

DEFENCE SECURITY SYSTEM

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Abstract: The main objective of this project presents an idea to secure the border in a simple and more reliable way, the proposed idea has a simple design and has a very high range, it covers a very large border area securing the border area from illegal entries, smuggling, and illegal movement of weapon without much involvement of security forces near border. After analysing the previous attack in our country and the number of accidents happening each year, it is evident that in most of the cases the security force are unaware of the entry of these terrorist hence in order to protect our nation from Such attacks and terrorist activity there is a need to implement a security system which will be smart enough to detect these activities and give proper information about each and every activity happening near the border. In this project, we propose building a security system that can be implemented by using advance feature like obstacle detection, obstacle identification, distance sensing and activity tracking, and quick communication between the source area and control room. If obstacle enters the border it automatically detects the obstacle give warnings and sends the record of activity to control room. Also it eliminates the enemy in more efficient and better way. This project is all about dealing with enemy in more efficient and smarter way using various sensors at border which are highly sensitive to detect, warn, & fire.

In this project we are implementing a robust mechanism along with an extreme electronics ideas to deal with an challenges across the border in more accurate manner. Also actual implementation of such security system will secure the life of our solders and avoide the human interface for border petroling.

I. INTRODUCTION

Now a days there is continuous increasing in illegal activities such as terosist entry, smuggling, border tampering & etc. For this purpose there is need

to continuous monitor the restricted border area more efficiently and accurately. Our system is a simple solution for this problem in which our system will do the patrolling work & detects the intrusion & eliminate that intrusion. This system is fully automated which needs only one or two persons for maintenance purpose. This project will basically concentrate on the human interfacing i.e. the detection & alerting the soldiers to take necessary action to the problems at the border. This system has ultrasonic sensors which are responsible for the detection of intrusion. As they are mounted over the section pillars. The sensors continuously rotate in the range of certain degrees (180)

& show the intrusion over the radar with its location. Another set of sensors which sense the intrusion & show over the LCDs & activate the alarm. As the sensors detect the intrusion vibration sensor & gas sensor sends signal to the receiver or control room again detect the intrusion by sensor mounted over it. As it detects, the laser rotating gun also come with camera which provides live surveillance at control room when the command of fire is received from command room it will fire towards the intruder & eliminate it. The ultrasonic sensors we use are HC-SR04. The controlling modules are Atmega328 MIC board. The laser used is Diode Laser.

The soldier with appropriate tag is detected by soldier encoded system and this data is matched with the soldier data using soldier decoded system which don't activate the firing gun. If some unauthorised person detected with no soldier tag then firing gun fire bullet.

In this complete system we are using the latest technology of HC-12 serial communication module to TX and RX data from control room to exact border area. The reason behind the use of HC-12 communication module is that it provide high speed data rate and highly securable data transmission system. All the information

sensed by various sensor will be converted into digital signal and this signal are processed by microcontroller and given to HC-12 communication module for transmission of information to display it on display and alerting through warning system.

Hence in order to sense various illegal activities across borders of nation there is need of such highly accurate electronic system which can avoid the terrorist activity. The various sensors used in system are gas sensor which will detect all the harmful gases which

are released by the material used for manufacturing bomb. This will detect the presence of bomb nearby the gas sensor. Which will give an warning alert to soldiers by turning on the buzzer and displaying bomb present warning on lcd display. Another sensor is ultrasonic sensor which has basically two antenna transmitter and receiver transmitting antenna transmits ultrasonic waves this waves are radiated in free space, after hitting an object or any obstacle in its way it reflects back and received by receiving antenna. By calculating the time required by wave to return back we can obtain the distance of obstacle from us.

The Vibration sensor which we have used in this project is piezo-electric vibration sensor. We use here a piezo crystal which can detect any movement very accurately. This complete setup of vibration sensor is buried under ground which will detect the presence of any activity under the ground by sensing the vibrations generated by the movement.

Warning system play the major role in this system which alerts the soldier about the un-authorized entry beeping the buzzer and by displaying the warning on screen in control room. The soldier also can warn the person entering the restricted territory two times. If that person won't stop entering then the soldier can give command to the automatic rotating gun to fire. If that person is from our army then soldier tag is detected and gun will not fire and if soldier tag is not detected then gun will fire. The complete operation can be viewed in control room using camera mounted above the gun to capture live video surveillance.

Practical implementation of such system at borders of nation will highly secure the borders and saves lives

of many soldiers. Implementing such system we can convert the borders into complete automatic electronic war field. Recently military of India have merged with IEEE in order to provide safe, secure & portable system to secure the international borders.

