Microcontroller Based Electronic Queue Control System

Gummadi Lahari[1], J Swetha Priyanka[2] and Muske Vamshi Krishna[3]

[1,2,3]*Vardhaman College of Engineering, Kacharam, Hyderabad, 501218, India*

Abstract

A low cost, portable micro-controller based Electronic Queue Control(EQC) system has been created for use in banking, hotel reservation counters, ticket counters, customer care centers, among other places. The created systems goal is to keep a queue in order and efficiently. The counter number and token number are displayed on the LCD in this system. The First-In-First-Out method is used to number the items. The systems were build around a low cost 8-bit PIC micro- controller and were completely controlled through software. The control programs were written in the C programming language. Then system is put to the test in a variety of scenarios in order to assess its performance. Finally, the counter number and token number will be displayed while push buttons are pressed.

Keywords

Crystal Oscillator, Display, Electronic Queue Control System, First-Come-First-Serve, Micro-controller.

1. Introduction

A sequence control system[15] is a method of arranging people in queues at a business or a government office. It might be reactive, like a system that organizes the current queue, or proactive, like a sequence control statistics collecting control that discovers and forecasts trends. When they encounter a long line, the system directs them to the nearest post or issues them a ticket. Consumers are removed from the waiting line sequence using a ticketed approach, which may provide luxury and relieve anxiety for customers while also ensuring that their turns are not forgotten. [1] The answer is a microcontroller based electronic queue management system. It simply implies that a consumer will not be required to wait in a line from beginning to end. Rather than standing in a long line, customers may sit down and read or finish a job. [11] This is beneficial to clientoriented organizations such as telecommunication firms' customer service centres, banks, hospitals, insurance companies, local government offices, and post offices. [12] Electronic queue control technology is available from a variety of manufacturers across the world, although it is quite expensive. The purpose of this project is to make low-cost equipment from of materials that are readily available in the area. [2] In this field, electronic sequence management solutions are being developed. In the suggested systems, several customer service counters can be maintained at the same time on a first-come-first-served (FCFS) basis. First-Come, First-Served is a strategy that prioritizes the input processing. People depart the queue in the order in which they entered, according to the First-Come-First-Served policy. It is the most equitable service provision when all clients think they are on an equal level. [7]

ACI'22: Workshop on Advances in Computation Intelligence, its Concepts & Applications at ISIC 2022, May 17-19, Savannah, United States
EMAIL: lahari7741@gmail.com (A. 1)

Figure 1: Long Queues

2. **Related work**

Long lines are a challenge for customer service-oriented businesses these days. Banks, post offices, and airports all had issues, and they became worse as rush hour approached. Customers and staff would be frustrated and uncomfortable as a result of poor queue management. Customers would opt to utilize other service providers that offer better services, which will reduce employee work satisfaction. [10] "A client is five times more likely to defect to a competitor if the issue is related to services rather than pricing or good," according to Brain MNC Net, a worldwide management consulting firm. Furthermore, "there are another 26 disgruntled consumers who have kept silent for every customer complaint." [9] According to Lee Resources International Net, in order to attract clients and sustain a profitable business, each firm must give exceptional service. Queuing, in reality, is a line of people waiting [14] to be served that moves from a central position to a specific spot. As a result, a sequence control system should function and coordinate sequence production efficiently. [8] The research employs a queue management system in smart queue management systems to investigate effective time management in a variety of applications. Because it uses GSM technology, a personal computer as the main server, and a microcontroller, the system is embedded. A master controller VB programme maintains the whole system, and the PC is accessed through a standard RS232 interface (Serial Communication). Despite the fact that the system was designed for clinical usage, i.e., doctor–patient communication, it may be changed and extended to suit a variety of other applications. The system's three key components - GSM, PC, and microcontroller - are all significantly reliant on accurate synchronization. The technology is increasingly being put to the test, and the results are promising. [6] The system flow includes the GSM modem, the Server PC, and the Micro-controller. The GSM modem is the system's hardware connection. The entire procedure is controlled by proprietary VB6 code. Embedded C code developed using the Keil compiler controls the microcontroller. [12] The server's display unit, as well as the room's power automation, are controlled by the microcontroller. The entire system is controlled by "Token Manager," a custom-built VB6-based software. It receives messages from the GSM modem through the RS232 port, decodes them, sends an acknowledgment to the GSM modem, and performs various actions depending on the received message. [3] In addition, the programme develops and maintains a database for logging patient data. The functioning of the system might be difficult. The process is broken down into the following steps: Receiving and decoding messages from users. Sending an acknowledgement to the user, as well as updating the queue database. Showing tokens and delivering messages to users 30 minutes ahead of time. It is now their turn. Clearing out the backlog.[5] The project Hospital Service Sequence Management System with Wireless Method suggests a new technique to queue management that would reduce public displeasure. The concept was inspired by observations of people queuing for services in hospitals and offices [12] without committing to a time estimate for their needs. Waiting for a service is inefficient and wastes a significant amount of time from the patients' productive time. Instead of physically queuing, we devised a way that allows people to monitor their line status using their distant portable devices. Consumers, hospital visitors, and everyone else may use web technology to access their lines remotely through the Internet, meeting the project's aim of offering a tool to manage office queues online. The outcomes benefit both parties in terms of managing their time for their other interests and hospitals in terms of commercializing their huge area. [8] Customers,

