



VISION BASED SPYBOT WITH OBJECT IDENTIFICATION & TRACKING

¹Prof. Akshay S. Utane (Assistant Professor ,EXTC Dept. PRMIT & R, Badnera.)

² Abhishek G Kadu (BE Student ,EXTC Dept. PRMIT & R, Badnera.)

³ Poonam Bramhanwade, (BE Student ,EXTC Dept. PRMIT & R, Badnera.)

⁴ Dhanashree Dhole , (BE Student ,EXTC Dept. PRMIT & R, Badnera.)

Abstract: The possibility of the paper developed with a dream to see the spots we wish to see voluntarily in a military field. In this paper this thought is acknowledged at our fingertips. Robots are assuming a critical job in the military application. The vast majority of the work in the military is unsafe for person. In a war field or safeguard task a warrior needs to take his own specific manner to achieve the goal. The vast majority of the ways are perilous for a warrior. Consequently robot replaces the trooper. The paper is done to make a variant of spying robot that can empower us to watch the place of our advantage. The extent of the robot additionally helps it to be utilized as a covert agent robot. ESP-32 CAM Module is uses for controlling all the processes. OV2640 camera is used to obtain real-time footages of the field. So in this way it will work in the way we acquire robot to work. To monitor the movement of the robot there is a inbuilt transmitter which is attached on the robot. The explanation for manual control of the robot is that it won't be lost attributable to nonattendance of human inclusion. Notwithstanding long range applications it very well may be utilized as a government operative robot inside short distances.

Index Terms - OV2640 camera, spy robot, object identification, object tracking, Spy robot, video transmission.

I. INTRODUCTION

The military is undeniably the primary customer of new advances and improvements in strategy, and is also often the sponsor of new improvements when it comes to envisioning new innovations in military settings. Numerous basic military technologies deployed out of the blue are now advanced to the piece of industrial robots. In any case, the importance of military autonomy and modern mechanical autonomy is still quite different. The military has special, robotic equipment while, in modern terms, the robot is a larger amount of a smart, adaptable, large-scale manufacturing machine. Later, the use of modern robots for military applications will always be imaginable. Cost and development of the specialized capacity of the innovative robot will build the enthusiasm of the military customers. In the research, we will demonstrate that the inspiration for the utilization of robots, inside the military and inside industry, is the substitution of people. The explanations behind this substitution are, as per the following: quality, cost and acculturation; be that as it may, utilizing an alternate methodology in each field, obviously [1].

Robot is an electromechanical, reprogrammable, multifunctional device which is capable of acting in the highly varied environment, and takes autonomous actions. The word "Robot" was first used in a 1921 play titled R.U.R. Rossum's Universal Robots, by Czechoslovakian writer Karel Capek. Now a day's every system is automated in order to face new challenges. In the present days automated systems have less manual operations, flexibility, reliability and accuracy. Due to this demand every field prefers automated control systems. Especially in the field of electronics automated systems are giving good performance. In the present scenario of war like situations, unmanned systems plays very important role to minimize human losses. So this kind of robot is very useful to do operations like detecting leakage of gases, obstacle, and object pick up and place at the time of emergency as well as security purpose providing human-robot interaction in rescue robotics [2].

The war field robot consists of arduino uno board as a controller board. It has L293D motor driver IC's along with a HC-05 bluetooth module. Two DC motors are also used for the motion of the robot. The night vision wireless camera is attached with the robot in order to monitor the situation and the camera can be rotated 360 degrees via the android application through motor. The sydney siege is considered one of the historic moment in the field of automation and robotics where a robot with a laser beam light and Bomb disposal Kit inbuilt was sent inside a dark room before the military commanders in order to reduce the risk of losing

human life. It was so far considered as the best police operation carried out by New South Wales police department with the use of latest technology resulting in less loss of human life [3].

