

# Industrial Automation using with Programmable Switching Control

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## ABSTRACT

In this paper, we have illustrated how to switch industrial loads using a user programmable logic control device for sequential operation. This operation is generally used for repetitive nature of work. Programmable logic controllers used in industrial applications are very expensive for simple operations like sequential switching of loads. In this project, we demonstrate the working of this simple operation using a microcontroller of 8052 family. The development of this application requires configuration of the program through input switches. In industries, there are many tasks are carried out which requires some repeated operation in various orders and time intervals. For example, certain loads need to be switched ON/OFF in specific time intervals. To achieve this, microcontroller is programmed in such a way that the loads can be operated in three modes: Set mode, Auto mode and Manual mode. In set mode, through timers, the machinery works based on input time set by the user where as in auto mode it works on default time settings and finally in the manual mode it functions while respective switches are pressed depending on the user's need and flexibility. All the modes and status of loads are displayed on an LCD. Thus, tasks performed by costly PLCs can now be achieved using a microcontroller making the device cost effective by adding C language to this project. Further the project can be enhanced by interfacing it with a GSM modem where by sending an SMS to the control system we can select the mode and timing remotely.

**Keywords :** Embedded Systems, PCB, Willar Software, Keil Software, Microcontrollers.

## I. INTRODUCTION

The analysis carried out in this project highlights the concepts, working, advantages and practical applications of programmable logic controllers, along with a comparison with other control systems for industrial automation in repetitive nature of work. This operation is generally used for repetitive nature of work using programmable sequential switching of any load using embedded system based microcontroller concept. It uses microcontroller from the 8051 family, which is of 8-bit.

In the set mode - through the inbuilt digital clock - the machinery runs based on the 'On' or 'Off' and on time, whereas in an auto mode, it runs through default settings; and, finally in the manual mode, the real-time systems used extensively in the industrial control

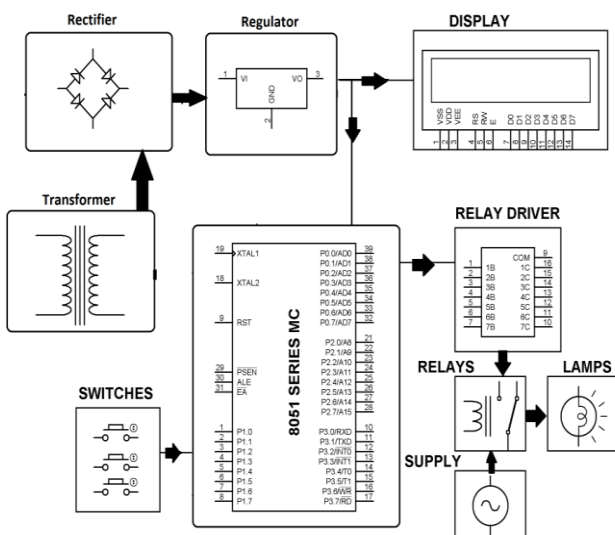
applications can run depending on the user's need and flexibility [1]. By adopting this project cost can be reduced as the tasks performed by the costly PLCs will be more when compare to the microcontroller methods. Furthermore, the project can be enhanced by interfacing it with a GSM modem, wherein - by sending an SMS to the control system - we can select the mode and timing remotely.

Programmable logic controllers used in industrial applications are very expensive for simple operations like sequential switching of loads. In this project, we demonstrate the working of this simple operation using a microcontroller of 8051 family. In industries, there are many tasks are carried out which requires some repeated operation in various orders and time intervals. For example, certain loads need to be switched ON/OFF in specific time intervals. To achieve this,

microcontroller is programmed in such a way that the loads a can be operated in three modes: Set mode, Auto mode and Manual mod. Thus, tasks performed by costly PLCs can now be achieved using a microcontroller making the device cost effective [2]. Figure no 2 shows the block diagram of industrial automation system.

