Automatic Gun Target System using PIR Sensor

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Abstract— Protecting our borders from the illegal movement of weapons, drugs, contraband, and people, while promoting lawful entry and exit, is essential to homeland security, economic prosperity, and national sovereignty.to secure our borders through the development of personal technologies and infrastructures as well as working closely with our neighboring countries. Usually we increasing border patrol staffing or any infrastructural facilities indeed we use advanced technologies like PIR sensor with automatic gun target system. So far increasing security level micro controller based automatic gun targeted system is introduced. More efficiency of this system is it can be used at no man's land. A PIR sensor is a motion detector which detects the heat infrared emitted naturally by humans and animal. With help of automatic gun target system using PIR sensor when a person in the field of vision of the sensor moves, the sensor detects a sudden change in infrared energy and the sensor is triggered activated automatically targeted. Hence we are creating safer, more secure and more efficient border environment.

Key words: PIR Sensor, Servo Motor, Micro-controller, Target Detection, Arduino uno

I. INTRODUCTION

The basic purpose of automatic gun target system using PIR sensor is to enhance the border security electronically with automation and with that to reduce the work load and responsibility of the border men that continuously take a look on border 24x7 .To facilitate these environment like the patrol agents, air and marine agents ,officers these are prevent terrorist and there weapons from entering and who illegally attempt enter in our borders hence we introduced Automatic Gun targeting System using PIR sensor which detect and target the living object or any movement in highly secured area such as Border by using automation. The automation is sensor base automated gun targeting system target the living object within the range of sensor.

Automatic Gun targeting System will not fully remove the responsibility from their soldiers, but shares the maximum responsibility and will reduce human mistake on the border. In this system we are using PIR sensor these sensor are detect the living human or animal The signal of sensor is provide to micro-controller, in response, when micro-controller generates the code and this code are received by RF receiver,

The micro-controller at receiver side control targeting gun, buzzer and motor drivers circuit as per received code and targeting gun at receiver will target the living object. The buzzer will indicate that target is sensed by sensor.

A. PIR Motion Sensor:

Passive infrared (PIR) sensors are very popular and useful as they are mass-produced at very low cost. PIR sensors is a motion detector which detects the heat emitted by human or any living object and it allow you to sense the motions, almost always used to detect whether a human or objects has moved in or out of the sensors range. When a warm body like a human or living object passes by, it first intercepts one half of PIR sensor, which causes a *positive differential* change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

Working of PIR Sensor:

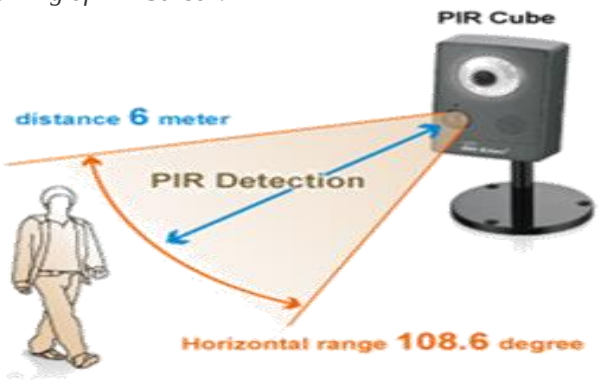

Fig. 1: PIR sensor

PIR is passive infrared it is pyroelectric or IR motion detector sensor it is basically made by pyroelectric sensor the pyroelectric sensor having round metal with a rectangular crystal in center. It detects level of infrared radiation or signal of living objects.in this system the micro-controller takes the output from the sensor and processing on it to emmited the digital output pulse from the analog sensor. In this system needs to detect the living object enters in the area or not.

B. Servo Motor:

In the servo motor control wire are used through the control wire servo motor are send the electrical pulse of different width, or pulse width modulation(PWM). It is having minimum pulse or a maximum pulse and a repetition rate. A servo motor turn only 90 degree either direction of total 180 degree movement. If user are move or rotate the object then use the servo motor. Motor are work with DC power supply then it is known as DC motor and if it is work with AC power supply then it is known as AC motor. In automatic gun targeting system detection of target or object is very important thing so system movement are consider or rotate the system it is also important thing that's why we are using servo motor.

Controlling servo motor:

Motor is controlled by pulse with modulation(PWM) it is provided by the control wires.it is having minimum pulse, maximum pulse or repetition rate.it can turn 90 degrees when direction form is neutral position. The servo motor is expects to view a pulse every time 20 ms and the length of pulse will determine how the motor turn. For example, 2.5ms pulse and the motor turn to the 90 degree position, when the pulse is shorter than 2.5ms it is moves to 0 degree and when if it is longer than 2.5ms then it will turn the 180 degree.

1) Arduino uno:

Arduino board is a single board micro-controller this board provides various analog and digital pins and this pins are provide the interface to various board and circuit. It is including the universal serial bus (USB) and the serial communication mechanism are provide based on programming language to provide integrated development environment. Arduino are support the programming languages like C, C++. The arduino is used to SRAM Memory, FLASH and EPROM storage device.

2) Aplications of Arduino uno:

1) It is open source board.
2) It is provide the water quality software testing.
3) It is used to control the DC motor.
4) Arduino using DC motor with closed loop control.
5) It is compatible with microcontroller.

3) IR Pulse:

IR pulse is a Infrared Radiation it detects the object radiation when living objects move then it detects the blood radiations. When any human changes its position then the human pulse also changes these pulse are detected by IR Pulse.

