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Automatic Target Detection and Shooting System

Alan Paul A[1], Badri Nath K[2], Giriraj R[3], V Manoj[4]
[1, 2, 3, 4]*Department of Mechanical Engineering, East Point College of Engineering and Technology, Bengaluru, India*

Abstract: ***Our paper consists of the idea of improving target detection and shooting systems in an effective and low-cost manner. We have reviewed other systems in the past and come up with a multi-mode system that has multiple modes with its advantages and applications. Our system is much cost effective. We have used easy to get parts to function. it also has a modular design.***
Keywords: Target detection, shooting system, mode, cost, modular

I. INTRODUCTION

The use of automatic target detection and shooting system in today's world of security and surveillance will play a vital role. We wanted to show such technology is possible to do with simple electronic devices. So, we used an ARM-based processor which can run python natively, in the simple term we used a raspberry pi as the microcontroller. We used a camera and ultra-sonic senor to relay the necessary data to detect the target. Our system was equipped with laser light to make sure we detected the target and pointed it at its target.

Many awareness points detecting techniques can be used as starting points for the determination of such objects on an image. Various interested point detecting methodologies by on blob detection (Lowe, 2004; Bay et al., 2008), corner detection (Harris and Stephens, 1988; Rosten and Drummond, 2006), and edge detection (Canny, 1986; Prewitt, 1970; Sobel and Feldman, 1968).

In addition, the low computational cost of the Canny edge detector allows the use of a pyramid structure to respond to targets in different scales without restricting real-time processing, which is one of the major objectives.

II. PROPOSED METHODOLOGY

Our method uses an inexpensive ultrasonic sensor and an 8MP camera that will be used to detect the subject and track them. Our system has various modes that it can operate under and this allows our system to be both an automatic and semi-automatic system that can be decided by the user of the system. This flexibly helps to save power consumption and help in the silent operation of detection too. The basic working cycle of our system is. The system can work by self-calibration of this ultra-sonic sensor. If the micro-controller detects an anomaly in the ultrasonic date after calibrating it uses its camera and sends those data to the control station and as well tries to find the command in this code to see what it needed to do next. So, this allows an operator to choose his option due to flexibility it makes our system work with more headroom in safety and controls the decision too. The various made of our system are as follows.

