

# PLC based Time Management System

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**Abstract** – The world over the decades has made considerable advancement in automation; automation is applicable in homes, industries, commercial and educational sectors. To schedule the time and break periods, PLC (Programmable logic control) is used. For every start or end of period siren is automatically rang. This design finds a tremendous use at domestic and industrial sectors where the teaching/ working sections can span over periods including breaks. The advantage here is that the siren rings at the start of each period without any human intervention to a great degree of accuracy. The time schedule results are compared with that obtained with a clock. The PLC 14SSR works with great accuracy and controls all functions. For interfacing HMI DOP-103BQ is used.

**Key Words:** PLC, HMI, Time Management, Automation, ladder diagram

## 1. INTRODUCTION

The world is running a race against time. As much as it is important to schedule our tasks, it is also important that this schedule is being followed. For industries and educational institutions that too, time keeping forms a vital but invisible task.

### 1.1 Introduction to PLC

A programmable logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability, ease of programming and process fault diagnosis [15]. PLCs can range from small modular devices with tens of inputs and outputs (I/O), in a housing integral with the processor, to large rack-mounted modular devices with a count of thousands of I/O, and which are often networked to other PLC and SCADA systems. They can be designed for many arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery backed-up or non-volatile memory. 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.

## 1.2 Introduction to Time Management

Time management is the process of planning and exercising conscious control of time spent on specific activities, especially to increase effectiveness, efficiency, and productivity. It involves a juggling act of various demands upon a person relating to work, social life, family, hobbies, personal interests and commitments with the finiteness of time. Using time effectively gives the person "choice" on spending/managing activities at their own time and expediency.[1] Time management may be aided by a range of skills, tools, and techniques used to manage time when accomplishing specific tasks, projects, and goals complying with a due date. Initially, time management referred to just business or work activities, but eventually the term broadened to include personal activities as well[6]. A time management system is a designed combination of processes, tools, techniques, and methods. Time management is usually a necessity in any project development as it determines the project completion time and scope [7]. It is also important to understand that both technical and structural differences in time management exist due to variations in cultural concepts of time. The major themes arising from the literature on time management include the following:

- Creating an environment conducive to effectiveness
- Setting of priorities
- The related process of reduction of time spent on non-priorities
- Implementation of goals.

## 2. LITERATURE REVIEW

Implementation of automatic college bell system using arduino by Burgoji Santhosh Kumar is used arduino for college time management system. The whole point of the "Arduino Platform" is to allow for easy and fast prototyping. Being able to just hook up an LCD and be able to display messages on it in a matter of minutes, instead of hours, is just amazingly powerful and convenient when you have an idea in your head and just want to see if it works. When you need more control and are actually thinking on converting your prototype into a real product, then yes, you need to get deep down into the microcontroller and get rid of all the excess fat, trim the circuit to just the bare bones, optimize the code, etc. For prototyping, the Arduino platform gives you a lot of pre-wiring and free code libraries that will let you concentrate on

testing your idea instead of spending your time building supporting circuitry or writing tons of low level code. Drawbacks: Small LCD display, fixed time table (preloaded according to program), complex circuit and hard find fault if something goes wrong[1].

Automatic School Bell with User defined Time Schedule by Syed Naveed Uddin, Mohd Omer Nawaz, T. Kalinga Raj, Shaik Mahammed Rasool is used microcontroller for time management in school. Only one time table can be feed at a time. Keypad gives access to manage time in between lectures. This will ring the School Bell at pre-scheduled times of periods on each day. There are different times per period varying from one school to the other. The basic design provides an opportunity of selecting the suitable time schedule for every school by momentarily pressing one of the push-toon switches. This signals the microcontroller to carry out the specific task, thereby ringing the bell at a regular time interval. Drawbacks: The heavy duty bells cannot be operated on such kind of system[2].

