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Queue Control System Using 8051 Microcontroller

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Abstract: ***Queue control systems are required to control the excessive queues in banks, temples, hospitals, shopping malls, airports, railway ticket counters, customer service centers, food court etc. These queue control systems introduced by the company or service provider not only control the queues of the customers but also ensure the provision of a better service. The existing technology provides us with a lot of such efficient control systems in different sectors. The current project aims to provide an efficient and low-cost, low-power queue control system in temples which can be used to control the odd situations like uncontrollable rush of people and stampede etc. In this project we have used a low-cost 8-bit microcontroller and a dc motor which is entirely software controlled. The control programs have been developed using Keil software and simulation is performed through Proteus simulation tool. The main innovation of this work is to allow and restrict only 12-15 persons per queue which enables to maintain a smooth functioning of a queue and also it reduces the visitors long waiting time. On a large scale it can be used along with different counters so that each visitor gets a chance to visit the temple in a reduced amount of time.***

Keywords":Queue Control Systems, Microcontroller, Queue Model

I. INTRODUCTION

The twenty first century is an eye witness to the fascinating industrial and technological inventions that not only boosts the speed of every single aspect like production, manufacturing, operations, quality control etc of an organization but it also results in faster execution of instructions. These developments and advancements increases a lot of workload on a particular individual in turn making them always stay in a crunch of time. And in this scarcity of time if an individual has to stand for long time waiting for their chance to avail the services required by them may lead them to get frustrated and discontented. The process of long waiting time is tedious and is very inefficient.

Electronic queue control systems are used to control queue in public or private places be it temples, banks, hospitals, food court, shopping malls, indoor and outdoor stadiums, ticket reservation counter etc. Also now-a-days ancient temples having vast and rich culture are also employing this technique so as to control the excessive rush of visitors who wants to have a glimpse of their favorite deity the moment they enter the temple which is not possible due to a long queue outside or within the premises.

Our main aim in this project is to design a queue control system which will have a check on the unnecessary rush of the visitors and also it will reduce the waiting time of the visitors. Instead of standing in long queues, visitors

may sit down and might learn some useful information like the history of the temple and about the other philanthropically related activities in which the temple is engaged and also they may provide a helping hand in doing some voluntary services like offering food, sweets etc to others. On a large scale it can be used along with different counters so that each visitor equally gets a chance to visit the temple in a reduced amount of time.

II. DESIGN AND IMPLEMENTATION

The project Queue Control System is designed and developed to provide queue control in places where situation like uncontrolled rush of people may occur. Also it leads to effective usage of proper management of crowds by saving time of the customers/persons in arrival/persons to visit and also by saving time of the staff. Queue control systems play an important role where there is a huge rush of people in places like international airports, cultural concerts, railways, banks, tourism places, open meeting etc. This project/prototype may be developed on a large scale to benefit the society for the same.

The project essentially consists of following sections or modules: Power supply module, Microcontroller, Entry and Exit gates, Mechanical Barrier, 7-segment display system.

The controller used in this project is AT89C51 with a crystal oscillator frequency of 11.0592 MHz. The block diagram below shows the basic section of the electronic queue control system designed, and the analysis of the system is based on the sections, the equipment split-units and associated circuitry.

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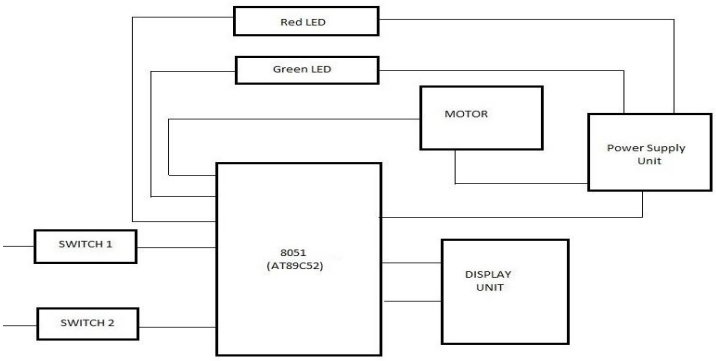

Fig.1: Block Diagram of Queue Control System

III. METHODOLOGY

The system consists of both hardware and software design stages.

