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INTELLIGENT SUBWAY SHUTTER CONTROL SYSTEM USING MICROWAVE RADAR

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ABSTRACT

The population is increasing at a very peak range all over the world. At same pace the threats faced by the people is also increasing. After certain period of time the public services cannot be accessed. Mainly the public transportation facility cannot be operated during night time so many people can experience threats. Majorly all the subway shutters are closed after 12 A.M. manually without proper supervision. So we overcome the manual operation of subway shutters after a certain period of time .We propose a technology in which intrusion of the people in the subway after 12 A.M. is monitored continuously. With the help of microwave radar the human presence within the subways are detected and the subway shutter doors are closed and opened accordingly after 12A.M. The scenario can be updated through IoT for monitoring from a control station.

Keywords: IoT(Internet of things), Microwave radar, public transportation ,shutter.

I.INTRODUCTION

The city has many subways but people mostly opt for road rather than the least path subway because the maintenance is poor. Subways after dusk is dimly lit and criminals prowl on such places. Recently in Delhi, a young man trailed 21 year old woman for 3 consecutive days after sundown, as she walked through the subway ,on her way back to home. The main objective is to stop the lingering of humans in the subway after sundown. The proposed system includes the automatic controlling of subway shutter based on presence or absence of humans. Here the transmission technique is amplitude shift keying and the circuit is powered with required voltage .The main objective of this work is to build the circuit without any programming skill and to make it work without line of sight requirement using the radar technology.

II.RELATED SYSTEM

In existing systems the subway shutters are controlled using manual switch control mechanism. Mostly the human presence is detected using PIR (Pyroelectric Infrared) motion sensors which has major disadvantage, it is harmful for humans because of the radio frequency generated at high power. And also during manual control proper detection of humans inside the subway is necessary which is tedious . In the existing system , after 12

A.M. the subway shutter is closed manually . Otherwise the human presence is indicated by the IR sensors installed in the subway ; based on which the subway shutter is operated automatically .

III.PROPOSED SYSTEM

In our proposed system we are using the microwave radar technology in order to control the subway shutter system .We are implementing the subway system in such a way that micro radar detects the presence of the human in the subway and keeps the shutter open as long as the person is present inside. Buzzer is turned on when human presence after 12 A.M . is detected for a longer time . This is helpful in warning the person inside to vacate the subway as soon as possible . If in case of absence of humans the radar detects and automatically closes the shutter at 12A.M.The status of the system is updated using IOT. Here we also installed water level sensor in order to detect any stagnation of water which will cause inconvenience to the people . This system performs reliable power management and provides compact system design mechanism.

IV.HARDWARE REQUIREMENTS

1. MICRO CONTROLLER PIC16F877A

This microcontroller used in CMOS FLASH – based 8-bit microcontroller and are easy to program .The features of PIC16F877A are ,it contains 256 bytes of EEPROM data memory, 2 comparators, 8 channels of 10-bit Analog to Digital Converter, 2 capture /compare/PWM functions . The CPU processing speed is about 15 (MIPS). The temperature range varies from -40 to 125 degree Celsius . The PIC microcontroller PIC16F877A is one of the most renowned microcontrollers in the industry. This controller is very convenient to use, the coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins out of which 33 pins are dedicated for input and output operations. PIC16F877A is used in many pic microcontroller projects. PIC16F877A also have many application in digital electronics circuits.

2. MICROWAVE RADAR

The main principle behind the radars involves transmission of electromagnetic waves with the help of directional antennas, the pulses are generally being reflected by the objects that intercept them. The receiver picks up these reflections , process it electronically and converts into visible form using display screen. The time taken by the radar signals to reach the object and return back is measured to determine the range of the objects.

3. UART

UART generally stands for “Universal Asynchronous Receiver/ Transmitter ” is a microchip which controls a computer’s interface with its attached devices through programming. Specifically, the computer is provided with RS-232C Data Terminal Interface (DTE) , so the data can be exchanged with modems and other serial devices . The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. UART is also a common integrated feature in most microcontrollers. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Serial transmission of digital information

(bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. Communication can be “full duplex” (both send and receive at the same time) or “half duplex” (devices take turns transmitting and receiving).

3.1. Asynchronous Receiving and Transmitting Protocol

Asynchronous transmission allows data to be transmitted without the sender having to send a clock signal to the receiver. In this case, the sender and receiver must agree on timing parameters (Baud Rate) prior transmission and special bits are added to each word to synchronize the sending and receiving units. In asynchronous transmission, the sender sends a Start bit, 5 to 8 data bits (LSB first), an optional Parity bit, and then 1, 1.5 or 2 Stop bits.