Microcontroller Based Automatic College Bell with Monitoring System by Aakanksha Rannaware, Snehal Girhepunje, Nupur Shal, Shweta Butoliya, Prof. S.A.Bagal, The task of ringing bell automatically is carried out in this paper It has an inbuilt Real Time Clock which shows the real time. When this real time equals to the bell ringing time then bell is switched ON following relay. The time is display on LED Scrolling Display Board. In this project the author implemented the idea of wireless communication between mobile phone and display board. Drawback: GSM module in this project uses recharge amount for communication of mobile phones. LED segments have complex circuit[3].

Automated College Bell System with Wireless Control by Vaishnavi.D.R, Neha Khanum, Apoorva Singh A, Sumaya Afreen Publication, In this paper for wireless commutation Bluetooth model is used. The navigation method and UI allow the operator to navigate around the system in a hassle free manner with less dependency on user instructions. Drawback: Range of Bluetooth is limited for specific meters. It will drain out mobile battery if Bluetooth is working all day [4].

ARDUINO based automatic electrical bell by Dhruvi jhala1, Shweta Rathore, Sandhya Chauhan, Samira Pandya, This paper features Arduino and RTC for time management. The program and time table is preloaded in this system. If the system fails the author has provided 3 push buttons on which we can operate the system manually. Drawbacks: The system is less reliable and has less accuracy[5].

**3. METHODOLOGY**

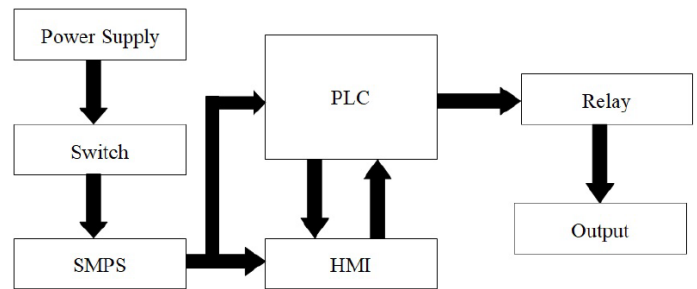


Figure 3.0: Block Diagram of Project

The above figure shows block diagram for PLC based school, college and industrial time management system. This project is energized by AC 230V power supply followed by main switch, SMPS, PLC and HMI (For Human Interface) and at the output end relay and buzzer is connected.

**3.1.1 Power Supply**

The power supply provides power to the PLC by converting the available incoming AC power to the DC power required by the CPU and I/O modules to operate properly.

**3.1.2 Switch**

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. In this project it is used to turn on the main supply for panel and also for safety of it.



Figure 3.1.2: MCB

**3.1.3 SMPS**

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical

power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as a personal computer, while converting voltage and current characteristic. In this project we have used SMPS to power PLC and HMI, it has only two positive and two negative terminals so further we have connected it to power distribution.



Figure 3.1.3: SMPS

### 3.1.4 PLC (Delta-14SS2)

Programmable logic controller (PLC) is a control system using electronic operations. Its easy storing procedures, handy extending principles, functions of sequential/position control, timed counting and input/output control are widely applied to the field of industrial automation control. Delta's DVP series programmable logic controllers offer high-speed, stable and highly reliable applications in all kinds of industrial automation machines. In addition to fast logic operation, bountiful instructions and multiple function cards, the cost-effective DVP-PLC also supports various communication protocols, connecting Delta's AC motor drive, servo, human machine interface and temperature controller through the industrial network. So for this project we have used delta 14SS2 PLC[13].



Figure 3.1.4: PLC 14SS2R

### 3.1.5 HMI

A human machine interface (HMI) is a platform which permits interaction between users and automation equipment. Delta's HMI products provide various communication ports for fast communication and convenient control of a diverse range of machines, systems and facilities. The color touchscreen enables intuitive parameter entry and a variety of ways to display variable data, including trend graphs and alarm elements. The high resolution LCD display visualizes operating, monitoring and efficient control in real time. In addition, the user-friendly editing software guides users in quickly creating easy-to-navigate visual icons and easily designing intuitive monitoring screens for applications, while making adjustments, scheduling, and programming operational sequences that enhance flexibility and save development time. This achieves rapid system development that simplifies wiring and installation, saves operating expenses, and makes systems more efficient, eliminating time-consuming adjustment and additional maintenance costs[12].