II. BLOCK DIAGRAM AND MODULE DESCRIPTION

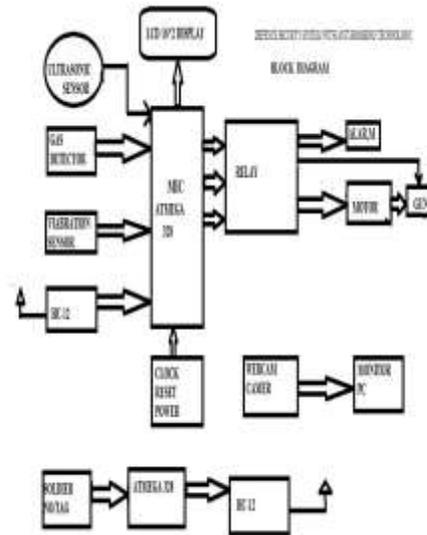


Fig.1. Block Diagram

1. Regulated Power Supply

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. A DC power supply which maintains the output voltage constant irrespective of AC mains fluctuations or load variations is known as "Regulated DC Power Supply". The 5V regulated power supply system as shown below:

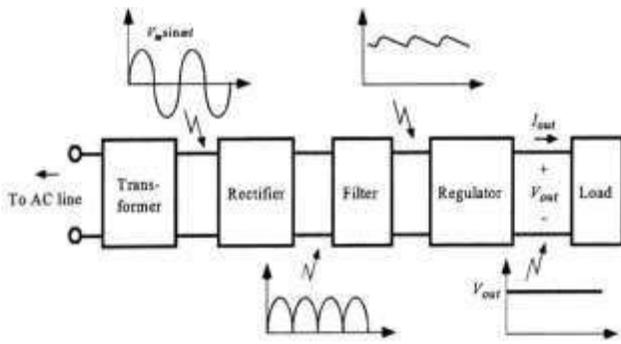


Fig.2. Components of a typical linear power supply

2.AVR 328 Microcontroller

The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing

Speed. This ATMEGA-328 integrated chip consists of

28 pins. It consists of 6 analog inputs that are shown in the pin diagram. Analog inputs can be represented as PC0 to PC5. These analog input pins possess the continuous time signal which acts as an analog input for the system. Further it also consists of 12 digital inputs. It can be represented as PD1 to PD11 which act as an digital input ports based on pulse width modulation (PWM). These PWM, which transmits the signal in the form of discredited form. Both analog and digital input ports can be used for various applications for the input power supply, VCC and GND pins are used. Pins PB6 and PB7, which acts as a crystal to generate a clock signal. By using this crystal, we can generate the clock signals and by these clock signals, we can use this clock signals for input sources.

PC6 pin are the one where it can be used for the reset option. Resetting the program can be done by using this PC6 pin. The pin diagram atmega-328 microcontroller can be shown below. Program to proceed for the applications. Then after, these programs can be uploaded through the Arduino microcontroller by using the power jack cable. The program can be uploaded to the microcontroller and ready further process. ATMEGA-328 microcontroller can Saves a

program and these IC can acts as a processor to do the process without any error. After by giving an analog or digital input to the system, we can do the process according to the applications. We can control the process of the application by editing the program in the Arduino software and again can be uploaded to the Arduino microcontroller via power jack cable. There is an option of reset button. The purpose of reset button is to reset the program which means the previous programs are deleted and we can use the Arduino for the other application purposes. Likewise, these Arduino ATMEGA-328 microcontrollers can be used for n number of applications. These Arduino microcontrollers are widely used in automation industries for controlling the process and to work the system in an automation mode. Here, I have provided a simple Arduino process of rotating a stepper motor for one revolution. There are many number of example programs that are present in the Arduino software. We can edit these Programs for our applications purposes.



Fig.3. Atmel AVR 328

Features:

Advanced RISC Architecture

- 131 Powerful Instructions
- Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers
- Fully Static Operation
- Up to 20 MIPS Throughput at 20MHz
- On-chip 2-cycle Multiplier
- 23 Programmable I/O Lines
- 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF

- Operating Voltage: 1.8 - 5.5V

3. Liquid Crystal Display (LCD)



Fig.4. Liquid Crystal Display

4. Ultrasonic Distance Sensor

The ultrasonic sensor radiate ultrasonic wave and after reflecting from any object it bounce back which shows the unauthorised obstacle in some restricted areas on the radar screen this alerts the soldier in control room by using alarm. ultrasonic sensor which has basically two antenna transmitter and receiver transmitting antenna transmits ultrasonic waves this waves are radiated in free space, after hitting an object or any obstracle in its way it reflects back and received by receiving antenna. By calculating the time required by wave to return back we can obtain the distance of obstracle from us.