patients, and stakeholders may view their lines remotely through the Internet using a web application, achieving the project's goal of providing an online tool to manage hospital waits. Both parties profit from the outcome in terms of managing their time for other interests and hospitals benefiting from commercializing their wide territory.

3. **Methodology**

Pic Microcontroller consists of 40 pins. It has 33 IO pins. As these digital pins are only IO pins we cannot see what is happening inside the microcontroller. In order to process that we are using an LCD. LCD is an output device which is showing what's happening inside the micro-controller. In programming we have written the code in such a way that we are using a variable which is a space in the memory. So, whenever the person presses the push buttons then the variable gets incremented. Whenever the variable gets incremented then the count also gets incremented, that count is displayed on LCD. The whole process works on 5v, as 9V battery is used, the battery is given to the regulator 7805C which gives 5v. In PIC microcontroller, microcontroller works from 5V to 6.6V. So, the 5V power supply is given to microcontroller. Crystal Oscillator which is of 4MHz, each cycle it will oscillate for 12 machine cycles, one instruction will be executed. Twelve times it goes high and low, high and low, first instruction is executed. If anything goes wrong then press the reset button it starts from the beginning.

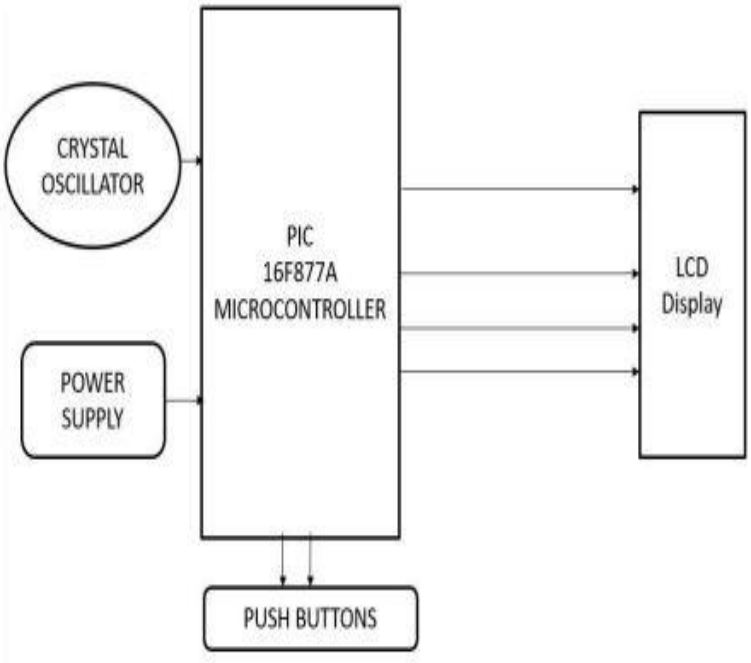

Figure 2: Block Diagram of Microcontroller based electronic queue control system

The components used in the project are crystal oscillator, PIC 16F877A microcontroller, LCD display,9V battery, Push buttons. The block diagrams explains all the components that are used in developing the project and the complete overview of the project.