A. Hardware Design

The hardware part is divided into three parts as microcontroller circuit, proximity sensors with motor circuit and display unit. The overall circuit is shown below.

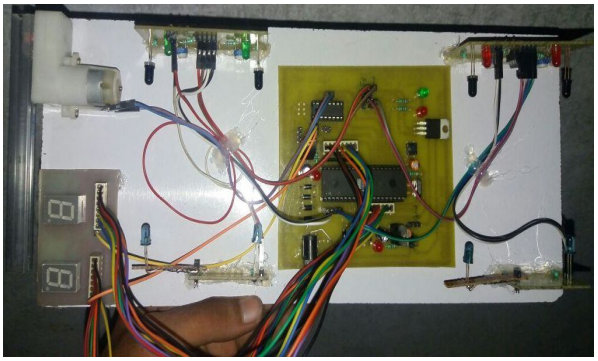

Fig. 2: Hardware Diagram of Queue Control System

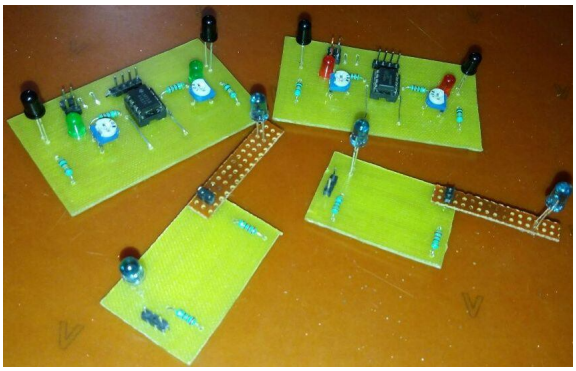

Fig. 3: Entry and Exit gates of the circuit

Three conditions are observed in this project which is described below:

Case A: When we are about to switch on the circuit or when the circuit is in off condition. The display unit shows no values.

Case B: When the number of person starts entering are less than the maximum limit because of the simultaneous exit from the exit end, green led continuously glows indicating that the motor is in the anti clockwise direction keeping the barrier open. Here the value of counter starts to decrement. Display shows value 15 because this is the within the maximum limit a queue can accommodate.

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Case C: While entering the counter starts to increment and when a maximum threshold value of the number of persons is crossed (in this case 15) then the red LED glows and the value displayed is 99 and it causes the motor to rotate in clockwise direction and the physical barrier closes.

Initially through the power supply module mains supply is given which is of 220V. The power supply brings the microcontroller and the associated circuits to an ON state. The microcontroller the initial status of the 7-segment display unit is checked which displays "00" which means the entry and exit is in the idle state. As soon as the people start entering from the entry gate the up-counter starts counting and increases the count value which is displayed in the 7-segment display unit.

The system is currently designed for holding a maximum value up to 15. As the number of people increases starting from 1, 2, 3....15 the mechanical barrier stays open. The mechanical barrier is operated by a battery operated DC motor. When the count of people as displayed by the segment display remains up to 15 the green led glows continuously indicating that the threshold value is not yet reached and the entry circuit is working properly.

When the count value has reached a maximum, the red led glows. The red led circuit is connected to the controller and to the dc motor. The barrier closes when the motor turns in the clockwise direction indicating it with red led.

In the entry and exit circuit the IR sensor circuit is used which is an equivalent circuit of IR led and a photodiode. The entire process is repeated from time to time and it totally depends on the maximum number of people entering or exiting.

B. Software Design

The software part is developed with the help of keil software. Given flow chart helps the program to execute the instructions systematically on the microcontroller thereby generating a required routine and sub routine program.

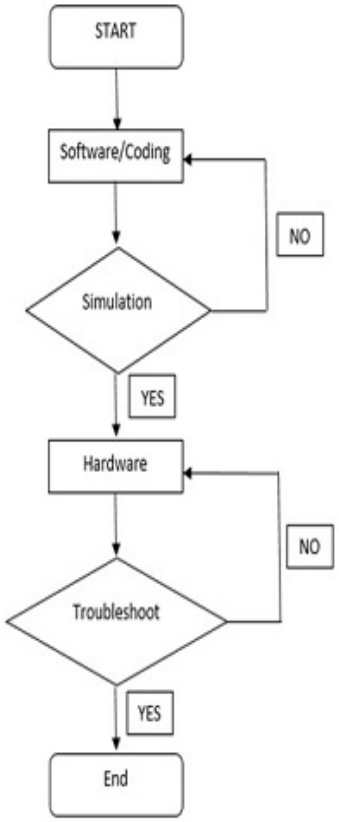

Fig. 4 Flow Chart for Software

IV. RESULT

Miniature working model of the proposed microcontroller based intelligent queue management system was successfully designed and implemented. Minor changes were included in the software to make the system more adaptive to the environment.