II. LITERATURE SURVEY

The main idea to construct this robot is for the spying purposes, it is for to keep an eye on people maneuvers in the battle ground or in the war days to reduce the chances of takeovers from the enemy side. Army people or entities have to face many dangers on their lives while spying on enemy or opposite entities. To overcome these ideas for this job robot will be more suitable and will decrease the risks of loss of human lives and can better spy illicit maneuvers of their opposite entities. Before entering to any doubtful districts we can send robot to check the status of that field so the military or army individuals don't need to risk their life. These types of robot will be constructed in such a way that it would have a camera mounted on it so the places can record the view clearly. Camera will be controlled through remote by using an android application. Now a days there are many people who can construct an android application without any trouble. For communication we need to use some modules, if we use Bluetooth module it won't be much efficient for long ranges as the Bluetooth communication is weak not that strong. There are many different modules with their different specifications. For large ranges we can use Wi-Fi, Zigbee and many others can be used. Future scope of this robot is very vast, as it will continue to modify with time[1].

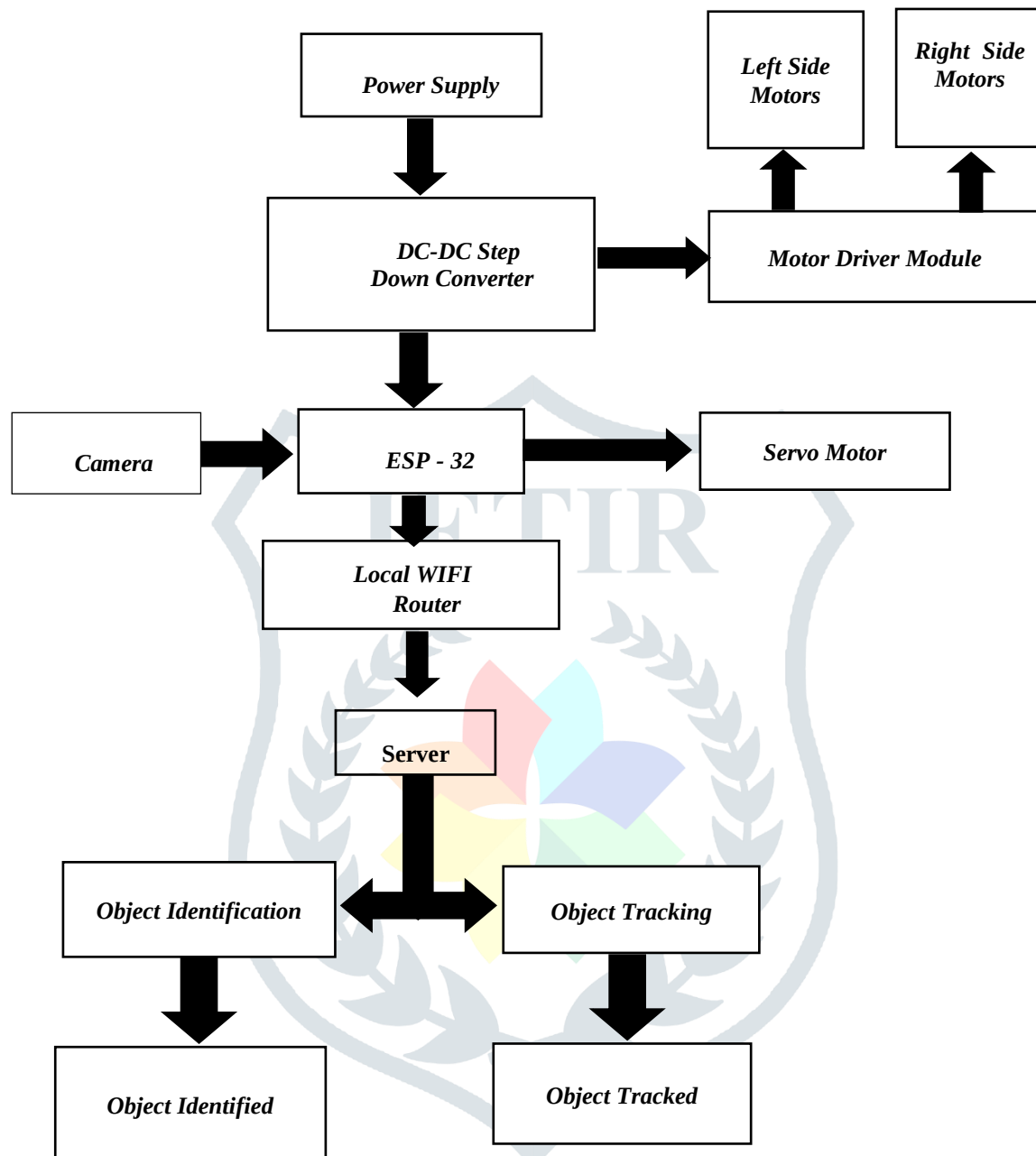
The primary focal point of this exploration is the use of robots in wars and in harmony and their effect on the general public. This paper examines about advances utilized for spying and observation in various situations and condition. The creators examine the need and motivation behind building up the cutting edge robots for various, unforgiving and unpredicted condition of the war zones. They intend to present progressed controlling, self-ruling and rapid robots to serve for harmony in countries, as effectively as human controlled machines. Alongside these variables, they center on growing innovative weapons and hardware to be utilized. This government operative robot is easy to use. It can undoubtedly move, catch pictures and transmit them remotely on the checking screen where the warriors can see the present circumstance of the war field. The powers can design their guards as indicated by the risks been appeared through the robot. This robot is utilized for short separation reconnaissance for the security of that locale. The structure comprises of a vehicle having a camera for checking with a RF innovation for remote activities. The transmitter send the directions to the recipient for controlling the development of robot. The collector gathers and disentangles the gotten flags previously intensify the micro-controller which drives the motors through drivers. Remote of the camera can send live sound visual recording to the application on mobile phone. Current military forces are using different kinds of robots for different applications going from mine distinguishing proof to spare exercises. In future, they will be used for perception and surveillance, coordination and support, correspondences establishment, forward-passed on antagonistic exercises and as strategic fakes to cover move by keeping an eye on resources[2].

