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Dynamic PIC18f1220 Microcontroller-Based Outdoor Smart LED Display Directory System

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ABSTRACT

The use of LED display system has replaced traditional methods of dissemination information to large and moderate audience in various places both private and public. In recent time the use of LED display system has metamorphose to various categories of usage like advertisement bill board, Time table of events and academic activities in some institutions of learning, also as a directory system This work present the report of design and implementation of outdoor electronic LED display system with PIC18F1220. Proteus 7 software was used to design the printed circuit board. The circuit was printed and the process of etching was carefully followed. The circuit was then programmed for displaying of information needed to be displayed.

Keywords: Directory System, Smart LED Display, LED display, with PIC18F1220, printed circuit board.

1. INTRODUCTION

Display system is a device that hold information that represent a particular event, it can be manual or electronic based. This use of manual display is becoming obsolete especially in this era of electronic business. Engineers and experts in the area of design of display system are now diverting the usage of display system to various applications. Figure 1, 2, and 3 shows the use of display system in various applications. Institutions of learning are currently using LED display system to display information to staff and student [1]. One of the basic factor that militate against the use of electronic display system is the power supply for 24/7. In country like Nigeria where power supply is erratic, an alternative power supply must be made available for continuous usage and functioning of the electronic display system as a means of communicating series of pre-programmed information to the audience [2]. The focus of this research work is to design and implement a dynamic outdoor LED display with photovoltaic power system. The proposed device is dynamic in the sense that the system can be reprogrammed anytime to meet up with changes in the area of applications. Case study chosen for this research work is Administrative building of Yaba College of technology. It was discovered that the Administrative building of Yaba College of Technology sign post has some limitations which include: The sign post is static and changes cannot be made with ease if the need arises in the future; the sign post cannot be seen at night sometimes because of the inconsistency of power supply; visitors coming into the college for the first time will to be looking for various location in such a big building that occupy various administrative unit of the college.

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The content of the display can be changed when the need arises. The system can be modified for other applications and buildings by simply reprogramming of its hardware to replace it display contents with new one.

2. RELATED WORK

2.1 Historical Perspective of LED display system
Display system have developed over years, some of the chronicles of events that revolves round development of display devices are: displaying of text with electromechanical device that use solenoid control a visible flag, example of this representation can be found in arrival/departure of airports, stock market display etc.; Cathode Ray Tube (CRT) earlier invented by Zworykin; Liquid Crystal Display (LCD) invented by George H. Heilemeier; Light Emitting Diode (LED); and Organic Light Emitting Diode (OLED). In recent used of microprocessors and microelectronic devices that enable many more pixels are been incorporated into display device for the purpose of displaying graphic displays and videos. [3,4]. "Early LEDs used seven segment display, but recent developments uses sensors and high switching rates are useful in advanced communications technology. One of the major advantages of LEDs over incandescent light source is lower energy requirement" [5,6].

2.2 Approaches and Technologies of LEDs display
Prevalent display technologies are VFD, LCD, and LEDs. Scholar's perception of the mentioned technologies and others are presented as follows: Eggcrate Display that was invented in the late 60s uses 5 by 7 matrix and allowed alphanumeric display have been used on many game shows to display contestants' scores and other information [7] Vacuum Fluorescent Display (VFD) is generally being "used on consumer electronics as in video cassette recorders, car radios, and microwave ovens VFD emits bright light with high contrast and can support display elements of various colors". Some appreciable innovation are now been introduced into design and implementation of Display system using the available technologies like: "Twisted Nematic Field Effect LCD; Electroluminescent Display; Super-twisted Nematic LCD; Thin Film Transistor LCD"; Organic Light Emitting Diode ([8].

2.3 Expert Approach to design of Display System
Some of the expert's approaches to design of Display system are: Organic Light Emitting Diode, in this approach LED display uses a collection of light emitting diodes as pixels for a video display, and it brightness make it appropriate for outdoor displays. It provide illumination in addition to visual display and appropriate for 3D large display and adiabatic operation [9] LED display using AT89C52 Single Chip Microcomputer, in this case a single chip microcomputer, is used to control a display screen size of about 32x192 where program code can be modified to accommodate new content [10]. S3C5540 ARM Chip and FPGA technology, this approach is used based on the module structure characteristics of the RGB (Red, Green and Blue) three colors display and the dynamic scanning display of the LED display which is achieved by FPGA technology, the approach enables display of texts, picture, and a remote data transmission [10]. Wireless LED Based Display, it also uses LED display modules with MSP430 processor, the only innovation in this approach is the use wireless system to transmit content to be display to the system. This uses LED display modules with [11].

