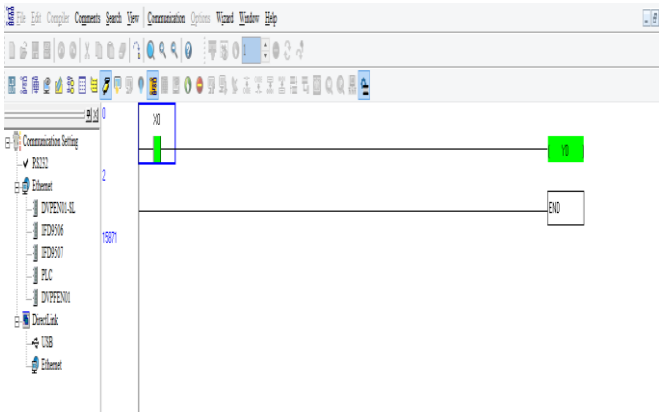

Fig 16: PLC program

CONCLUTION

PLC is much better when compared to relay based automation. PLC uses, simple program. The major advantage is that, it consumes less power, low maintenance cost, can be programmed. Also, the HMI is used to make the user to reduce his stress and frustration to a great extent as they can know all the locations in the place where they visit for the first time. This does not require any computer languages and internet connection.

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