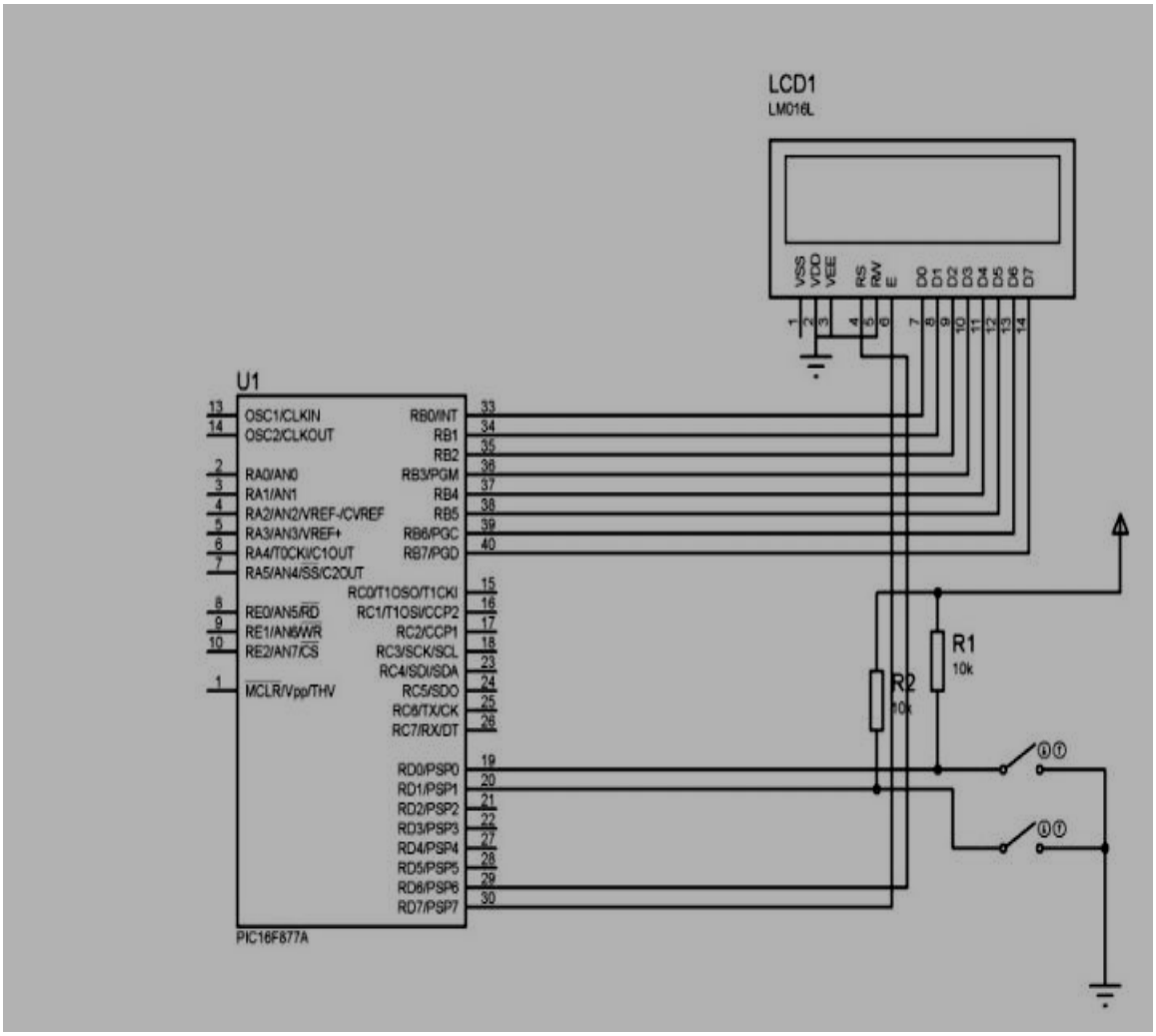

Figure 3: Circuit Diagram of Microcontroller based electronic queue control system