Figure 3.1.5: Delta HMI DOP-103BQ

### 3.1.6 Output

At the output relay is connected to siren .A siren is a loud noise-making device. In this project used as bell, the audible range for his siren is about 500 meters (in open areas).



Figure 3.1.6: Siren

### 3.2. SPECIFICATION

#### 3.2.1 Specification of the Project:

INPUT: 230V AC

OUTPUT: Buzzer Sound (According to time interval)

Hardware: DVP-14SS2(Delta PLC), DOP-103BQ (Delta HMI)

Software: DOPsoft 4.0.0.1(HMI Programming)

WPLsoft(PLC programming)

#### 3.2.2 Specification of computer (Laptop) system used for programming PLC and HMI

Software:

Operating system Windows 10

WPLsoft

DOPsoft

Hardware:

Intel core i5 2.20GHz

520 GB Hard Disk

4GB RAM

### 4. RESULT

#### 4.1 Delta HMI in Offline mode in laptop

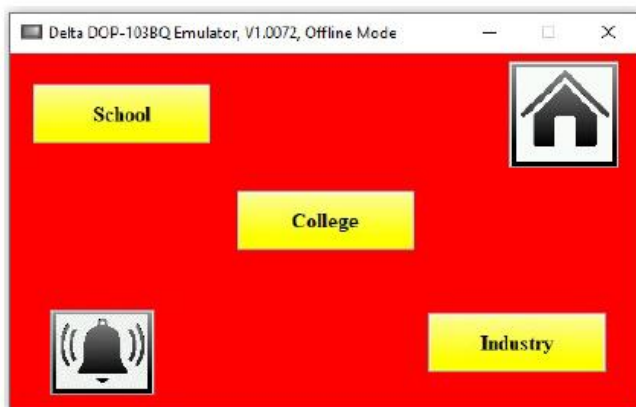


Figure 4.1: Screen of HMI

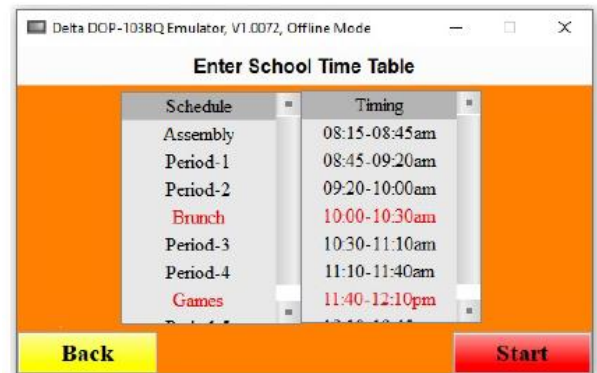


Figure 4.2: School time table of HMI



Figure 4.3: Industrial time table of HMI

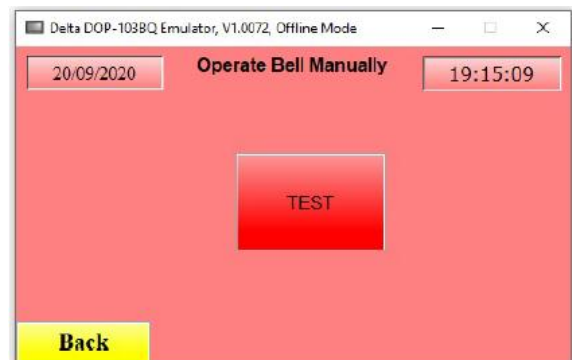


Figure 4.4: Test screen of HMI of HMI

### 4. CONCLUSIONS

Present day ringing the bell in colleges, schools and sirens in industry are carried out manually. The main disadvantage of this is that one person has to be alert for this. At the same time during that time he could not be engage in another task. To overcome from this, we have decided to prepare the PLC based project which will be operated automatically and the ringing of bell will start by its own time. The time input can be edited as per requirements. We can say that it will be much useful for colleges, schools and industries.

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**BIOGRAPHIES**


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