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Instantaneous Battlefield Gun (IBG)

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ABSTRACT

Internet of Things (IoT) is the system of inter related computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UID's) and the ability to transfer data over a network without requiring human - human or human - computer interaction. IoT has made revolution in the field of military applications which bases for the purposes of reconnaissance, surveillance, together termed as Internet of Military Things (IoMT). Considering IoMT and applying the ideas of military domain, a potential application called Instantaneous Battlefield gun (IBG) is proposed. IBG is an instance of an automated security system which involves in detecting the obstacle using ultrasonic sensor and then aiming at it using laser beam of light. Security and accurate detection is the major concern of IBG.

Keywords— *Internet of Things, Internet of Military Things, Ultrasonic Sensor, Wi-Fi Module, Arduino Mega 2560, Servo motor, Object Detection, Laser Diode*

1. INTRODUCTION

The Internet of Things (IoT) basically alludes to an environment of discrete figuring gadgets with sensors associated through the framework of the web. This creative innovation interfaces the gadget to the web as well as gives the client, different highlights like continuous investigation, stage to examine the gathered information, cloud information stockpiling, trigger an activity from a remote area, remote warnings etc. The Internet of Things has raised its limits in military applications, associating ships, planes, tanks, automatons, troopers, and working bases in a durable system that increments situational mindfulness, hazard evaluation, and reaction time. By coordinating frameworks of sensors, actuators, and control frameworks into existing military foundations, the military can turn out to be increasingly proficient and compelling and thus, The Internet of Military (IoMT) involves the full realization of pervasive sensing, pervasive computing, and pervasive communication, leading to an unprecedented scale of information produced by the networked sensors and computing units. Instantaneous Battlefield Gun (IBG) evolves in developing a technology that detects the object (obstacle) and destroys it by using a laser beam of light. Object detection is done with the help of ultrasonic sensor which is used to set a particular range for the surveillance zone. The concurrent view of the battle ground can be visualized with the help of camera which is mounted on two Servo motors. The information of object detected, its location (in (x, y) coordinates) and distance (in cm) is displayed on screen at control room or monitoring station. As soon as the object is detected the IBG shoots it. The compilation is Arduino based and Microcontroller Mega 2560 has been used.

2. RELATED WORK

Security and accuracy are considered key issues in real world. Many research activities have been carried out in order to provide the security using IoT paradigm which helped to build a smart and safe environmental zone, thereby improving the quality of human life.

Abhay Pratap Singh [1] has introduced probably the least complex strategy utilized for the observation purpose. Here a predefined run is put away in microcontroller in which on the off chance that the obstacle enters, at that point it gets first recognized by ultrasonic sensor, then an SMS is sent to a concerned individual utilizing Global Standard for Mobile correspondence (GSM) and furthermore a camera is utilized to catch the picture of that object. The disadvantage discovered here was that the client can't make

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a prompt move as he/she should arrive at that spot to check the camera recordings each time, as the picture can't be sent over the GSM. Likewise, Gangaram Bhor [2] also proposed a system based on ultrasonic radar technique. Target detection and shooting is the key aspect of this system. There are two robotic vehicles- One detects the intruder when entered in the surveillance zone using ultrasonic sensor. It then measures the distance between them and another defensive vehicle explodes the intruder depending on the coordinates sent by the first robotic vehicle. Yet, this framework has got two significant downsides, first is that the framework is bit intricate and cumbersome and another is that as the information is passed between two robotic vehicles, the specific position and separation of the distinguished obstacle may get adjusted because of the different electrical noises, which will eventually bring about propelling the rocket (defense mechanisms of the system) in wrong ways.

3. PROPOSED METHODOLOGY

From the above researches, shortcomings of the applications turned to assets of IBG. As the mechanical capacities of partners and enemies advance, more weight is put on military officers to envision, survey, and make a move in progressively pressurized situations and confined time spans. IoT is distinctively utilized in IBG, by fusing arrangement of sensors, actuators, and control frameworks and so on. Some of them are detailed here.

3.1 Controller-Arduino Mega 2560

Arduino Mega 2560 is a Microcontroller board. It accompanies more memory space and I/O pins when contrasted with different Arduino boards accessible in the market. There are 54 advanced I/O pins and 16 simple pins. This board accompanies 2 voltage controllers of 5V and 3.3V which gives the adaptability to control the voltage according to requirements. It has a Universal Serial Bus (USB) link port that is utilized to associate and move code from PC to the board.