II. SYSTEM OVERVIEW

A. Block Diagram and Working of Transmitter:

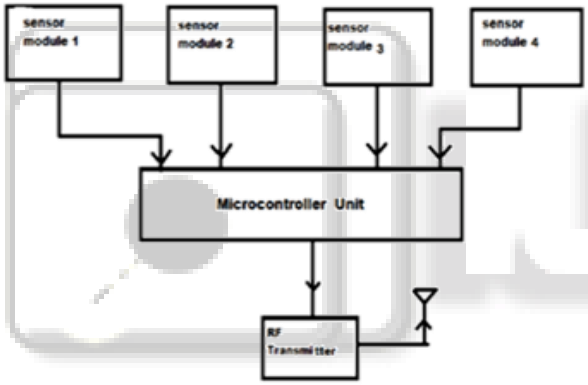

Fig. 2: Block Diagram of Transmitter Section

As shown in figure the living object is detected by presence of motion sensor. It's consist of the Passive IR Sensor module that detects the motions or invisible IR radiations of the any living object and generates a signal. This signal is given to the micro-controller and then the micro-controller generates a code corresponding to sensor detection. this generated code looks like something as 0010, 1001, etc. Then this code is given to the RF Transmitter for modulation of the signal and transmission of signal to RF receiver on receiver side.

Each passive IR sensor senses the living objects and generates the signal at the port of micro-controller and then it depends on the micro-controller to generate a unique code corresponding or related to the passive IR sensor detection. Multiple passive IR sensors can detect a single living object and generate codes which result generates signal on the multiple ports of the micro-controller. Under such a situation, it depends on the micro-controller it takes the input of multiple sensors at a time and then decide the correct location of the living object on the basic of received data.

B. Block Diagram and Working of Receiver

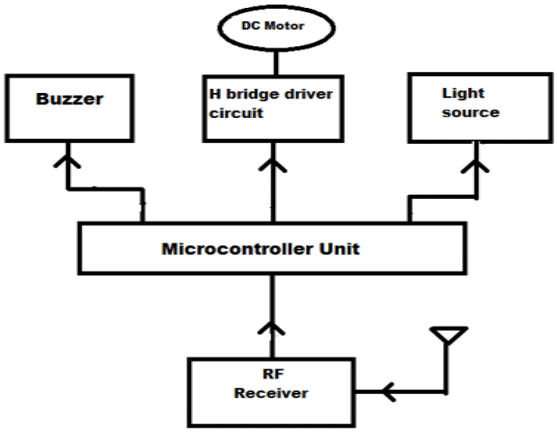

Fig. 3: Block Diagram of Receiver Section

The receiver contains Micro-controller, RF transceiver, H- Bridge Driver circuit, light source, Buzzer Alarm, DC motor. The signal is transmitted via transmitter is received by the RF receiver, and demodulated by a demodulator. Then the signal is transmitted to the micro-controller and then micro-controller gets this code which is transmitted by a transmitter and then performs the function accordingly to that. The signal received and the code regenerates is called obtained code. The format of obtained code is the 1001, 1101 etc. Each code regenerated is perform some target function. It depends on the code, how much degree the motor will rotate and targets itself to object locations, the targeting function is completed, the buzzer module is activates and buzzer alarm system activates.As the buzzer system gets activated, after the very small delay, the targeting system is activated, and light source starts focusing over the destination location. The fire activated until the sensor stops sensing the IR radiations. It is a completed the destruction program of the determine living object of in area of border.

The motion can vary according to the sensation of the sensors as the code transmitted is very rapidly and changes is occur. The transmitter and receiver are available the 80M from each other. If more distant is occur then receiver will create problem in reception of code which is an very important part of program. The transmitter and receiver are works on 433 MHz frequency.

III. MATHEMATICAL MODEL

Steffen boltzmann law says that Between the two objects net radiation heat are exchanged it is calculated by following equation:

$$Qnet = \sigma A_1 F_{1-2} \varepsilon (T_1^4 - T_2^4)$$

Where,

σ :Steffen boltzmann constant(5.669×10-8W/m2k4)
A1 :The surface area of body 1
F1-2 :The view or shape factor(depending on object)
Ɛ :The equivalent emmisivity of two objects.
T1,T2 :The absolute temperature of two object.

IV. CASE STUDY OF LIVING OBJECTS

- What is the influence of walking intruder into the output signal in the frequency and amplitude?
- How to design the best electronic circuitry?
- Find the output depends on the following:

1) distance between the human body and the motion sensor.
2) human body Walking speed.
3) pattern design and focal length of the system

The requirements specify that is very fast movements and it is slow motions of intruders living bodies that have detected. The range of slow motion is half a meter per second, and the fast motions is up to 3 meter per second or it also 5 m/s (18 km/h).The output signal of IR detectors is respond in a certain frequency range and it is depends on the focus of the system and the walking speed of living object , designing the electronic circuitry that time it is calculated

The relation between frequency, focus, and velocity:

$$f = \frac{V_b * f_b}{2\pi * s * L}$$

Where,

F :focal length in mm
F :frequency in Hz
V :Velocity and living object walking speed in m/s
s :Sensing element size
L :Distance of working

The standard element size which is a 2mm×1mm for dual element detector. The value of calculation is included for s is vertical size which is 1mm.

V. CONCLUSION

Hence we can design a kind of Indian make Automatic firing weapon which can target intruders automatically and fire at the direction of intruders.The automatic gun targeting system is feasible for highly secured area such as border. Which will automatically create psychological burden on enemies. This system helps reduced the responsibility and efforts of soldier in border security.

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