

# Sequential Automation Process Using Microcontroller

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**Abstract.** The final product of industry was reached through different stage since raw materials. Each stage has specific process and repetitive in nature. Each process made an automation with the aids of recent technologies. The microcontrollers is one which plays a vital role and it has more stability, reliability, minimal error and good performance. The microcontroller's function controls task logically called as switching state: ON and OFF. This aid is generally used for step-by-step processes. This project demonstrates about the operation of sequential process using the microcontroller from 8051 family. This application employs input switches to execute the programmed instructions. Even though the process is in repetitive nature, there are many operations are in industries to be carried out to produce an end product. Some products need to processed in certain time intervals. Finally, to achieve the required product, the proposed systems uses some different kinds of modes, like auto, set and manual according to the operation.

**Keywords:** Microcontroller 8051, Sequential Switching.

## 1 Introduction

Automation is the evolution introducing steam engines at the earlier stages are know using robotics and PCs to efficiently and effectively accomplish repetitive operations. Machines employed in industrial automation can also complete tedious jobs that aren't particularly appealing to workers[1]-[5]. When it comes to industrial automation technology, there are both benefits and drawbacks for an organization. If used wisely and efficiently, it can provide significant future possibilities. It comes in many shapes and sizes. The automation technologies have the efficient to create a most safe and economic environment, allowing lives to experience a decent standard in living and a better quality living. There are two types of automated machines: open loop and closed loop machines which the closed loop

machines finish the cycle stated earlier and then continue it until it is stopped, whereas open loop machines go through a cycle and then stop[6]-[8].

## **2 Literature review**

The literature review related to the research is subjected to searched over the past two decades to find the researches made by the researchers in the field of automation using microcontroller. Saito et al presented a paper about the home gate way developed system for interconnecting network and power line home automation network with internet. This provide remote access from internet for digital appliances. Al-Ali and Al-Rousan, a java based home automation system through world wide web and embedded system. Chen Peijiang and Jiang Xuehua has presented a paper which present GSM based SMS remote monitoring system which includes two parts which are monitoring through the remote monitoring system. Wijetunge et al has presented a paper on the basis of wireless network sensors like, RF, Wi-Fi, Bluetooth and Zigbee have been developed and monitoring through embedded systems.

### **2.1 Problem statement**

Technology has advanced such a lot within the last decade and it is also created more comfort which is affordable economically. The controlling of devices in personal mode can take man power and may take time to done the work. So, it requires to exceedingly systematic manner that is tried to implement in the system.

### **2.2 Componets**

The principle during which the project is predicated is fairly simple. First, the programming code is coded in the microcontroller. Then the switches are provided to modify the timing of the loads to be operated for particular interval in the sequential operation. The below listed componets are utilized

- Microcontroller (AT89S52)
- Voltage regulator (LM7805)
- Filter
- Relay driver
- Relay
- Push buttons
- LCD
- Diode
- LED
- Power supply

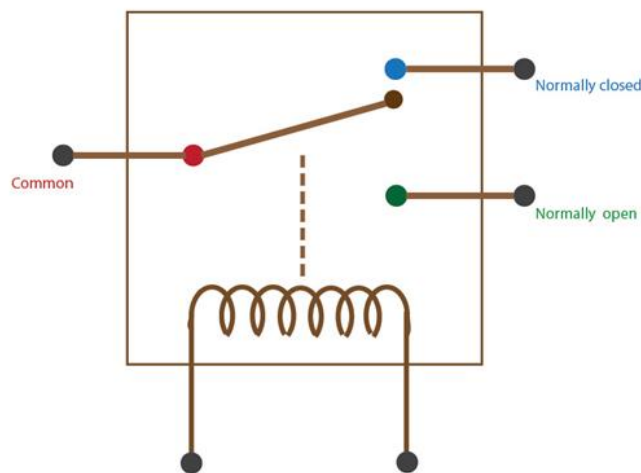
The AT89S52 microcontroller with 8k bytes is low strength and excessive performance. The tool is constructed with Atmel's excessive density nonvolatile reminiscence generation and makes use of the enterprise fashionable 8051 training set and pin out. The application reminiscence may be rewritten in machine or the use of a nonvolatile reminiscence programmer way to the on chip Flash. The Atmel AT89S52 is a effective microcontroller that mixes a configurable 8-bit processing unit with a machine programmable flash on a monolithic chip to