## II. LITRATURE REVIEW

Prof. Jaikaran Singh, Prof. Mukesh Tiwari, Mr. Manish Shrivastava (2013) [3] explained that despite years of activity, truly open and intelligent control systems seem still to be a promise of the future. Agreement on common architectures and application objects was needed to raise open control systems from exchanging raw data to the level of real interoperability of off-the-shelf components. Future control platforms and programming languages should have been new built-in mechanisms that supported implementation of intelligent functions, such as flexible resource management and exception handling. This article argues that many of these challenges can be met by taking full advantage of emerging software engineering technologies. This also meant that the modeling techniques and design practices of software engineering should be combined with the traditional ways of thinking in automation.



Source:www.nevonprojects.com

Figure 1. Block Diagram of Industrial automation

Aishverya Kumar Sharma, KushagraKumar Choubey, Mousam Sharma (2015) [4] described that the project

mainly focuses on the controlling of home appliances remotely when the user is away from the place. The system is SMS based and user uses wireless technology (GSM). The system uses GSM technology thus providing universally access to the system for automated appliance control.8051 Micro Controller is the core component of this project. The objective of this project is to investigate a cost-effective solution that will provide controlling of home appliances remotely. The motivation was to facilitate the users to automate their homes having universal access. The home appliances control system with an affordable cost was thought to be built that should be mobile providing remote access to the appliances. This work includes the study of GSM modem using sensors. GSM network operators have roaming facilities; user can often continue to use the mobile phones when they travel to other countries etc.

Ojaswini Vijay Duragkar, Prof.P. V. Gawande (2016) [5] explained that Internet of Things (IOT) had provided an opportunity to build powerful industrial system and applications by leveraging the growing ubiquity of RFID, wireless, mobile and sensor devices. Many industrial IOT applications have been increasingly developed and deployed in recent years. In this project, they had access fully automated Site from anywhere in the world that the power of internet.

Bhosale Kiran Uttam1, Jadhav PappuShivaji, Prof.Pisal.R.S. et.al (2017) [6] discussed that Internet of things (IoT) was rapidly increasing technology. IOT was the network of physical objects or things embeded with electronic software, sensors, and network connectivity which enables these objects to collect and exchange data. In this paper, they had been developing a system which will automatically monitor the industrial applications and generate Alerts/Alarms or take intelligent decisions using concept of IoT. Safety from leaking of raw gas and fire are the most important requirements of home and industries security system for people. A traditional security system gives the signals in terms of alarm.

Mohd Sayeed, Syed Sayeed Ahmed, et.al (2016) [7] illustrated how to switch industrial loads using a user programmable logic control device for sequential operation. This operation was generally used for repetitive nature of work. Programmable logic controllers used in industrial applications were very

expensive for simple operations like sequential switching of loads. In this project, they have demonstrated the working of this simple operation using a microcontroller of 8052 family. The development of this application requires configuration of the program through input switches. In industries, there were many tasks carried out which requires some repeated operation in various orders and time intervals. For example, certain loads need to be switched ON/OFF in specific time intervals. To achieve this, microcontroller was programmed in such a way that the loads can be operated in three modes: Set mode, Auto mode and Manual mod. All the modes and status of loads were displayed on an LCD. Thus, tasks performed by costly PLCs could now be achieved using a microcontroller making the device cost effective. Further the project could be enhanced by interfacing it with a GSM modem where by sending an SMS to the control system they could select the mode and timing remotely.

### III. MOTIVATION

- By automation the productivity is increased as there are less human for production.
- High accuracy (due to program i.e., c language).
- When manually operated there are more chances of errors so automation helps in less human error.
- It is reliable as it is automated.

### IV. OBJECTIVES

The main objective of the project is to design a programmable sequential switching of any load using embedded system based microcontroller concept. It uses microcontroller from the 8051 family, which is of 8-bit. The development of this application requires the configuration of microcontroller architecture - that is, the selection of the machines, and writing debugging of the application program. In this project, the clock plays an important role, wherein it is used in these modes: the set mode, auto mode and manual mode for controlling different machines [8].