Case I: When counter is at initial position.

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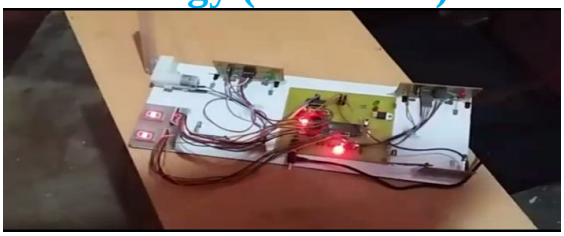

Fig. 5 Initial Counter status

Case II: When counter counts above 15, the mechanical barrier closes.

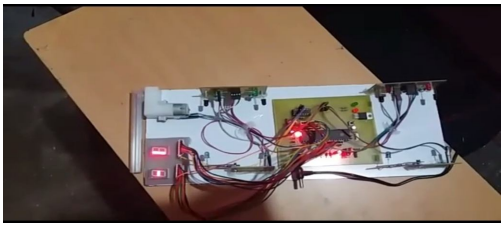

Fig. 6 Counter status above 15

Case III: When the counter starts decrementing from value 15 and reaches 12, mechanical barrier opens.

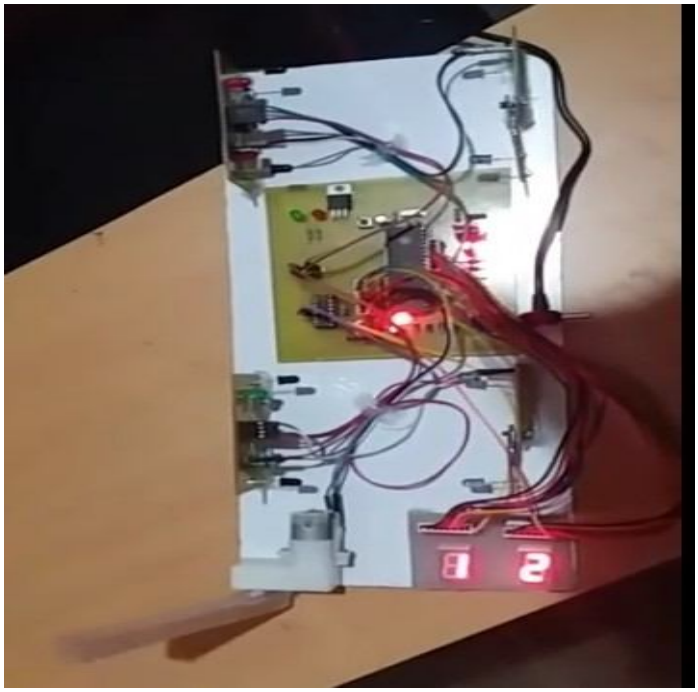

Fig. 7 Counter status below 15

V. CONCLUSION

A queue control system for quick and efficient management of queue has been designed. The proposed system may seem simple in design but it has wide range of practical applications in our daily lives. The system brings about quick and easy management of queue with very little cost and can be successfully implemented in medium crowd environment.

The low power requirements and easiness in configuration greatly enhances the portability if the system enabling it to be used with battery for sufficient amount of time. The reliability of the system can be enhanced by future modifications and the cost can be further brought down by mass production.

With this project the customers/persons in the process will be able to wait in line and once there is an alert the customer or persons in the queue knows what is going on in the process and will know what action to be taken. The server or attendant will be able to

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attend to more than one person at a time i.e. do a capacity or processor sharing type of service discipline. Also the attendants or servers will be able to keep track/count of the number of people or customers that have been attended to but cannot keep count of the number of customers or persons in the process at any particular time; thus, with this ability to keep count of persons or customers that are served or attended to, the efficiency and the average number of persons served can be calculated.