The circuit diagram explains the connections between the components. PIC microcontroller has 40 pins. The pins in microcontroller numbering from 33-40 are connected to the digital pins(D0-D7) of LCD display. The crystal oscillator is connected to 13 and 14 pins of microcontroller. Code is dumped into the microcontroller through RS232 serial port.

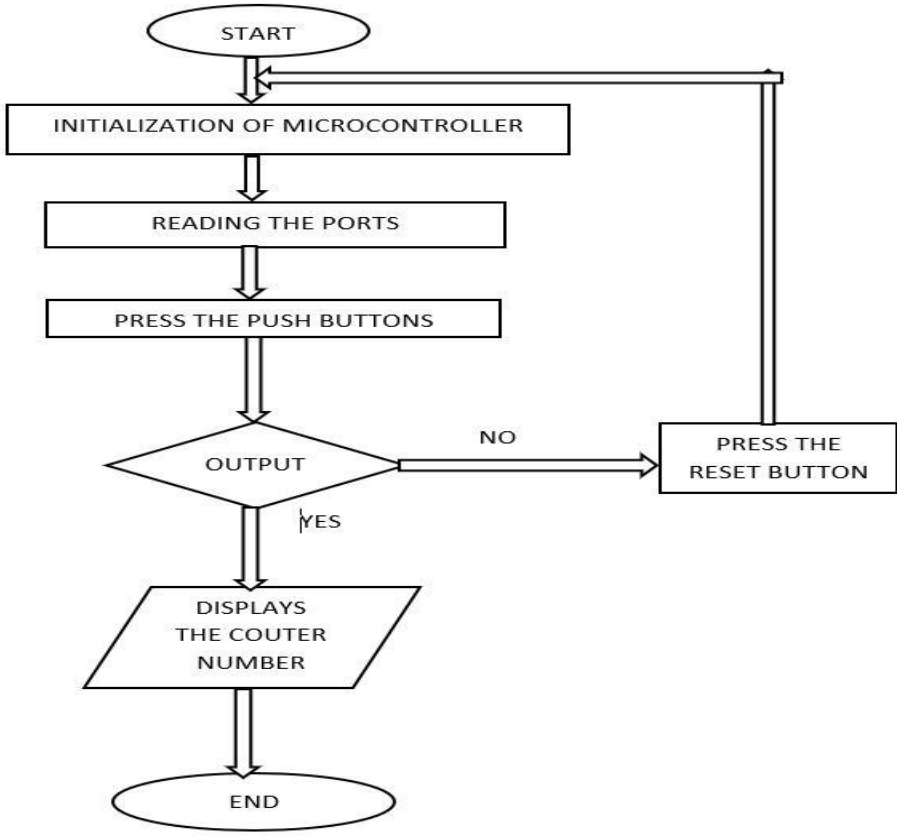

Figure 4: Flow Chart of Microcontroller based electronic queue control system

The steps involved in working of the project are: 1) Start 2) The microcontroller gets initialized as power supply is provided to it. 3) As the ports in the microcontroller are used so as soon as the microcontroller gets initialized the ports are read. There are four ports in the microcontroller. The four ports are Port A, Port B, Port C and Port D. Whenever the push buttons are pressed the corresponding ports are read and the counter number along with token number are displayed on the LCD. 4)In this way the token numbers and counter numbers are incremented and corresponding person will complete their work according to their corresponding token numbers.