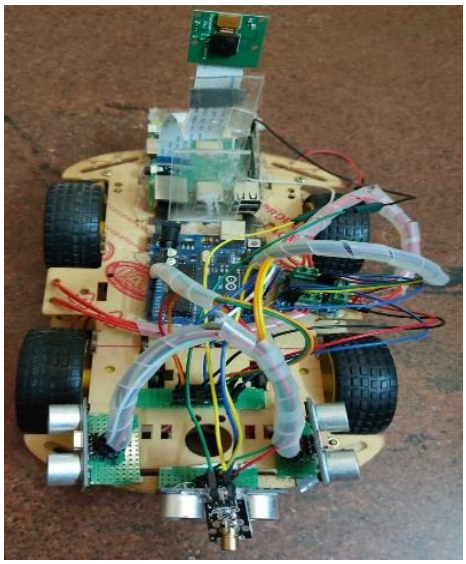

Figure.1 Top view of our system

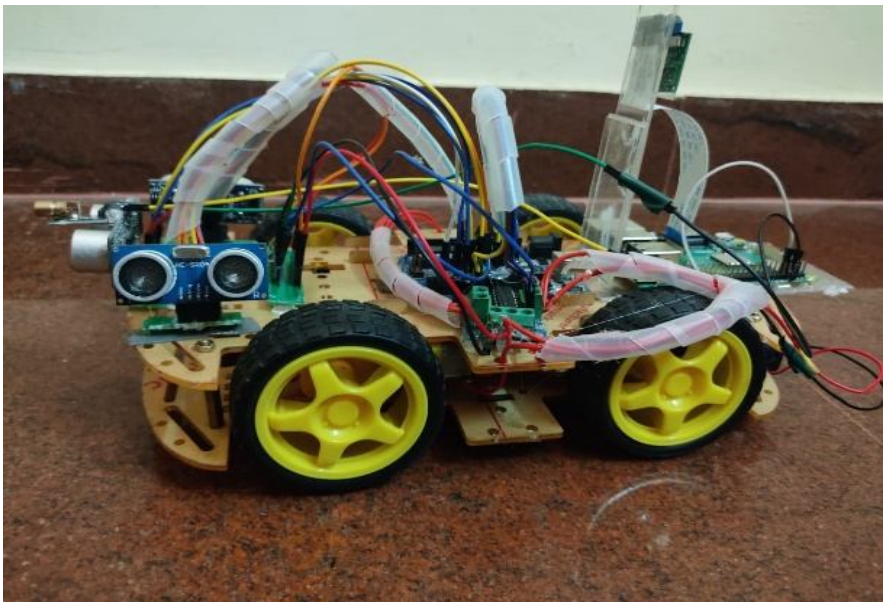

Figure.2 Side view of our system

A. Manual Mode With All Systems Active

This operation protocol utilizes the full potential of the system. Then control station can receive and send data to all the devices connected to the system. Since all the devices are working the lead time can be reduced by a lot. The main drawback of using this system can be that it has more power consumption.

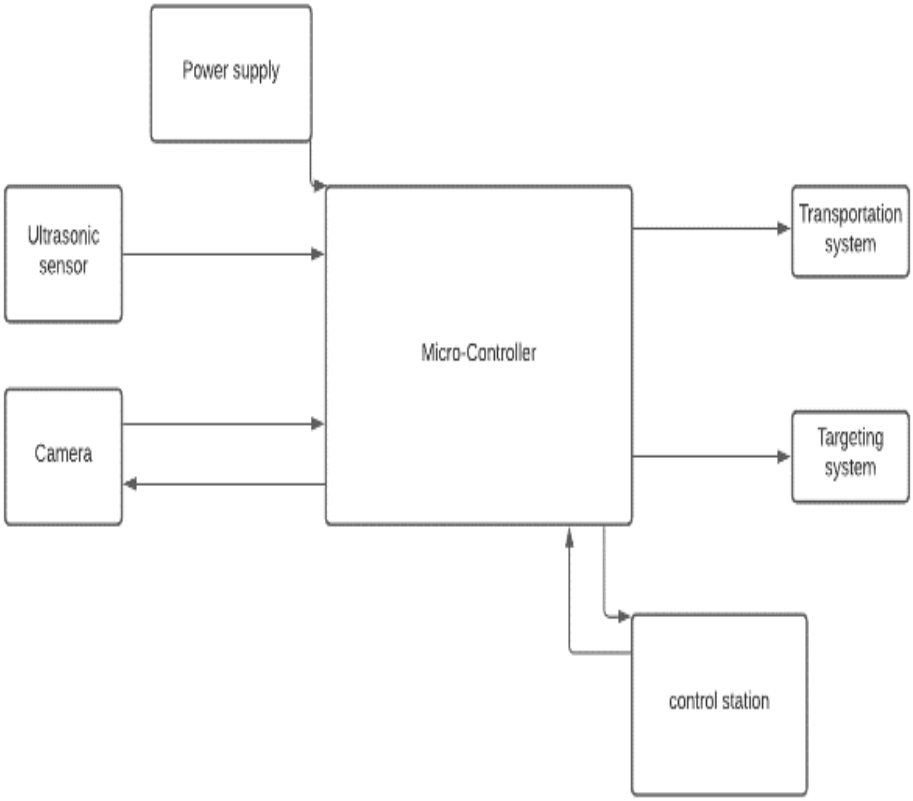

Figure 3 Manual mode block diagram

B. Hibernation mode

This mode turns off the camera, transportation system, targeting system and even cuts communication to the control station. This ensures that power consumption to be very low when compared to other working modes. It works by just using the ultrasonic sensor and when it detects a change in the sensor's data (In simple words if any movement is detected). Then the Microcontroller can toggle on the camera based on data from the camera it can toggle its mode to manual or automatic based on code in the Microcontroller or by the operator in the control room as it sends a message to the control room as soon ultrasonic detects any motion. The main drawback of this mode is its reaction time to turn on targeting or transportation system but its mode is intended to use when battery power is used.