The task is to build a mechanical vehicle which will be controlled through the android application which will be linked or connected to the remote of the camera for observation purposes. The camera which is attached on the robot it will continuously send or transmit the data by OV2640 camera. This robot has a very useful application in the battle ground or war fields in form of spying purposes as an agent. As in this research paper, existing system is discussed where global system for mobile (GSM) – built mobile robot and Dual tone multi frequency build robot (DTMF) was used, these robots have realistic drawbacks for example, more vitality or energy is acquired to the system, the robot and the controlling unit must be in viewable pathway, for various Mobile phones, the control unit must be reassembled so that thusly the movement of the system is subordinate to cell phone. To end this requisite with a final goal, this research paper presents a voice over android application via Bluetooth connection. In this exam control on both remote correspondence between the versatile robots Android GUI application has been achieved. This framework can also be created by upgrading the execution and adding highlights. The improvement of this framework depends on the application used there. The frame may include highlights such as gas sensor, thermal image recognition, automated arm connection, and may be used in pick-and-place and so on should be possible. The improvement of this framework has been achieved by wide application zones, for example in army and legal authorization and industrialized and mischance organization criteria correspondence between the versatile robot Android GUI applications has been achieved [3].

This innovative robot system is constructed to perform various special tasks which is dangerous for human's life, which have his risk factor of human loss. On the whole we can say it can be used to perform task in cases where some crime happened and can be very important for military or army for keeping an eye on opposite entities or we can say purpose of spying. Some of the time it is important for a human which is bomb transfer master to incapacitate the gadget. For this reason, the master who uncovered the bomb will put on a defensive suit and protective cap, get a tool compartment of gear, and walk the 100 or so meters to the site. To achieve the bomb's area, it might be important to climb stairs, creep through entry way or even rests to satisfy the mission. This framework spares the profitable existence of our officers. This robot can also be used as robotic arms and mobile robots to go into armed force territory. The entire framework is controlled through android application. In this paper, usage of IOT information arranges in military condition has been demonstrated utilizing Wi-Fi framework accessible on mechanical vehicle and android telephones. The robot which have automated arm and autonomously movable robot have numerous applications in this field. If the robot have these applications it will just not enter the danger zone and record but it can also move obstacles from its way and place things in front of itself to hide. Every step and performance will be tracked or can say recorded which will later analyze on big screen tenuously. This robot will also have a night vision camera which will allow the robot to see in darker places or in night time. This whole system would be fully controlled by android applications which will be easily accessible to the user. The Wi-Fi gadget and microcontroller which will get directions sends by the android application. The innovation can be enhanced further by offering directions to accepting circuit and control it by utilizing satellites correspondence. It will be utilized in shopping centers for pickup, drop trolleys and car vehicle painting.