3. MATERIALS, METHODOLOGY AND DESIGN
3.1 Materials and Methods
Major components to be used for design and implementation of the proposed system are: Tri color Light Emitting Diodes (LEDs), LED emit light when an electric is passed through it, standard tri color LED will be used for better and wider vision; PIC18F1220 Microcontroller, this component is chosen because of its advantages over others which includes**,** low power, high performance C-MOS 8-bit microcomputer with 8kb of flash programmable and erasable read only memory (EPROM), and embedded on-chip flash that enables the memory to be programmed in system or by

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conventional non-volatile memory programmer. PIN Configuration of PIC18F1220 Microcontroller is as shown in figure 4; Crystal Oscillator, this will be used to create electric signal with a precise frequency; Buffer Transistor, this is a transistor to allow current flowing in-between first and second terminals, established on the voltage or current distributed to a terminal three. Seven buffer .transistors are used for this project as an amplifier and it function is to boosts the input signals and passes it to various lines of the LED rows.
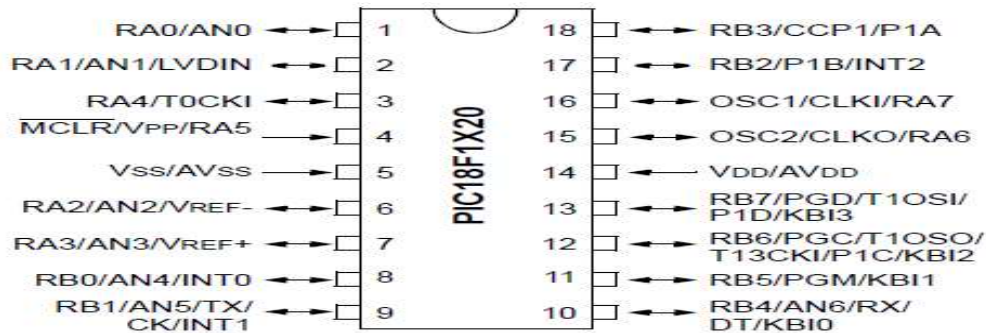

Figure 1. PIC18F1X20 microcontroller. Pin configuration

The focus of this research work is to design an outdoor LED display system to be used as directory system in a large building with different occupants and units. The methodology majorly include software and hardware design methods. The proposed system model (schematic diagram for the proposed design) will be considered before consideration of either software or hardware design. Model of proposed device is given in figure 2.
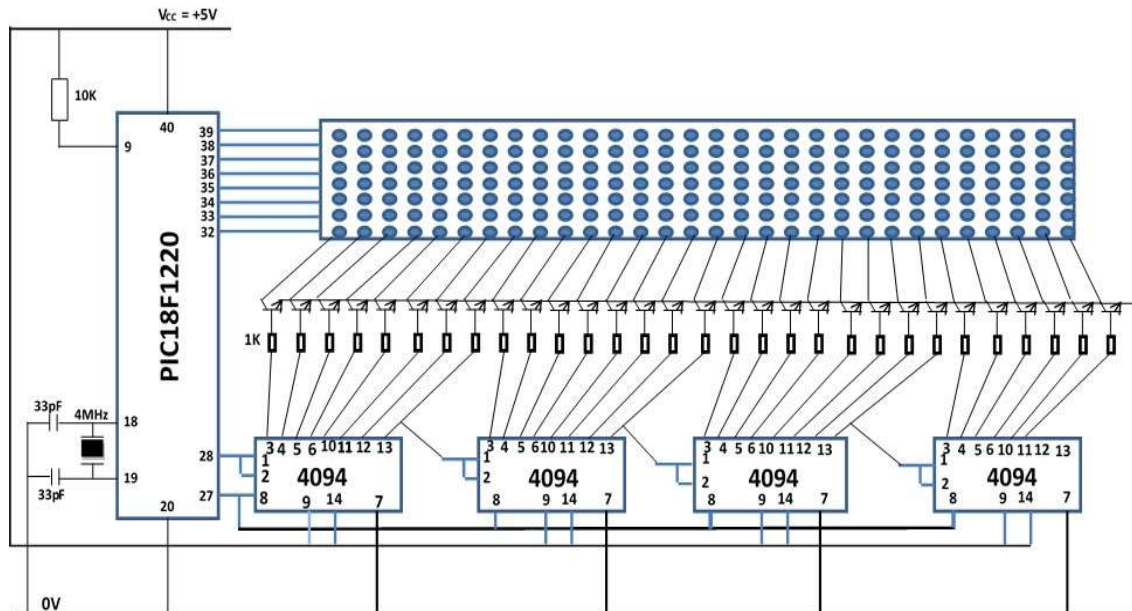