It is discovered that this project will be able to be implemented in areas where the only physical queuing is practicable, and more realistic for queuing discipline of first come first served (FCFS) though flexible in environments where processor or capacity sharing and service in priority can be practiced; also noticed is that to an extent the service discipline of pre-emptive resume can be observed wherever is implemented to manage queues.

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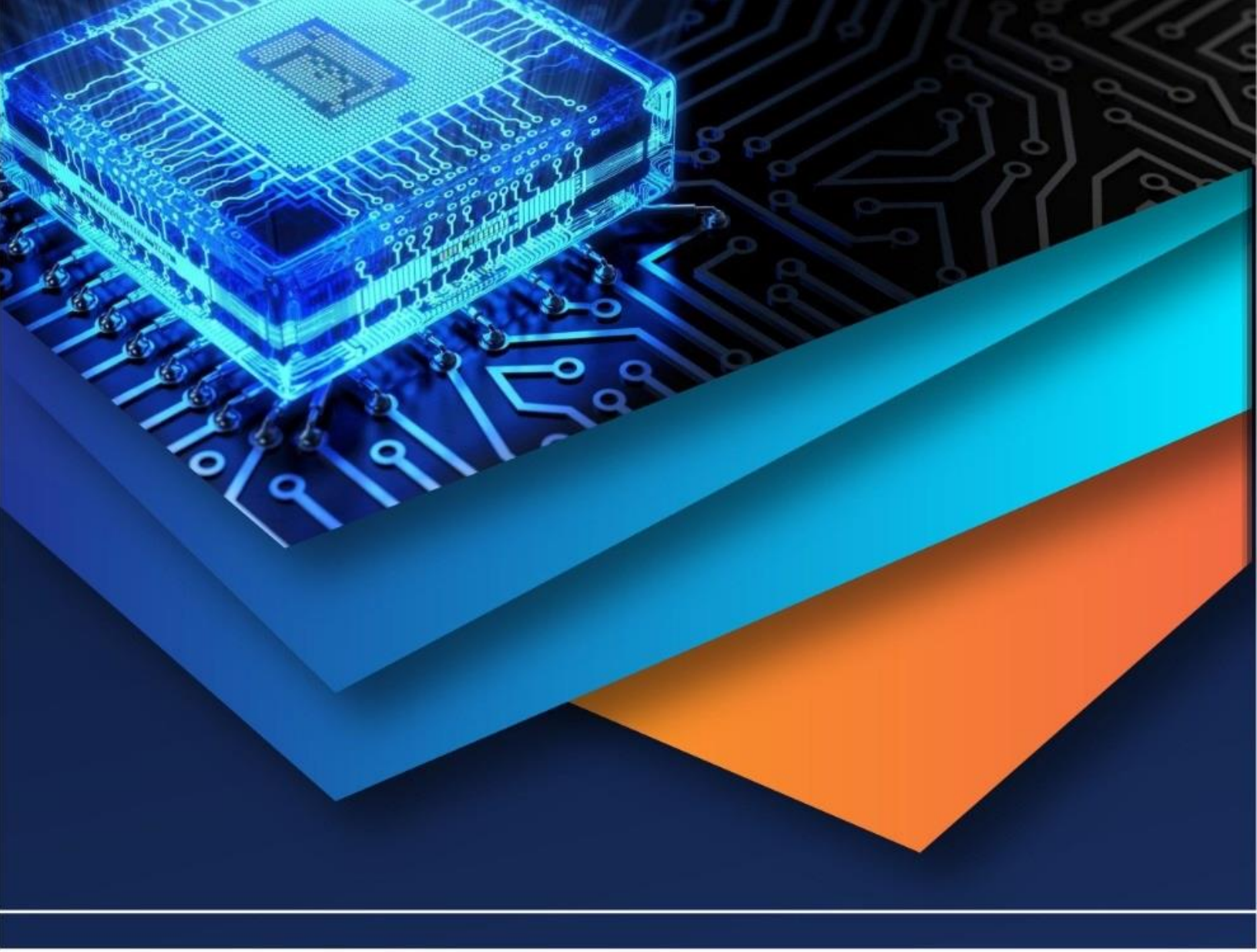

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