III. METHODOLOGY

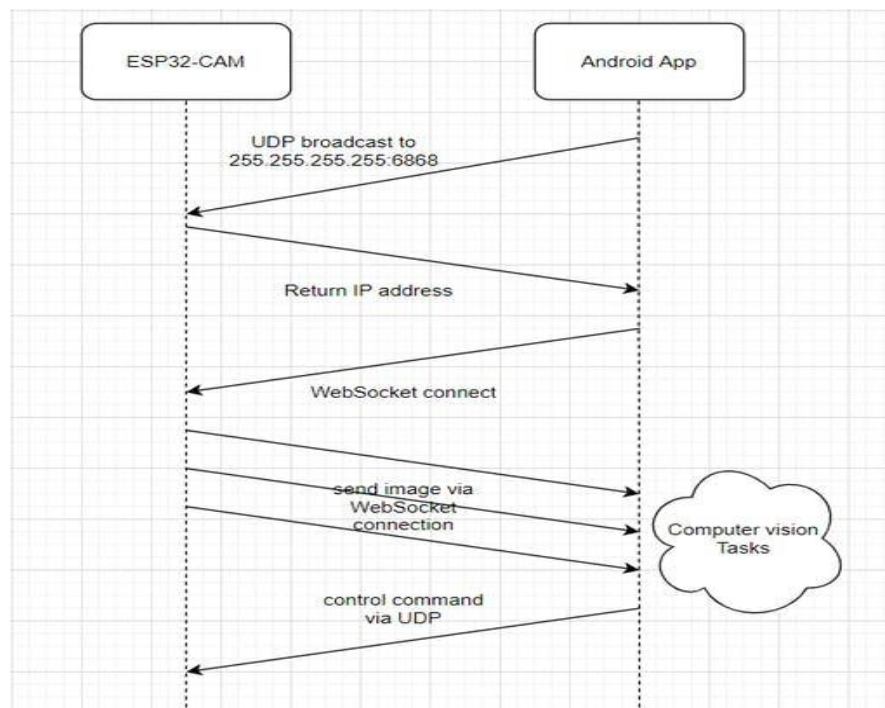
As shown in figure 7, the system works in this way that firstly, the commands are given to the receiver via Mobile application which is then processed and transmitted to the driver circuits which moves the motors. Then the commands are passed to the camera's motor and the rear wheel's motors which then moves accordingly. The footages obtained through the OV2640 camera is real-time transmitted to capture card of the camera and then is displayed on mobile screen.



3.1 FLOW CHART:

ESP32-CAM and Android Phone connect to the same wifi network.

ESP32-CAM act as a UDP server listens on port 6868, Android Phone sends a broadcast message to address [255.255.255.255:6868](https://www.jetir.org/202205224/255.255.255.255:6868) to acquire the address of the ESP32-CAM, then create a WebSocket connection to that address port 86. After connection is established, ESP32-CAM will stream images to Android phone, then the image processing is done there. Android phone can also control the ESP32-CAM GPIOs via UDP package.



IV. IMPLEMENTATION

4.1 WORKING

There are some spying robots which are controlled by remotes, spying robot also have a camera in it and it also transmits video material or information to the mediation group or spying group. The size of these types of robots are usually suitably small so can travel more efficiently. The task that we have to perform, we have moveable military mediator or spying robot which will be controlled by remote, we have used ESP-32 CAM Module. These type of robots which should be handle in a secret manner it have camera which will also controlled by remote, batteries, an antenna. We have used an desiccated Application to control the robot and whole system through remote In our robot we have also used OV2640 camera, , it is used to latch all information or data to the robot. In our application there are four button's to control the robot in all direction and two additional button's for object tracking and object identification . If the robot have to travel in dark areas or in night we have set up a LED light on the OV2640 camera with all the lightning circuitry. .To have good control over speed and turning we have used plastic gear motor (four) with its L289N motor driver and two servo motor to control the direction of the camera in your spy bot .

4.2 MICROCONTROLLER

As in figure 1, all the pin are defined with its use, as you can see in figure, GND,5V are connected to the power supply GPIO 12 is connected to servo motor , GPIO 13,14,15,2 is connected to L289N motor driver which is use to control the direction of the robot .