Figure 2. Model of proposed System

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Two categories of program will be executed to achieve the aim of the research work, these are programs for communication with Communication with PC and SCM, and subroutines. The flowchart for the programs is given in figure 3 and 4respectively.
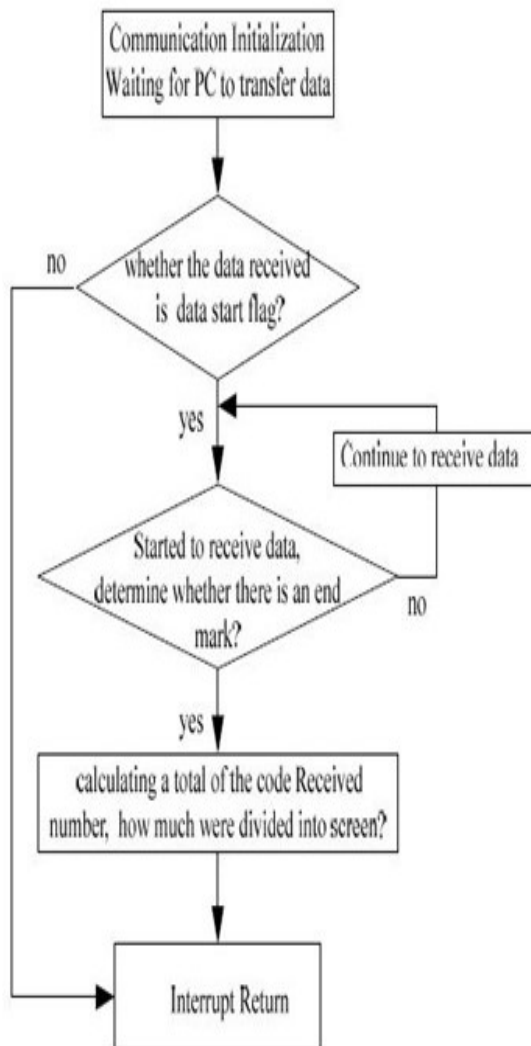
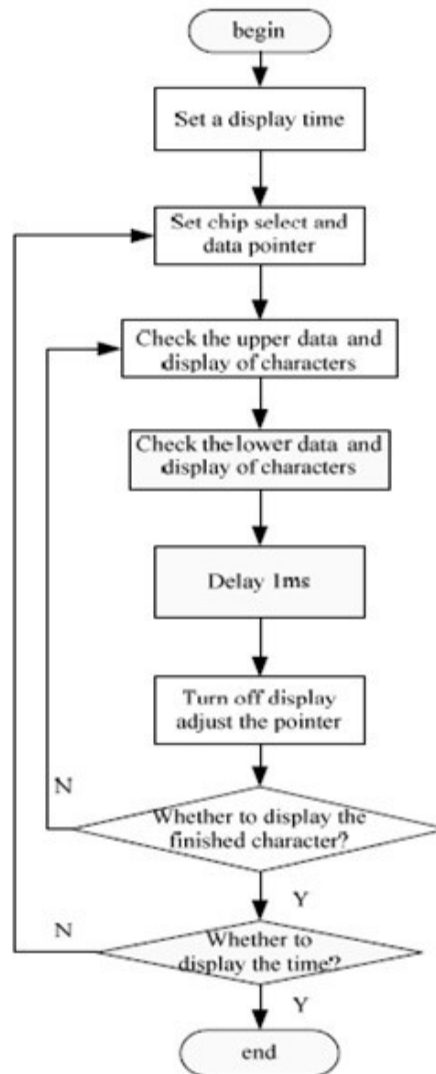

Figure 3. Flow Chart of the Main Program

Figure 4. Flow Chart of Subroutines

3.2 Software Design Method

The module of microcontroller used was dispatched in with pre-programmed operation, which can be modified towards various application or usages. The PIC18f1220 Microcontroller was reprogrammed with respect to the flowchart in figure 3 and 4 respectively which is tailored to focus of the research work.