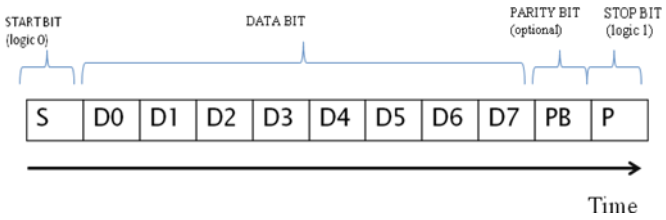


Fig 3.1 , Basic UART packet format: 1 Start bit, 8 data bits, 1 Parity bit and 1 Stop bit

4. DRIVER CIRCUIT

The signals from controllers or microcontrollers are being amplified by the driver circuits in order to control the power switches in semiconductor devices. The additional functions of the driver circuit includes detecting malfunctions, storing and reporting failures to control systems, analyzing the sensor signals. The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.

5. WATER LEVEL SENSOR

This sensor measures the depth or level of the substances that can flow such as liquids, slurries, granular material and powders. The information about the stagnation of rain water in subway is intimidated through IOT. The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point. Generally the latter detect levels that are excessively high or low.

V. SOFTWARE REUIREMENTS

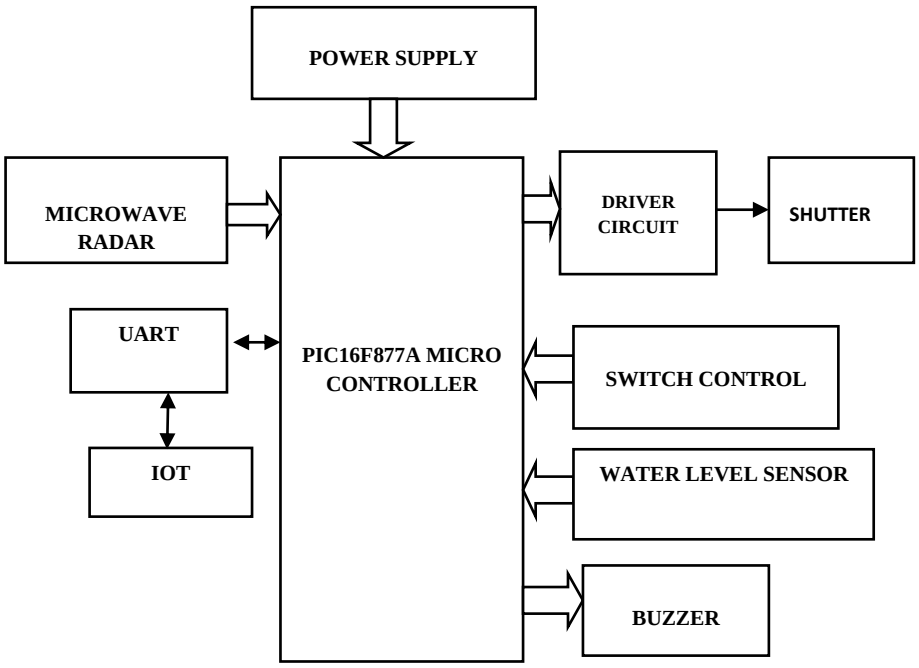
1. EMBEDDED C

High-level language programming has long been in use for embedded-systems development. However, assembly programming still prevails, particularly for digital-signal processor (DSP) based systems. DSPs are often programmed in assembly language by programmers who know the processor architecture inside out. The key motivation for this practice is performance, despite the disadvantages of assembly programming when compared to high-level language programming.

2. MPLAB IDE

It is used to develop applications for microcontrollers and signal controllers , generally running on PC (Windows, MAC OS, LINUX). It provides an single integrated environment which is helpful in developing code for controllers ,hence the name Integrated Development Environment (IDE) . MPLAB IDE is user friendly, easy to use and includes a host of free software components for developing application fast and super-charged debugging .

VI.BLOCK DIAGRAM



VII.WORKING PRINCIPLE

The microwave radar generates electromagnetic waves which are radiated., Due to the presence of human inside the subway the received signal detected will vary in its parameters .These parameters are analyzed by performing correlation between the original transmitted signal and the detected signal. Some weighted threshold value is assigned initially which when compared with the correlated output value indicates the presence of

human inside the subway . Also the water level in the subway is simultaneously monitored. The data in form of analog signal is fed into micro controller which has inbuilt (ADC) Analog to Digital convertor will process the information received .The UART is helpful is serial communication with the interfaced devices ; through this an alarm or warning message is sent to control station to monitor the presence or absence of humans in subway .If the human presence is detected the alarm is turned on as well as the shutter is kept open as long as the human leaves the subway. If no presence is detected after 12A.M , the shutter is closed automatically . The alarm is also turned on when the water level is above some threshold value in the subway and an alert message is sent to main control station such that some actions can be taken soon .

VIII.CONCLUSION

Figure 2. shows the prototype of the proposed system . In this prototype ,the microwave radar module is deployed which emits the electromagnetic waves . Within a certain range if any human or object is detected the waves are reflected and receiver in the module detects the presence. Therefore the buzzer is turned on and the LCD display show alert messages .

Fig 2. The prototype of the proposed system .

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