Figure 1. ESP-32 CAM Module

4.3 L289N MOTOR DRIVER

This motor driver that we have used is linked with ESP32-CAM Module to get control on robot. From figure we can analyze that IN 1, IN 2, IN 3, IN 4 are connected to GPIO 12, GPIO 13, GPIO 14, GPIO 2 and OUT 1 and OUT 2 are connected to the right hand side motor similarly OUT 3 and OUT 4 are connected to left side motor . Power source of +12V is given to driver

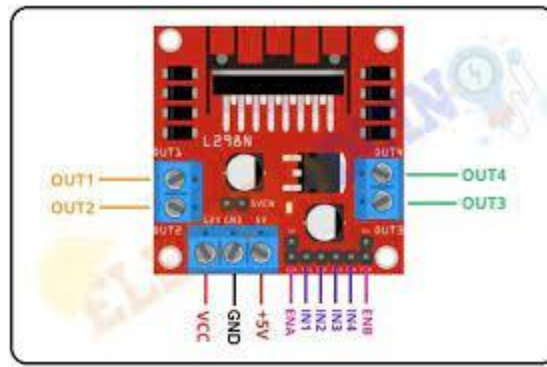


Figure 2. L289N Motor Driver

4.4 HOW TO BURN CODE IN ESP-32 CAM MODULE

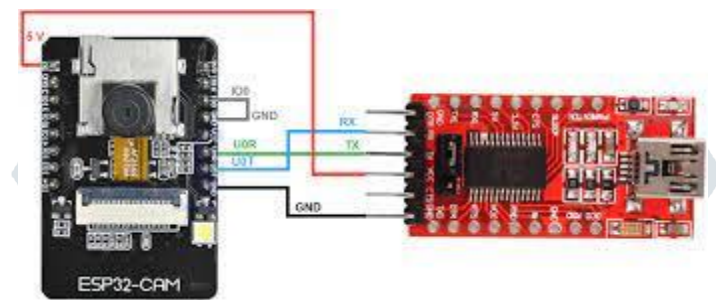


Figure 3. Connection of ESP32-CAM Module with FTDI Module

To burn the code into the ESP-32 CAM module using FTDI programmer module first we have to make connections as shown in the above figure 3.

To upload the code in ESP32 CAM module using Arduino IDE follow the steps:

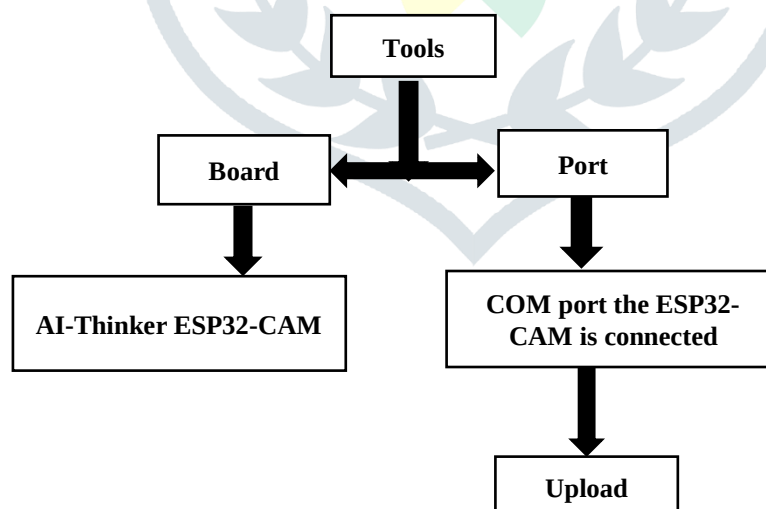


Figure 4 : steps of code uploading for ESP32 CAM module

4.5 OV2640 CAMERA

The OV2640 CAMERACHIPTM image sensor is a low voltage CMOS device that provides the full functionality of a single-chip UXGA (1632x1232) camera and image processor in a small footprint package. The OV2640 provides full-frame, sub-sampled, scaled or windowed 8-bit/10-bit images in a wide range of formats, controlled through the Serial Camera Control Bus (SCCB) interface. This product has an image array capable of operating at up to 15 frames per second (fps) in UXGA resolution with complete user control over image quality, formatting and output data transfer. All required image processing functions, including exposure control, gamma, white balance, color saturation, hue control, white pixel canceling, noise canceling, and more, are also programmable through the CCCB interface. The OV2640 also includes a compression engine for increased processing power. In addition, Omni Vision CAMERACHIP sensors use proprietary sensor technology to improve image quality by reducing or

eliminating common lighting/electrical sources of image contamination, such as fixed pattern noise, smearing, etc., to produce a clean, fully stable color image.