Fig.5. Ultrasonic sensor

Features:

- Minimum range 10 centimeters
- Maximum range 400 centimeters (4 Meters)
- Accuracy of ± 1 cm
- Resolution 0.1 cm
- 5V DC Supply voltage
- Compact sized SMD design
- Modulated at 40 kHz
- Serial data of 9600 bps TTL level output for easy interface with any microcontroller

Specification:

- Supply Voltage 5 V
- Supply Current 15 mA
- Output Data speed 9600 Bps
- Output Data Format 8-N-1 8 data bytes, no parity, 1 stop bit

- 1 – GND Supply Ground

5. Piezo Vibration sensor

The vibration sensors detect the unauthorised underground activity very accurately with vibration detector sensors. Piezo Vibration Sensor is suitable for measurements of flexibility, vibration, impact and touch. The module is based on PZT film sensor LDT0-028. When the sensor moves back and forth, a certain voltage will be created by the voltage comparator inside of it. Therefore, outputs high & low levels. In spite of the fact that it has a high receptivity for strong impacts, a wide dynamic range (0.001Hz~1000MHz) also guarantees an excellent measuring performance. Finally, you can adjust its sensitivity by adjusting the potentiometer with a screw.

FEATURES:

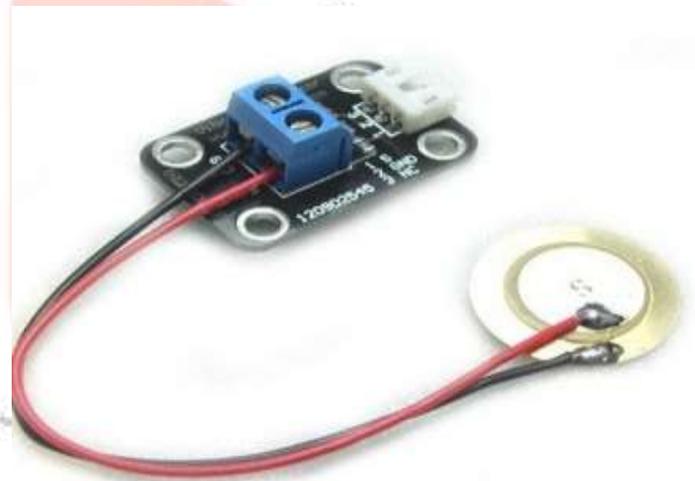


Fig.6. Peizo Vibration Sensor

- Uses the MQ-6 LPG Gas Sensor
- Easy SIP interface
- Compatible with most microcontrollers we can upgrade this to provide SMS alerts also
- On board Status and Power LED
- On board Pot for threshold setting
- This sensor has a fast response time
- Good sensitivity to Combustible gas in wide range
- Long life and low cost
- Simple drive circuit
- High sensitivity to Propane, Butane and LPG

7.HC-12 Serial Communication module

- Standard grove socket
- Wide dynamic range : 0.001Hz~1000MHz
- Adjustable sensitivity
- High receptivity for strong impact

6.MQ-6 Gas Sensor

The MQ-6 gas sensor module from RhydoLABZ,kochi is used in this circuit. This LPG Gas Sensor (MQ6), ideal sensor for use to detect the presence of a dangerous Liquefied petroleum gas (LPG) and it has high sensitivity to propane, butane, isobutene, natural gas. The sensor can also be used to detect combustible gases, especially methane. This sensor has a high sensitivity and fast response time. The drive circuit is very simple. This circuit can detect leakages in your Home, car or in a service station, storage tank environment. This unit can be easily implemented to industrial level by upgrading its ranges.



Fig.7. MQ-6 Gas sensor

HC-12 wireless serial port communication module is a new-generation multichannel embedded wireless data transmission module. Its wireless working frequency band is 433.4-473.0MHz, multiple channels can be set, with the stepping of 400 KHz, and there are totally 100 channels. The maximum transmitting power of module is 100mW (20dBm), the receiving sensitivity is -117dBm at baud rate of 5,000bps in the air, and the communication distance is 1,000m in open space. The module is encapsulated with stamp hole, can adopt patch welding, and its dimension is 27.8mm × 14.4mm × 4mm (including antenna cap, excluding spring antenna), so it is very convenient for customers to go into application system. There

is a PCB antenna pedestal ANT1 on the module, and user can use external antenna of 433M frequency band through coaxial cable; there is also an antenna solder eye ANT2 in the module, and it is convenient for user to weld spring antenna. User could select one of these antennas according to use requirements. There is MCU inside the module, and user don't need to program the module separately, and all transparent transmission mode is only responsible for receiving and sending serial port data, so it is convenient to use. The module adopts multiple serial port transparent transmission modes, and user could select them by AT command according to use requirements. The average working current of three modes FU1, FU2 and FU3 in idle state is 80µa, 3.6mA and 16mA respectively, and the maximum working current is 100mA (in transmitting state)



