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IOT Based Grid Eye Thermal Mapping Gun Security System for Defence Applications

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Abstract **- Grid-EYE is a thermal mapping technology by Panasonic Semiconductors, using which embedded devices like Arduino Boards can generate fast the thermal maps of places, without requiring expensive thermal cameras or complicated image processing algorithms. IOT Based GRID-EYE sensor is part of a device which shall detect both the position and the intensity of the heat radiated by the surface of either a single or multiple targets or to utilize a Hot Target Mode (HTM) to track the target with the highest temperature when multiple elements of interest are involved at the same time and also specialized software and GPS Video MMS can be viewed instantly through SMART Phone.**

In highly critical border areas military personnel cannot monitor all the time. In such areas grid eye sensor system proves highly advantageous and efficient. An autonomous sentry gun system with IOT is implemented using the grid-eye technology which tracks and points the intruder. Grid-Eye Sensor system is interfaced with IOT to control the operating mode of the sensor and to provide a thermal image of the target on the monitoring panel at the control section. This project can accurately sense multiple intruders at a distance up to 5m 16.404ft. The temperature accuracy of the sensed object is maximum when the difference between the surroundings and the object is ±2.5°C or ±4.5°F with a maximum viewing angle of 60 degrees.
Keywords: **Grid eye, Defence, Security,Sensor System, Infrared, IOT.**

I.INTRODUCTION

The greatest threat to national security today is terrorism and it is difficult for the military forces to protect the border area. In critical border areas like Kashmir and Bangladesh the regular forces cannot monitor the intruding terrorists as the area is quite large and rough.

To assist the army and security forces, the grid eye thermal mapping using sentry gun with wireless network is utilized to study and monitor the environment. This project is not depending on conventional motion detection technologies like PIR, Ultrasonic etc., that cannot give the location or angle at which the object is present, making them useless for the application. Grid-Eye module uses thermal signatures to find the exact location and angle and position in real time.

II.PROPOSED METHOD

In this proposed method, the grid eye sensor provides the path to overcome the disadvantages of PIR sensor. The grid eye sensor is capable of sensing the intrusion around 6meters, it can sense multiple intrusions, it can provide the exact position of the person being detected or the person is in motion.

In the proposed method, the security system consists of two sections: control section and remote section. The remote section consist of the grid eye sensor that sense the illegal intrusion, servo motor for horizontal and vertical rotation, laser pointer that acts as sentry gun, a vibration sensor, arduino board that is interfaced with the above mentioned devices and zigbee transmitter with GPS and Controller (IOT) for transmitting the information to control section.

The control section consists of zigbee receiver which gets information from remote section through MMS Live on SMART Phone. The IOT Based zigbee module is interfaced with PC for viewing the thermal mapping of intruders.