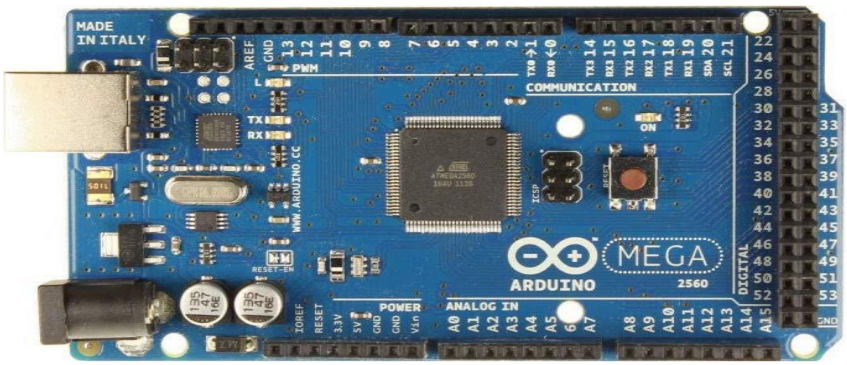

Fig. 1: Arduino Mega 2560 Microcontroller

The Arduino Mega 2560 in figure 1 is customized by utilizing the Arduino Software, an Integrated Development Environment (IDE) basic to all Arduino sheets and runs both on the web even when connected or disconnected to the internet.

3.2 Wi-Fi 8266(ESP 8266)

The ESP8266 (Figure 2) is the most mainstream and minimal effort Wi-Fi System on Chip (SOC) with coordinated TCP/IP convention stack that can give any microcontroller access to any Wi-Fi arrange. It is an independent Wi-Fi organizing arrangement, which implies that we can store and run the application in it without the guide of any outer processors. Its working voltage is in between of 3.0 ~ 3.6. Its frequency range is 2400 ~2483.5 MHz. ESP 8266 Pin out –ESP 8266 has 8 pins, to be specific: RX, VCC, GPIO 0, RESET, CH_PD, GPIO 2, TX and GND (as appeared in Fig.2).Pins are arranged in two lines, having 4 on each column .Few models have nail depiction to the PCB, which make it basic.

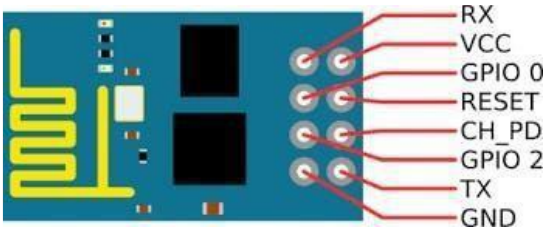

Fig. 2: ESP 8266 pin out

3.3 Servo Motor

A servo motor (Fig.3) is an electrical gadget which can push or pivot an item with extraordinary precision. It is a little gadget that has an output shaft. This pole can be situated to explicit rakish situations by imparting the servo a coded sign. For whatever length of time that the coded signal exists on the info line, the servo will keep up the rakish situation of the pole. In the event that the coded signal changes, the precise situation of the pole changes. It very well may be pivoted from 0 to 180 degree, however it can go up to 210 degree, contingent upon the assembling. This level of pivot can be constrained by applying the electrical beat of appropriate width, to its Control pin. Servo motor checks the beat in each 20 milliseconds. Beat of 1 ms (1 millisecond) width can turn servo to 0 degree, 1.5ms can pivot to 90 degree (unbiased position) and 2 ms heartbeat can pivot it to 180 degree. The engines are little, have worked in charge hardware, and are incredibly amazing for their size. The fundamental chart of a servo engine is appeared in the accompanying figure 3. It has a control circuitry, the motor, a set of gears, case and furthermore 3 wires that associate with the outside world. One is for power (+5 volts), ground and the white wire is the control wire.

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Fig. 3: Servo motor

3.4 Ultrasonic Sensor

The HC-SR04 Ultrasonic Distance Sensor (Figure 4) is a sensor utilized for distinguishing the separation to an item utilizing SONAR (Sound Navigation and Ranging).It offers incredible non-contact go discovery with high precision and stable readings in a simple to-utilize bundle from 2 cm to 400 cm or 1" to 13 feet. The running exactness can reach to 3mm and useful edge is < 15°. It tends to be controlled from a 5V power supply. The activity isn't influenced by daylight or dark material, albeit acoustically, delicate materials like fabric can be hard to identify. It comes with ultrasonic transmitter and beneficiary module.