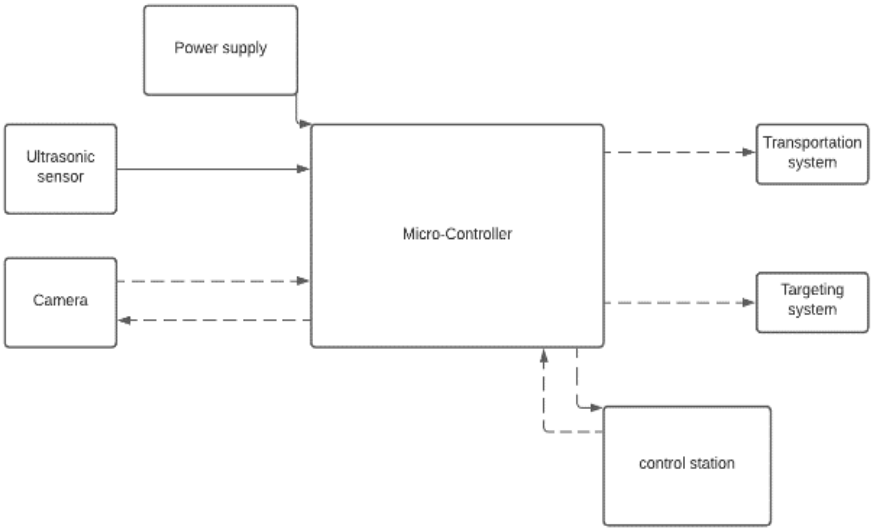

Figure 4 Hibernation mode block diagram

C. Automatic mode with the Transportation system and Targeting system in hibernation

This operation protocol uses the Ai (artificial intelligence) programmed into the MCU to track the target. In this case, the target moves into a trespassing zone then the system can toggle to manual or fully automatic mode. This flexibly helps in better detection of target and little more power consumption but in return no human monitoring is necessary. As the Transportation and targeting system is in hibernation this means a little latency in following the target and shooting the target. Thus, this problem can be overcome by coding the Micro-controller by increasing the trespassing zone in the code when compared to real life. Also, this mode can be used as a surveillance mode. Thereby increasing real word use of this mode.

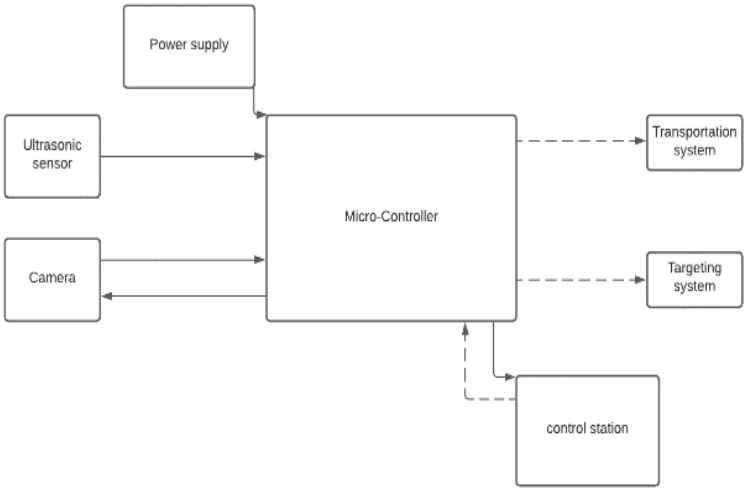

Figure 5 Automatic mode with the Transportation system and the Targeting system in hibernation

D. Automatic Mode with all Systems Active

This is protocol is fully automatic by using the Ai (artificial intelligence) program. The mode doesn't need any human or anyone in the control station command to work. The mode has high accuracy and reliability. The power consumption is very high thus needing this mode to be operated for a short time or connected to the wall. In this mode latency is low and performance is high, this mode can be toggled from manual or hibernation.

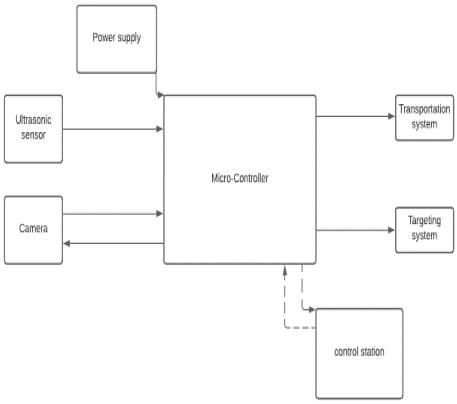

Figure 6 Automatic mode

III. ADVANTAGES

Our target detection and shooting system are better than other systems when the cost of the system is considered. As it used hardware that is available to the general public even the performance of our system is quite good.

The system has multiple working modes that give it an edge over other methods of target detection and shooting system. The automatic mode shows the Ai capability of the system, having a manual mode allows the human operator to make a decision, if necessary, in extreme cases. It can be converted easily to other transportation systems or stationery can its design is flexible and no much extra coding is needed.

IV. LIMITATION

During deployment of the system, an extensive survey of the surrounding must to done which would limit its application in new environments using automatic mode but it can still manual mode could get the job done. As well it will increase latency in those cases. As it will have to be deployed in real work, an environment-protected case or shell would be needed to be designed which should increase its time of design depending on the deployment locations.