4.6 REMOTE CONTROL

The Remote control is basically an mobile application and its size is 16 MB. Which is available on play store and its name is ESP32 AI CAM . Remote control application consist of six press buttons which are as follows FORWARD, BACKWARD, RIGHT, LEFT, OBJECT DETECTION, OBJECT TRACKING, LED, STREAM. Design of application is as shown in the figure 4 .

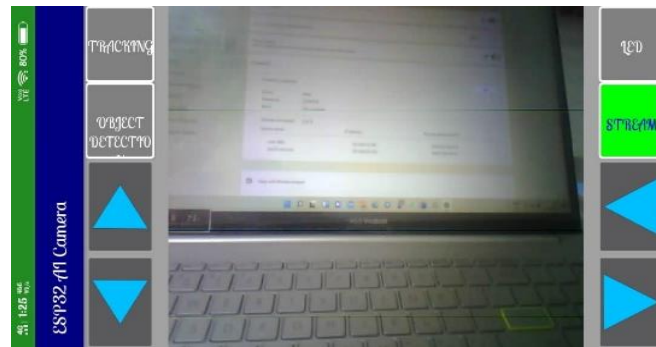


Figure 5 Application After connecting to ESP-32 cam Module

4.7. ROBOT VEHICLE

This whole military spying robot consists of a OV2640 camera, we have four wheels, and four plastic DC gear motors, one L289N Motor Driver, one LM2596 DC-DC buck Converter and ESP32-CAM module. The ESP-32 Cam module is similar to ESP 8266 Module but it comes with additional OV2640 camera we have 16 pins to operate the robot. One LM2596 is only used for ESP-32 cam module to give steady +5v to the module. The use of ESP32-cam Module is not just used for video steaming but also gives command to the motor driver to move robot in a very precisely way on the function path or route. Accuracy is very important in these robots. In our robot it consist of four DC plastic gear motors with its power source. To run these motors we need motor drivers and we have used L289N motor driver. In our robot as we have mentioned we have used DC plastic gear motors each motor is connected to the wheel. Each wheel can move in forward and reverse direction due to DC plastic gear motors reverse capability. One set of a DC motor is connected to control the movement of a project. And one servo motor is mounted to camera for the movement of the camera.

Once you switch on the power supply ESP-32 cam Module is in active state and it start searching for the local WIFI network how's WIFI credentials are already entered in code which we have inserted in ESP-32 Cam module. Now we have to open the mobile application which is particularly designed for this robot now we have to connect phone WIFI to the same WIFI to which ESP-32 cam module is connected now we have to click on STREAM button Which is displayed in the mobile application. Now as per requirement we can set ESP32-cam Module to Object tracking and Object identification.