offer a enormously bendy and value powerful option to many embedded manage applications. The AT89S52 consists of the subsequent capabilities as fashionable: The microcontroller has a six vector stage interrupt architecture, and a complete duplex mode are all included. Built-in oscillator, serial port and timing circuitry The AT89S52 additionally has static common sense for low-frequency operation and software-selectable sleep modes. The contents of RAM are stored in Power down mode, however the generator is stopped, blockading all different tool capabilities till the following interrupt or hardware reset.

The LM7805 family of 3-pin polarity regulators are available and a variety of fixed output voltages for a wide range of applications. With sufficient heat dissipation, it can provide more than 1A of output current. Although these devices are typically designed as DC voltage regulators, they can be used with pairing components to produce variable voltage and current.

This project uses a capacitive filter. It reduces the unwanted noise from the rectifier output and smooths the DC current. As long as the mains voltage and load stay constant, the output of this filter will remain constant. Any change in any of these variables will change the DC voltage received at that moment. Usually, a small amount of current is only required for cathode rays and other vacuum tubes.

Darlington transistors is a single array of high voltage and current. A darlington pair has a rated collector current of 500mA. Relay, hammer, light, display, line drivers, and logic buffers are some applications. Each darlington pair on the ULN2003 is equipped with a 2.7 kW base resistor in series for direct operation with 5 V TTL or CMOS devices.



**Fig. 1.** Relay switch.

Switch which is electrically controlled is called relay. Electromagnetic principle is employed and also mechanically control the switching mechanism. Relays are used when a low-power signal is required to control a circuit, or when a single signal needs to control multiple circuits. Relay coils carry a lot of current, usually 30mA for 12V relays but up to 100mA for lower voltage relays. Most integrated circuits cannot supply this current, so transistors are typically insisted to increase the current to the higher level needed to the relay coil. The common 555

timer IC's maximum output current is 200mA, therefore these devices are suitable. Without amplification, it is possible to supply relay coils directly.

The main switching operation for operating any part of a machine is the pushbutton, or simply pushbutton. Buttons are usually made of hard materials such as plastic, etc. Usually, the surface is flat or contoured so that a person's finger or hand can easily press or press down. Some buttons that are not biased require a spring to return to the undepressed state, but buttons are the most commonly biased switches.

LCD consist of materials that combine the properties of liquids and crystals. They have a temperature range over which molecules move almost as in a liquid, but are filled with crystal-like structures. Crystalloid offers TN and STN dot matrix LCDs with and without backlight in TN and STN variants. You can connect these modules using either a 4-bit or 8-bit microprocessor or microcontroller. The DC current is converted into AC current with the diode. Below, the numbers and allowable voltages of some of the most popular diodes on the market. The maximum allowable reverse bias voltage of the diodes are 50V and the maximum carrying capacity of forward current is 1 amp. Diodes with similar characteristics are interchangeable. Also, a larger diode can be used in place of a lower capacitance diode, but a smaller capacitance diode cannot be used in place of a larger capacitance diode. For instance, instead of IN4002; IN4001 or IN4007 can be used in place of IN4007.

Light Emitting Diodes are semiconductor devices. It is like a transistors and other diodes which are made of silicon. LEDs emit light due to minimal chemical impurities added to some chemical materials like, silicon, gallium, arsenic, indium and nitride. A photon is emitted when a current is passed through the semiconductor. In an ordinary light bulb, it produces light by heating the filament, because LED's produce photons directly rather than through heat. Electronic equipment or products require a reliable power supply to operate. Almost every device in your home, such as TVs, printers, and music players, has a built-in power supply that converts AC power to DC voltage to keep it running. Converts AC power to 12V DC thanks to its own rated current. The system requires a 12V input power supply and can be converted to a 5V output using the IC7805 voltage regulator.