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4. IMPLEMENTATION AND TESTING

The printed circuit board used was design and implemented using proteus7 professional software. The output of the design with the use of the proteus7 is shown in figure 5.
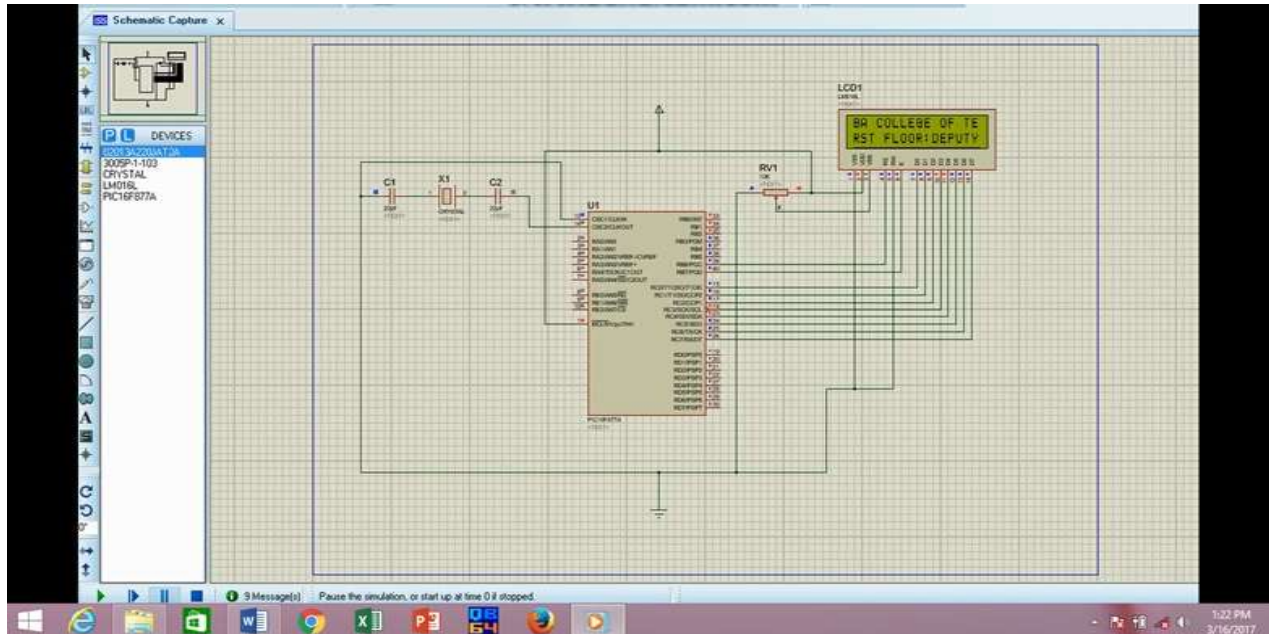

Figure 5. Design Output from proteus7

4.1 Implementation
The project consist of several units/components mentioned earlier, the various components are connected as shown in figure 5, after which modular test approach was adopted for fault diagnosis at every stages of implementation.

4.2 Testing
Modular testing approach was adopted, the testing of the circuit was done as it was progressively built upon. The PIC18F1220 was tested first to ensure it will perform the function it required to perform. Test was carried out at completion of every stage of design. The final output was tested and it was in line with the focus of the research work.

5. CONCLUSION

There is no doubt that the use of LED display device have gone beyond display of text or graphic, it can be used for various applications as demonstrated in this research work. The system was designed by carefully selection of the devices and components and modular testing was adopted at all stages of implementation to ensure workability and fault correction. This outdoor electronic LED display system with PIC18F1220 can be modified for various directory system in future.

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