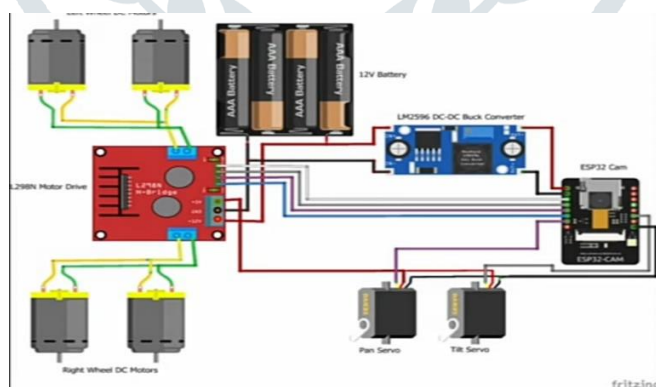


Figure 6 Robot vehicle circuit

V. RESULT

Amid tests, our plan works successfully. The essential metric for our paper would be precision. This has been tried to the best of our capacity. We have the ability to see exactly the things that are going on. As far as we can tell, our structure has created no disturbing influences. Depending on the course of the engine, the robot moves depending on the information we provide via the remote control. With the help of the camera, we can see the things going on in the region where the robot is hidden. By keeping the circuit direct, most customers have the capacity to use it effectively [10]. The goal of this paper is to limit human setbacks in psychological militant assault, for example, 9/11. The battle robot has been intended to handle such a brutal dread assaults. This robot is Application based, remote-controlled, and has every one of the controls like an ordinary vehicle. A remote camera was introduced to you, with the aim that it will screen opponents remotely, if required. It can quietly go into enemy zone and send us all the data through its small camera eyes. This undercover agent robot can show in star apartments, shopping malls, jewelry rooms, and so on, where there is risk of gatecrashers or scared mongers. Since human life is in every case valuable, these robots are the substitution of contenders against fear based oppressor in war zones [9].

The following images are some example of which we have taken from 150 examples.

1. Bottle

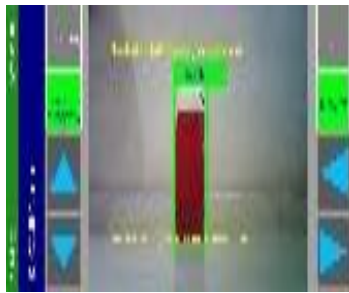


Fig 1

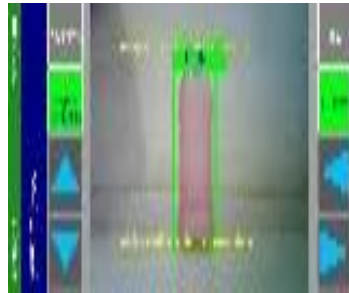


Fig 1.1



Fig 1.2

2. T.V

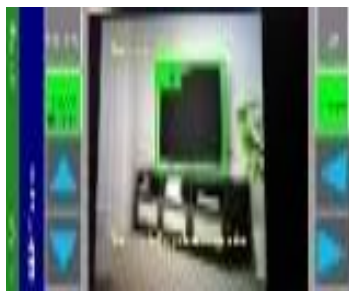


Fig 2



Fig 2.1



Fig 2.2

3 Laptop



Fig 3

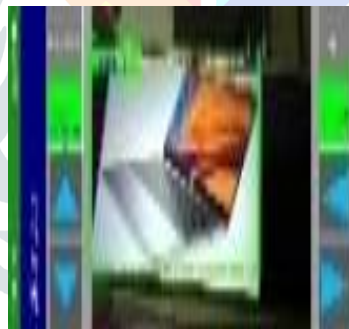


Fig 3.1



Fig 3.2

4. Clock

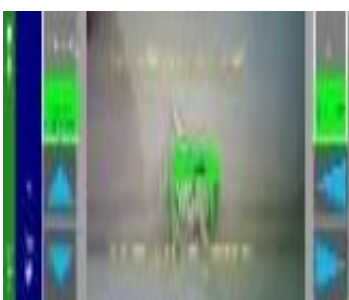


Fig 4

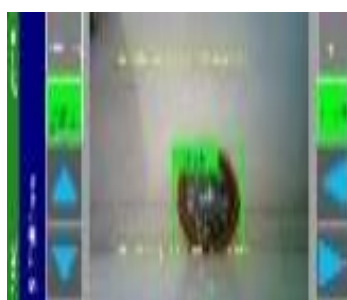


Fig 4.1



Fig 4.2

5. Bag



Fig 5



Fig 5.1



Fig 5.2

6. Car



Fig 6



Fig 6.1



Fig 6.2

7. Motor Cycle



Fig 7

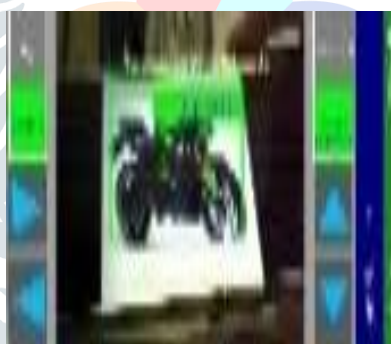


Fig 7.1



Fig 7.2

Table 1: the accuracy of Object identification

Sr.no	ObjectName	ObjectDetected	Dictation%	Result
1.	Bottle	Fig 1	98.2%	Detected
		Fig 1.1	98.5%	Detected
		Fig 1.2	98.6%	Detected
2.	TV	Fig 2	98.8%	Detected
		Fig 2.1	98.9%	Detected
		Fig 2.2	98.4%	Detected
3.	Laptop	Fig 3	98.6%	Detected
		Fig 3.1	98.5%	Detected
		Fig 3.2	98.1%	Detected