Fig. 4: Ultra Sonic Sensor

3.5 Laser Diode

A Laser Diode (Fig.5) is a semiconductor gadget like a Light Emanating Diode (LED), transmits cognizant light in which all the waves are at a similar recurrence and stage. The rational light is delivered by the laser diode utilizing a procedure named as "Light Amplification by Stimulated Emission of Radiation", which is contracted as LASER. It produces light of high productivity and as it is little in size, it permits better handling.

Fig. 5: Laser Diode

4. OPERATION

The operation of the IBG gun is as follows- In this proposed automated model, the IBG can be placed at the center of specific locations such as borders, sea areas etc. The gun is capable of scanning through a cycle of 180° maintaining a definite angle along the y-axis which is set initially. Through this every minute area can be scanned. The IBG gun usually scans from 0 degree, while scanning if any obstacle is detected, the system then aims at it. The aiming process is carried by laser diode (Fig.6) using the accurate coordinates measured by the gun.

Fig. 6: Laser Diode

It comprises of a web camera utilized for live streaming of the observation zone. The distance of the objects detected and shot are viewed on a PC wirelessly using a Wi-Fi module (Figure 8). The gun (Figure 7) after shooting the object, continues its scan from the very next position in the same direction.

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Fig. 7: IBG

After completing the entire cycle of 180 degrees clock wise, the gun performs a step up in its angle along y-axis. It performs the same procedure in the anticlockwise direction.

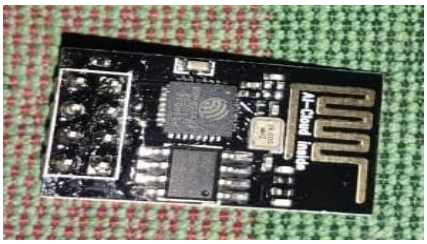
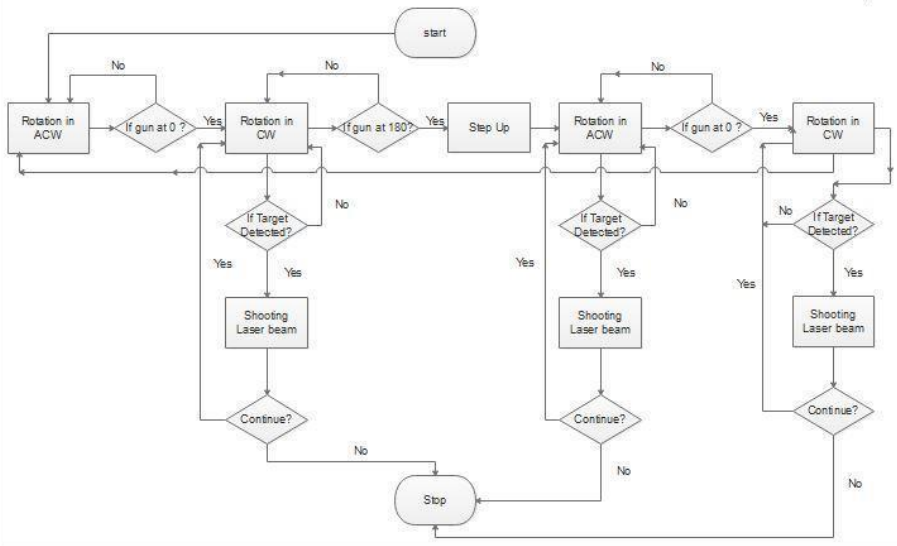


Fig. 8: ESP 8266

After the limit of ultrasonic sensor (Figure 9) is reached, it performs step down in its angle along y-axis after every scan either in clockwise or anticlockwise direction.

Fig. 9: Ultra Sonic Sensor

Its main aspect is not only to reduce the risk of human life on the battle field but also to provide accurate detection and attack than that of a human. Unlike a human, it doesn't get tired and works more effective and better for long period. This project can be implemented in army, navy and as well in air force services. The entire operation of the system can be pictorially represented using a flowchart as shown in figure 10.



ACW-Anti Clock Wise, CW-Clock Wise

Fig. 10: Flow Chart

5. CONCLUSION

In the proposed system, we presented Instantaneous Battlefield Gun (IBG), an application of IoT in military domain. The primary goal behind the plan of this framework is to keep away from the genuine nearness of the human and to control all the necessary

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actions automatically thereby saving lives. Thus, not only improving the survivability but also it provides accurate detection. Also, the special components used here such as Arduino mega 2560, Wi-Fi module, Servo motor, Ultrasonic sensor and video camera upgrade the exhibition of the system, there by conquering the impediments of different frameworks. Training the camera to scan the RFID tags, implementing a 360-degree detecting robot could be the future scope of the case study.

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