Features:

Fig.8. HC-12



Fig.9. Camera

- Long-distance wireless transmission (1,000m in open space/baud rate 5,000bps in the air)
- Working frequency range (433.4-473.0MHz, up to 100 communication channels)

- Maximum 100mW (20dBm) transmitting power (8 gears of power can be set)
- Three working modes, adapting to different application situations
- Built-in MCU, performing communication with external device through serial port
- The number of bytes transmitted unlimited to one time
- Update software version through serial port

8.Camera

A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and emailed as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

The term "webcam" (a clipped compound) may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet. Some of them, for example, those used as online traffic cameras, are expensive, rugged professional video cameras.

Features:

- Webcams are known for their low manufacturing cost and their high flexibility, making them the lowest-cost form of videotelephony.
- Despite the low cost, the resolution offered is rather impressive, with low-end webcams offering resolutions of 320×240, medium webcams offering 640×480 resolution, and high-end webcams offering 1280×720 (aka 720p) or even 1920×1080 (aka 1080p) resolution.
- They have also become a source of security and privacy issues, as some built-in webcams can be remotely activated by spyware.

9.DC Motor



Fig.10. DC Motor

A machine that converts dc power into mechanical

energy is known as dc motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of the force is given by Fleming's left hand rule. When electric current passes through a coil in magnetic field the magnetic force produces a torque which turns the DC motor on.

The principal advantage of a d.c.motor is that its speed can be changed over a wide range by a variety of simple methods. DC motors have many applications and used for multi-purpose applications. Industrial Use: Lathes, Drills, Boring Mills, Shapers, Spinning, and weaving machines.

Industrial Use: Electric Traction Cranes, Elevators, hair drier, Sewing machine.

10.Buzzer



Fig.11. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."

Specifications:

- On-board passive buzzer
- On-board 8550 triode drive
- Can control with single-chip microcontroller IO directly
- Working voltage: 5V
- Board size: 22 (mm) x12 (mm)

11. Relay



Fig.12. Relay

The relay is an automatic protective and switching device which is capable of sensing abnormal conditions in electrical circuits. These are operated to open or close the load contacts in response to one or more electrical quantities like voltage and current. Relays are used in a wide variety of applications like electric power systems, home appliances, automobiles, industrial equipments, digital computers, etc.

Relays are classified into several types based on their functionality and application they are implemented for. These classifications include electromagnetic, solid state, high voltage, thermal relays, and so on.

Relays are switches that open and close circuits electromechanically or electronically.

Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

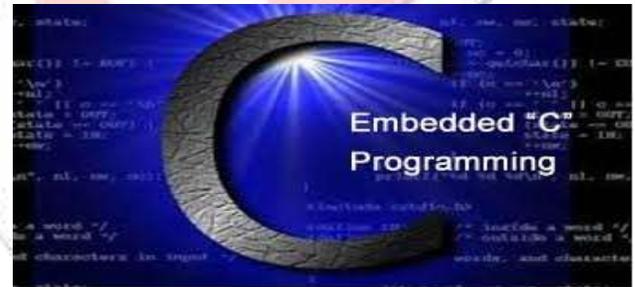
How do relays work?

All relays contain a sensing unit, the electric coil, which is powered by AC or DC current. When the applied current or voltage exceeds a threshold value, the coil activates the armature, which operates either to close the open contacts or to open the closed contacts. When a power is supplied to the coil, it generates a magnetic force that actuates the switch mechanism. The magnetic force is, in effect, relaying the action from one circuit to another. The first circuit is called the control circuit; the second is called the load circuit.

There are three basic functions of a relay: On/Off Control, Limit Control and Logic Operation.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits.

12. Embedded C Software



Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware

addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

Use of C in embedded systems is driven by following advantages

- It is small and reasonably simpler to learn, understand, program and debug.
- C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
- Unlike assembly, C has advantage of processor- independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.
- As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'
- It is fairly efficient
- It supports access to I/O and provides ease of management of large embedded projects.

III. RESULTS & FUTURESCOPE

We have fabricated a robust and portable security system for the country borders. We believe that our system is very simplified and have the features that other border security systems does not have at portability level. Our system can be improved by doing the advancements according to the needs. The accuracy & precision of the system can be improved by using multiple sensors & it will give good & accurate results with high precision.

IV. REFERENCES

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RESEARCH PAPPER:

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