				Detected
4.	Clock	Fig 4	98.6%	Detected
		Fig 4.1	98.4%	Detected
		Fig 4.2	98.4%	Detected
5.	Bag	Fig 5	98.5%	Detected
		Fig 5.1	98.9%	Detected
		Fig 5.2	98.4%	Detected
6.	Car	Fig 6	99.7%	Detected
		Fig 6.1	99.8%	Detected
		Fig 6.2	99.9%	Detected
7.	Motor cycle	Fig 7	99.5%	Detected
		Fig 7.1	99.4%	Detected
		Fig 7.2	99.6%	Detected

Below image shows the output generated while object tracking using spybot

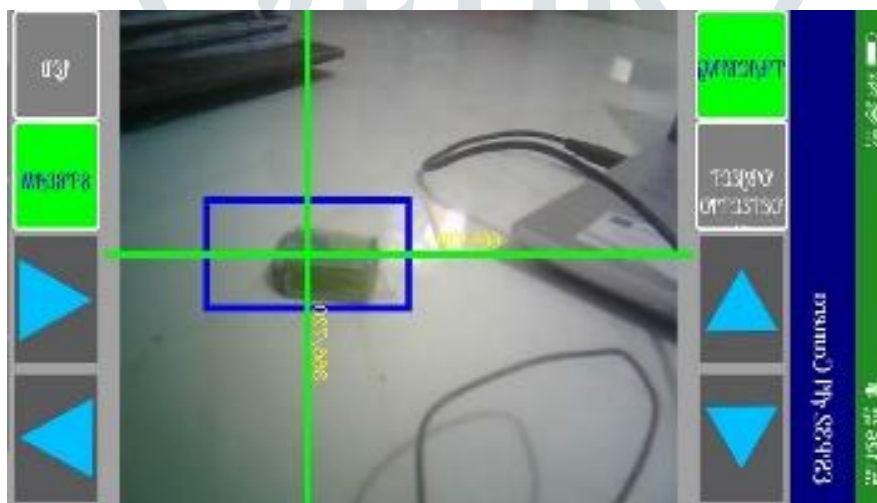


Figure 5.2. final output of object tracking using Spybot

VI. CONCLUSION

The essential point of view of the military reconnaissance robot should make it straightforward. The administration operator robot can move without quite a bit of a track, getting pictures and transmitting them remotely, at that point the warriors give a recommendation about the dangers and conditions in the field of war. The robot moves relying upon the engines, which are reliant on the data we give about the transmitter (remote). RF signals are utilized as control signals. By utilizing these characters, the coding is done and signal is sent by the sender. At the beneficiary end, this decoded banner is given as a commitment to the drive of the engines. The robot is utilized for brief detachment and along these lines ensures the wellbeing of the territory. This makes the powers see precisely what's going on in the encompassing locale and to set it up as it ought to [5]. With the assistance of this proposed advancement, there is some help for our security controls in area of interloper. This mechanized structure can likewise be utilized in high height territories where it is troublesome for people, as a feature of our edges fall into high elevation areas. The proposed computerized structure can likewise be utilized in the look for the harmed individuals amidst disasters, for example, trembling, falling of the building and past in the mining zones [2].

This spying robot can be modified and made it for prolonged ranged and can be make it more useful by consuming more operational procedures and modules like Wi-Fi module, raspberry pi. Future scope of this robot is very efficient it may have gas sensors to detect the harmful or hazardous gases in the surroundings. It can also be used as bomb diffuser and bomb disposal team can also use these type of robot in many ways and reduces the risk factor of human loss. Further, a terminating framework can be set on the robot, to fire any foe when he is spotted. The innovation can be enhanced further by offering directions to accepting circuit and control it by utilizing satellites correspondence. It will utilized in shopping centers for pickup, drop trolleys and car vehicle painting. Likewise, the framework can be made android based, where all controlling should be possible through

an advanced mobile phone. There is a light called halogen light which is useful for the camera's vision which is attached on the robot. This robot can also be controllable by giving commands through voice it will response to the voice commands also.

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