V. CONCLUSION

When we compare our system with other target detection and shooting system relatively low cost of the system starts out but in some other systems other devices passive infrared sensors, Light detection, and ranging could give an upper hand to those systems. By the way cost of this sensor is so high and it doesn't scale well with the performance to cost ratio. The various modes in our system help our system to be used in a wide range of applications. Since our system design doesn't protect from harsh environment cheap and easy to design 3D printed case can be used. Thus, making our system much flexible when compared to other systems.

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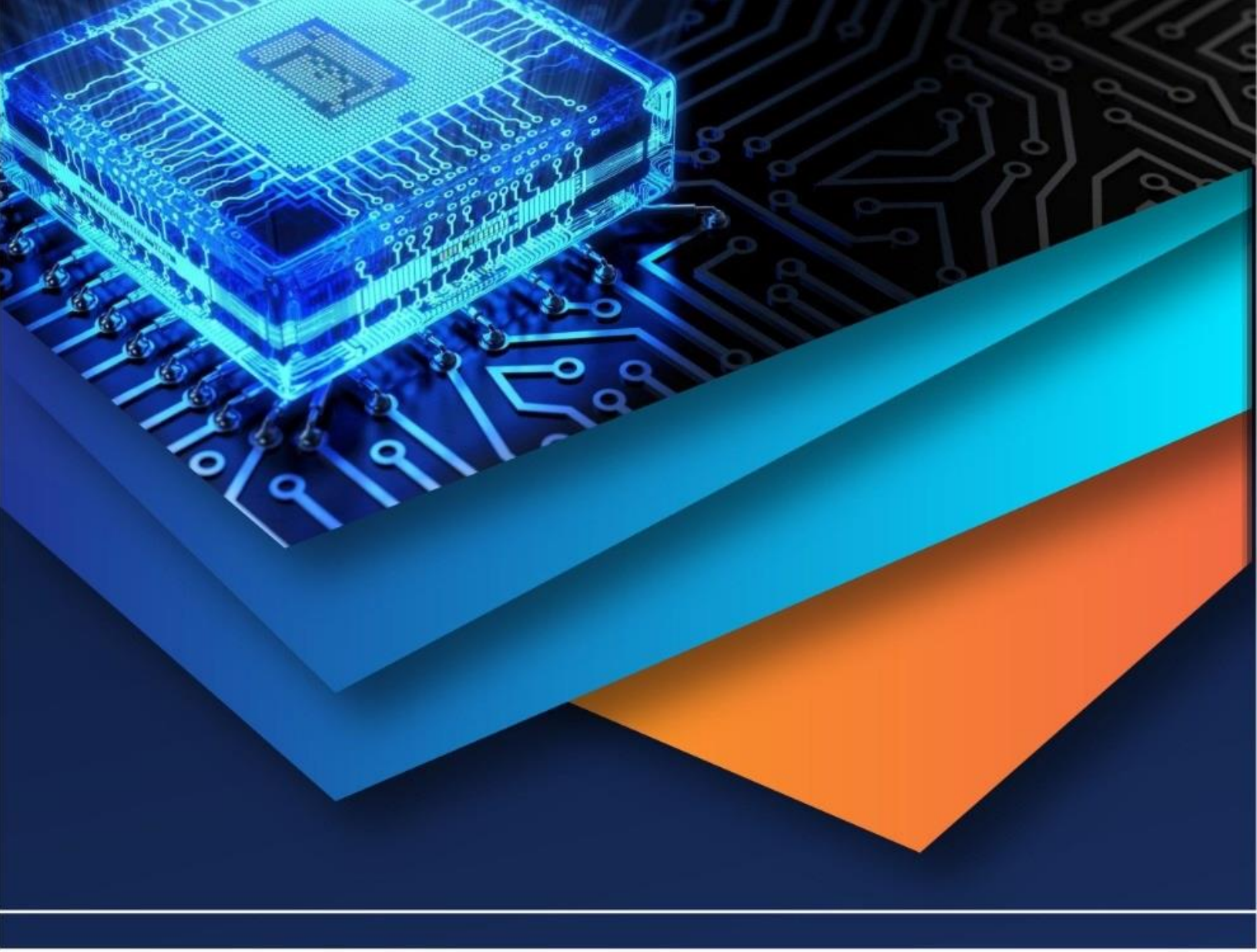

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