4. **Hardware Implementation**

The components used in the project are: PIC 16F877A microcontroller, LCD display, 9v battery, push buttons, resistors, capacitors and 7805C voltage regulator. The above is the hardware implementation of the microcontroller based electronic queue control system.

Figure 5: Microcontroller based electronic queue control system

5. Software Implementation

PIC Microcontroller is used. So the code is dumped into the microcontroller by using MPLAB software [4]. The programmable pin in the microcontroller is pin1. Code is written in C language as it is easy to understand and easy to identify the errors if any.

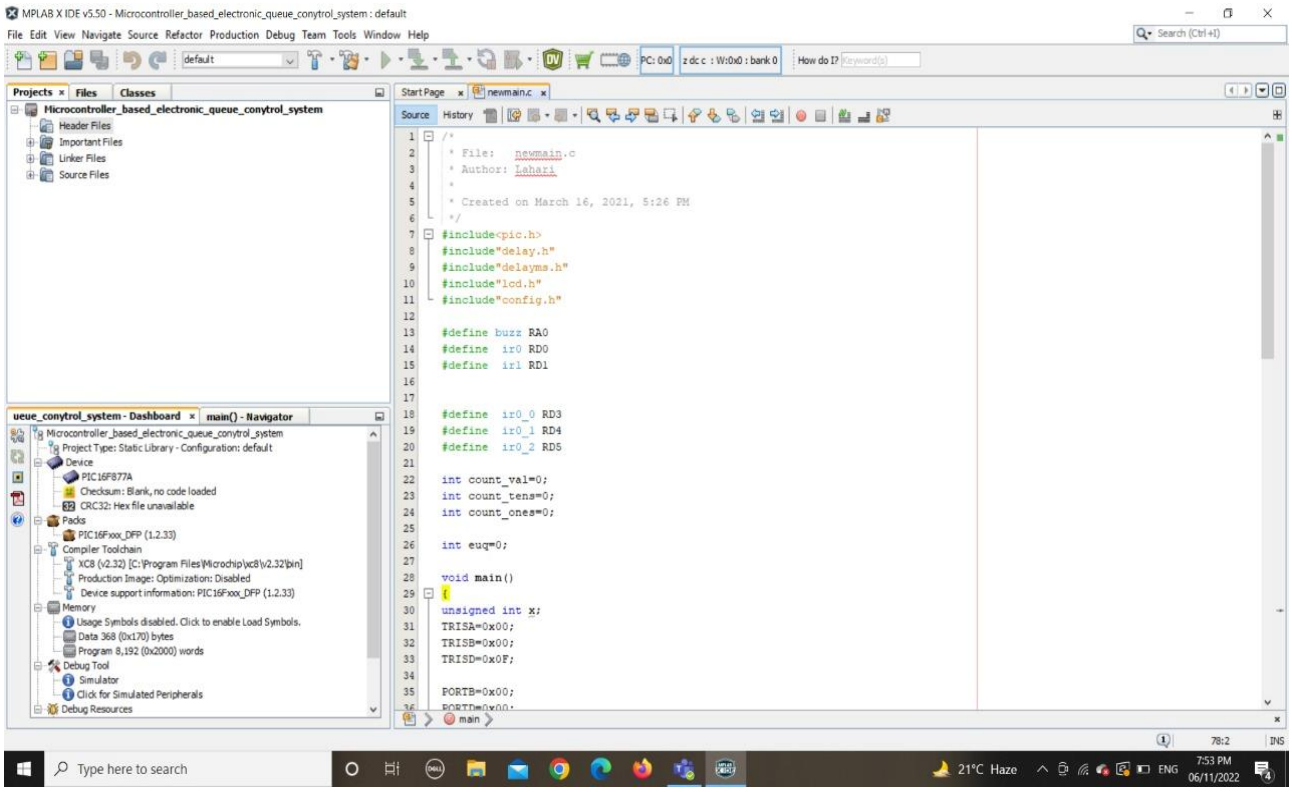

Figure 6: Program Code in MPLAB software

6. Results

The queuing system is based on FIRST-COME-FIRST-SERVE scheduling.