III. TOOLS USED

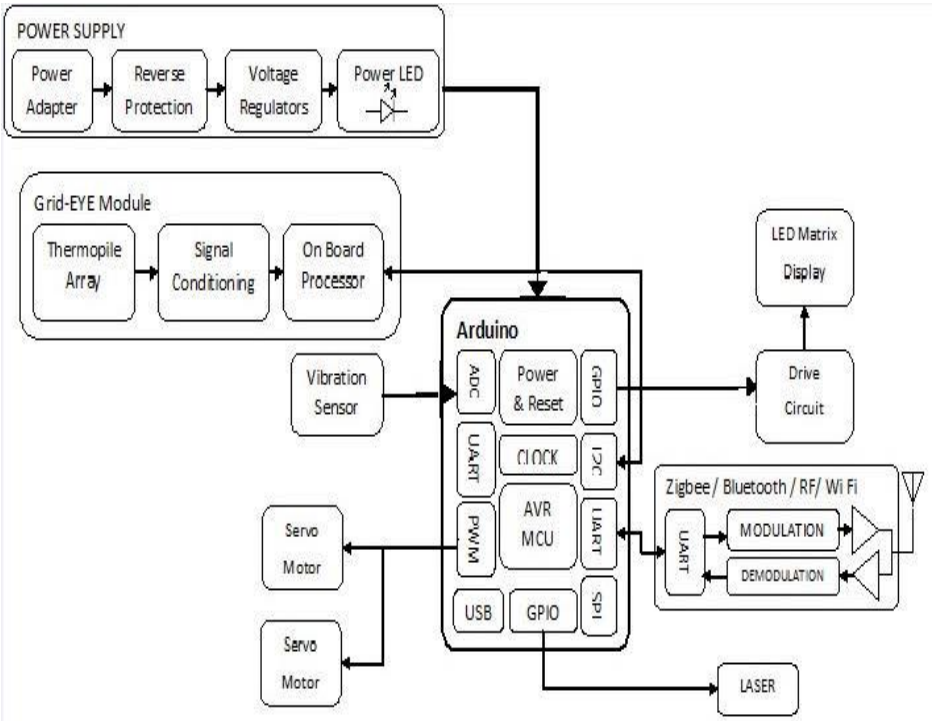
A.Hardware Tools

Grid eye sensor
Servo motor
Vibration sensor
Arduino microcontroller
Zigbee transmitter and receiver
Remote trigger weapon (LASER)