### V. METHODOLOGY

#### A. HARDWARE (PCB DESIGN)

The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. It applies this

information, together with the user specified design rules and various design automation tools, to assist with error free board design. Design Rule Checking does not include high speed design constraints. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.[9]

#### B. SOFTWARE (KEIL SOFTWARE)

- Install the Keil Software in the PC in any of the drives.
- After installation, an icon will be created with the name "Keil uVision3". Just drag this icon onto the desktop so that it becomes easy whenever you try to write programs in keil.
- Double click on this icon to start the keil compiler.
- A page opens with different options in it showing the project workspace at the leftmost corner side, output window in the bottom and an ash colored space for the program to be written.
- Now to start using the keil, click on the option "project".
- A small window opens showing the options like new project, import project, open project etc. Click on "New project".
- A small window with the title bar "Create new project" opens. The window asks the user to give the project name with which it should be created and the destination location. The project can be created in any of the drives available. You can create a new folder and then a new file or can create directly a new file.
- After the file is saved in the given destination location, a window opens where a list of vendors will be displayed and you must select the device for the target you have created.
- The most widely used vendor is Atmel. So, click on Atmel and now the family of microcontrollers manufactured by Atmel opens. You can select any one of the microcontrollers according to the requirement.
- When you click on any one of the microcontrollers, the features of that microcontroller will be displayed on the right side of the page. The most appropriate microcontroller with which most of the projects can be implemented is the AT89S52. Click on this microcontroller and have a look at its features. Now click on "OK" to select this microcontroller.

- A small window opens asking whether to copy the startup code into the file you have created just now. Just click on “No” to proceed further.
- Now you can see the TARGET and SOURCE GROUP created in the project workspace.
- Now click on “File” and in that “New”. A new page opens and you can start writing program in it.
- After the program is completed, save it with any name but with the .asm extension. Save the program in the file you have created earlier.
- You can notice that after you save the program, the predefined keywords will be highlighted in bold letters.
- Now add this file to the target by giving a right click on the source group. A list of options open and in that select “Add files to the source group”. Check for this file where you have saved and add it.
- Right click on the target and select the first option “Options for target”. A window opens with different options like device, target, output etc. First click on “target”.
- Since the set frequency of the microcontroller is 11.0592 MHz to interface with the PC, just enter this frequency value in the Xtal (MHz) text area and put a tick the Use on-chip ROM. This is because the program what we write here in the keil will later be dumped into the microcontroller and will be stored in the inbuilt ROM in the microcontroller.
- Now click the option “Output” and give any name to the hex file to be created in the “Name of executable” text area and put a tick to the “Create HEX file” option present in the same window. The hex file can be created in any of the drives. You can change the folder by clicking on “Select folder for Objects”.
- Now to check whether the program you have written is errorless or not, click on the icon exactly below the “Open file” icon which is nothing but Build Target icon. You can even use the shortcut key F7 to compile the program written.
- To check for the output, there are several windows like serial window, memory window, project window etc. Depending on the program you have written, select the appropriate window to see the output by entering debug mode.
- The icon with the letter “d” indicates the debug mode.

- Click on this icon and now click on the option “View” and select the appropriate window to check for the output.
- After this is done, click the icon “debug” again to come out of the debug mode.

The microcontroller program is the most important part of our project. It is written in assembly language. [10]

### C. Programming Code

```
#include<REG52.H>
void delay(void);
interval10;
void delay(void)
{
int i;
for (i=0;i<10;i++);
for (i=0;i<10;i++);
}
void main(void)
{
bit mybit;
mybit = 1;
while(1)
{
mybit = !mybit;
P1 = mybit;
delay();
}
}
```

## VI. CONCLUSION

The project “programmable switching control for industrial automation in repetitive nature of work” has been successfully designed and tested. It has been developed by integrating features of all the hardware components used and software also in which we have used C language. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced microcontroller and with the help of growing technology the project has been successfully implemented. We conclude that by implenting these systems we can access the live data and control the device interfaced with our system.

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