### **2.3 Implementation**

This project is designed to work the same way as a PLC for specific tasks such as time-based programmable sequencing of loads. As previously explained, the 4 loads are used separately from the 4 relay contacts controlled by the relay driver IC ULN2003. Auto mode, set mode and manual mode were the three different modes of working. When manual mode is selected, four additional buttons are available for manual activation of the relay. When auto mode is selected, microcontroller outputs 38-35 are raised to generate high logic levels on ULN2003 inputs 1-4. Corresponding pins 16-13 go low to turn that relay on. The difference in sequential operation time from one load to another can be changed up or down by selecting the setting mode by pressing the manual control and setting buttons respectively. As a result, you can choose the time interval between loads. If required, the load can be switched on or off via a relay using buttons 1 to 4 when manual mode is on. All of the following actions are displayed on the LCD to help you program the time and mode selection. A 230V to 12V stepdown transformer and a four diode that form a rectifier that generating pulsating dc, which is regulated by a 470 F to 1000 F is employed in the circuit. The filtered DC is yet pulsating, the regulator is utilised to

maintain a constant DC, which can range from 7V to 15V. The voltage at primary side varies from 160V to 270V in the secondary side, which is determined by the formula  $V_1/V_2=N_1/N_2$ . The operating modes (i) Auto mode: In this mode it works automatically for the time settings which is already programmed. (ii)Manual mode: In this mode it operates while the switches are pressed to the required time of operation. (iii)Set Mode: In this mode, it operates in the default mode by the instructions provided by the programming codes as shown Fig. 2.1 – Fig. 2.3

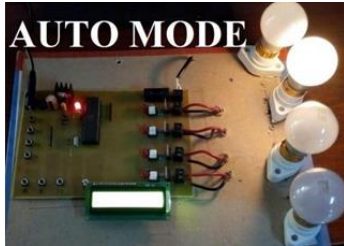


Fig. 2.1. Auto mode.



Fig. 2.2. Manual mode.

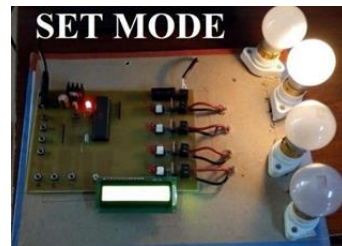


Fig. 2.3. Set mode.

## 2.4 Results and Conclusion

Several statistics had been found after the undertaking changed into finished in all stages. Following that, it's far defined why those outcomes had been received. Operation-orientated devices need to be hired to gain surest automation performance. This is because of timing problems visible in the course of load operation, which is probably averted via way of means of using a accurate controller. While one-of-a-kind system may also produce comparable outcomes for a given task, a few may also provide more device flexibility than others. This changed into decided after it changed into found that a microcontroller lets in for greater bendy load control.

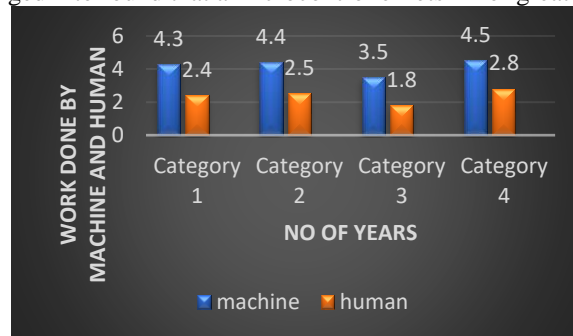


Fig. 2.3. Comaprision of workdone by machine and human

Once the design of the entire production line is complete, a system cost estimate can be developed. The human-machine interfaces (HMI)can also be developed for monitoring and remote control of process variables and system performance. Although the HMI system is very useful, it is not recommended for use in this application. HMI systems are undesirable because the high cost of installing HMIs means that the systems can operate normally without them. This project was considered for the production line and it is scalable. Many operations can be

done in the future to update the entire line of production. Likely, the processes on the line must be integrated, and synchronization between the processes considered in this project is required.

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