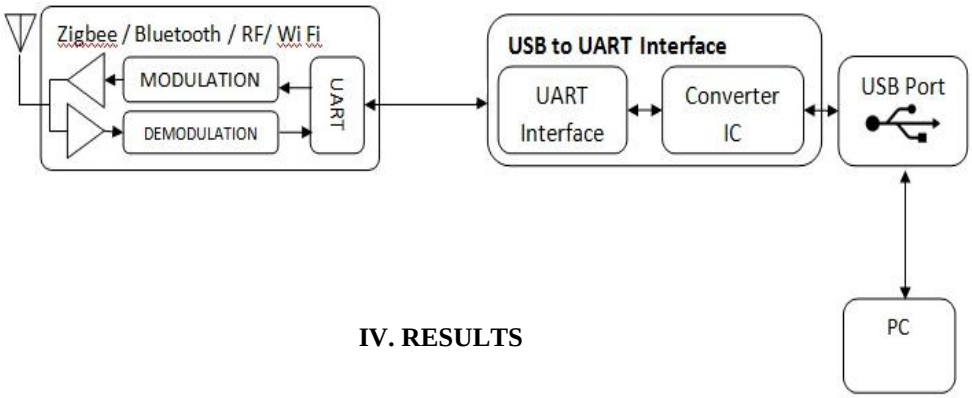
B.Software Tools

MATLAB
OrCAD- For PCB design
Visual Studio for PC interface programming

Block Diagram of Remote Section



Control Section



IV. RESULTS

Simulation Output

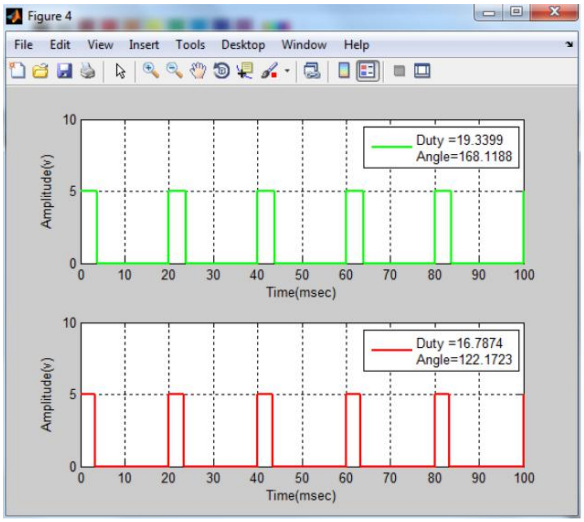


Fig.1a

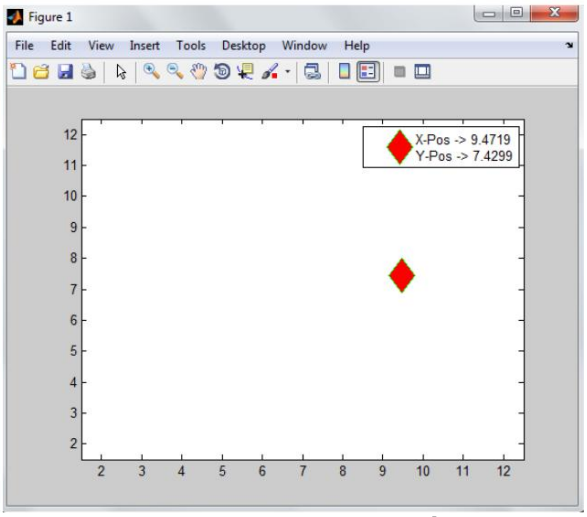


Fig.1b

The figure (1a) gives the information about both the PWM signal which is given as input to the servo motor 1 and 2 respectively. The servo angle in both horizontal and vertical direction can be easily read from this plot. The figure (1b) shows the intruder position.

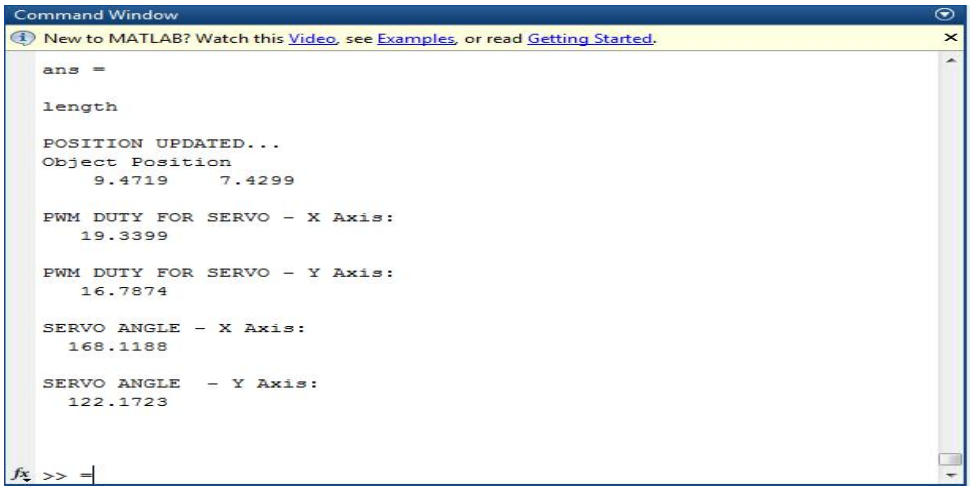


Fig.2 Command Window

The above figure shows the output value of intruder position in both horizontal and vertical direction, duty cycle value of PWM signal for servo motor in horizontal and vertical direction, servo angle value along horizontal direction and the servo angle value along vertical direction.