Maximum Length

The electronic queue system can display [11] the numbers from 1 to 6 and again it can display the numbers in reverse order. As we are using the LCD display we can even see counter number as well as the other data that one want to display.

Cost Analysis

The overall product cost is very less. The overall cost of the product is Rs.700.

Specifications of project

As this is the cost effective this can be installed anywhere very easily. The project is cost effective. It is very efficient. The waiting time also reduces.

Comparative Analysis

The existing projects are very costly and they uses WiFi. If WiFi is unstable then the token numbers would not be displayed. The existing projects are very complex and they cannot be easily installed. The current project doesn't uses any WiFi, instead the project has buzzer and LCD so whenever the push buttons are pressed the token numbers are displayed on LCD and the buzzer makes sound. So the corresponding person can do his work. The project is very simple and the project is easy to install anywhere as it occupies very less space.

Output

The token numbers and the counters numbers are displayed on LCD.

7. Conclusion

A queue control system has been built for rapid and effective queue management. Although the suggested system appears to be basic in design, it has a wide variety of applications in our daily lives. The technique allows for rapid and easy queue control at a low cost, and it can be effectively deployed in medium-sized crowds. The system's mobility is substantially enhanced by its low power consumption and ease of configuration, allowing it to be utilized with a battery for an extended period of time.

Future Scope

Further, this project can be improved by adding GSM module to send the messages for the person who is in queue and conform their reservations.

8. References

[1] R. J Tocci, 2000, Digital Systems. New Jersey: Prentice-Hall, 7'edition

[2] Iovine, John. PIC microcontroller project book. McGraw-Hill Professional, 2002
[3] Obulor R. and Eke B. O., "Outpatient Queuing Model Development for Hospital Appointment System" International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-4, ISSN: 2395-3470, April 2016.
[4] Gurumurthi, S. Benjaafar, S. (2004), Modelling and Analysis of Flexibile Queuing Systems, Wiley Periodicals.
[5] Maister, David H. (2005), the psychology of Waiting Lines.
[6] Md. Nasir Uddin, Mm Rashid, Mg Mostafa, Belayet H, Sm Salam, Na Nithe SZ Ahmed, "Automated Queue Management System", Global Journal of Management and Business Research: An Administration and Management Volume 16 Issue 1 Version 1.0 (2016).
[7] Basil Roy, Aswin Venugopal, "A Novel Intelligent System for Efficient Queue Management", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 2, Issue 5, May 2013
[8] Wong Chun Yuan, "Portable Electronics Queue Control Systems", Malaysian University.
[9] "Microprocessors: Principles and Applications" by A. Pal.
[10] INSPEC: Controlled Indexing - access control, telecommunication congestion control, queuing theory, telecommunication.
[11] Non-Controlled Indexing - OPNFT security simulations, multi-model reference control, queuebased resource management, communication networks, congestion control procedures, model references, target queue length, network utilization, queuing delay, queuing loss percentage, access control schemeFuzzy Control of Queuing Systems by Runtong Zhang, Yannis Phillis, Vassilis Koikoglou
[12] A. E. Seun, U. I. Bature, K. I. Jahun, A. Y. Nasir, A. M. Hassan and U. S. Toro, "Hospital Electronic Queuing Solution System," 2019 2nd International Conference of the IEEE Nigeria Computer Chapter (NigeriaComputConf), 2019, pp. 1-7, doi: 10.1109/NigeriaComputConf45974.2019.8949662.
[13] M. B. Hossain, M. N. Hossain, Md. Moqbull Hossen and M. H. Rahman, "Design and development of microcontroller based electronic queue control systems," IEEE Technology Students' Symposium, 2011, pp. 48-52, doi: 10.1109/TECHSYM.2011.578386
[14] Sanjay, Bose K. (2002), an Introduction to Queuing Systems, Springer.
[15] Allen, A. (1990), Probability, Statistics and Queuing Theory with Compute Science Applications, Academic Press Inc., Second Edition.