Thermal Mapping

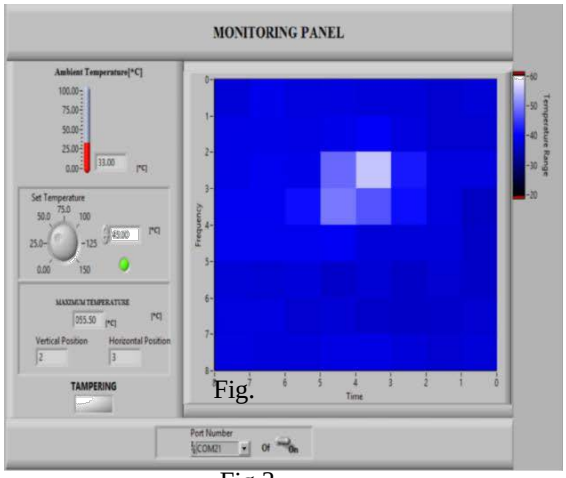


Fig. Fig.3

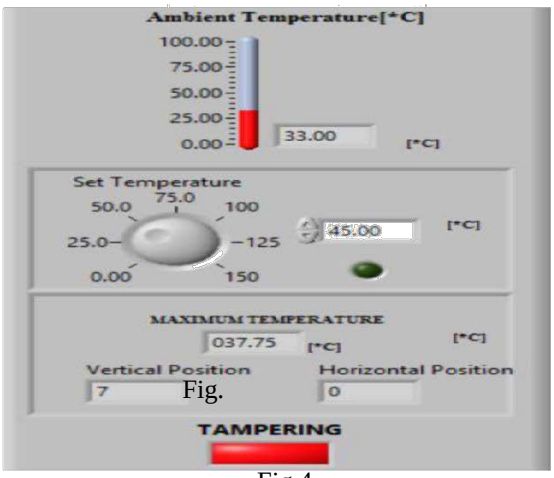


Fig. Fig.4

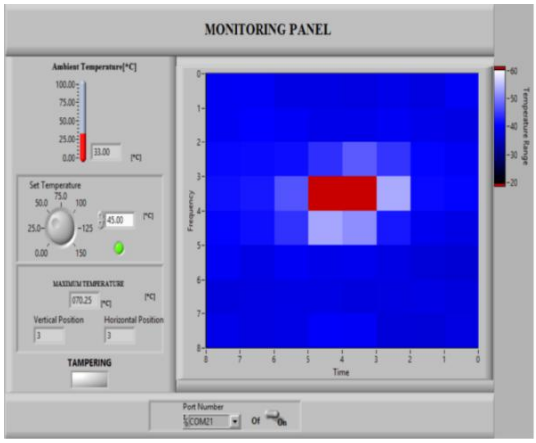


Fig.5

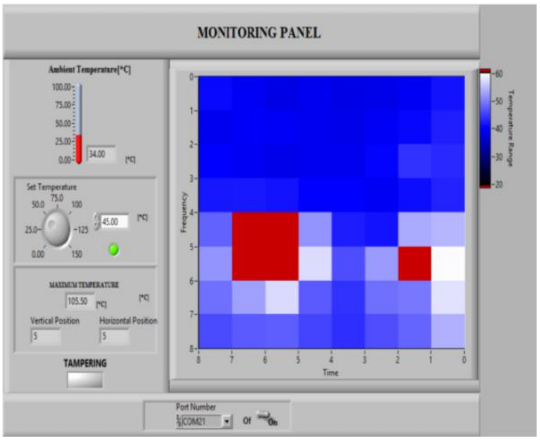


Fig.6

In figure 3, thermal mapping of an intruder is shown. Red color indicates that the person is in shooting range. In figure 4, the thermal mapping of two intruders in the shooting range is shown. In figure 5 the detection of an intruder is shown, where the temperature sensed is in the range of 50-55 degrees. In figure 6 the tampering field becomes red when the system gets damaged by any means which is detected by vibration sensor, also gives the ambient temperature value.

V. CONCLUSION

In this project, the detection of intruders is done by grid eye sensor and vibrations are detected by vibration sensor, which is present at the remote section. By using Arduino microcontroller the sensor output is processed and given to the zigbee transmitter unit. Simultaneously the arduino provides the input for servo motor which in turn makes the laser pointer to point at the intruder. In the control section, the information from the remote section is received by zigbee receiver. The thermal mapping done by the grid eye sensor is monitored instantly in the monitoring panel which maps the movement of the intruder even if they are near or away from border and also gives the information about the exact position of the intruder being detected. The vibration detected is shown in the tampering block present in the monitoring panel. This project can accurately sense multiple intruders at a distance upto 5m 16.404ft. The temperature accuracy of the sensed object is maximum when the difference between the surroundings and the object is ±2.5°C or ± 4.5°F with a maximum viewing angle of 60 degrees. So by using this novel idea we can easily track the enemy intrusion in the border areas and ensure the safety of military troops.

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