International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 05 | May 2023 www.irjet.net p-ISSN: 2395-0072

Multipurpose Warfield Surveillance Robot Using IoT

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Abstract – *The field of robotization and robotics is a extensively used discipline in the manufacturing assiduity. It's substantially used to meet the requirements of colorful diligence similar as food and libation, healthcare, and home entertainment. This design proposes developing a robotic vehicle that can be operated ever using an Android app. The proposed robot can be equipped with a camera and wireless connectivity to transmit real- time videotape and images. It can be used for surveillance in war zones. Wi- Fi is a fairly new technology, and its practical and growth eventuality are immense. The app for Android can be used to connect with the security system and give a GUI that the stoner can use. The system will also respond to the stoner's commands. The device is equipped with a stir sensor and a camera.*

Key Words: Surveillance, IoT, Wi-Fi, Raspberry Pi 4, Robotic Arm, GUI.

1. INTRODUCTION

The arrival of new high- speed technology and the growing computer Capacity handed realis- tic occasion for new robot controls and consummation of new styles of control proposition. This specialized enhancement together with the need for high performance robots created briskly, more accurate and more intelligent robots using new robots control bias, new motorists and advanced control algorithms. This design describes a new provident result of robot control systems. The programming of the robot takes time if there's any change in the design the reprogramming has to be done. Therefore they aren't stoner friendly and worked along with the stoner preferences. To make a robot stoner-friendly and to get the multimedia tone in the control of the robot, they're designed to make stoner commanded work. The ultramodern technology has to be enforced to do this. For enforcing the ultramodern technology, it should be known by all the druggies to make use of it. To reach and to full-filler all these requirements we're using android mobile as a multimedia, stoner-friendly device to control the robot. This idea is the provocation for this design and the main theme of the design. In this ultramodern terrain everybody uses smart phones which are a part of their day- to- day life. They use all their diurnal uses like review reading, diurnal updates, social networking, and all the apps like home robotization control, vehicle security, mortal body deconstruction, health conservation has been designed in the form of operations which can be fluently installed in their handheld smart phones. This design approached a robotic movement control trough the smart phones. Hence a devoted operation is created to control an bedded robotic tackle. The operation controls the movement of the robot. The bedded tackle is developed on jeer pi 4 regulator and to be controlled by a Smart phone on the base of Android platform. Jeer pi 4 regulator is to admit the commands from the Smart phone and takes the data and controls the motors of the robot by the motor motorist L293D. The robot can suitable to move forward, rear, left and right movements. The Smart phone is been connived to the device by using Bluetooth. It has inbuilt Bluetooth device HC-05 module to admit commands from smart phone. A wireless camera is fixed on the body of a robot for surveillance purpose indeed it has a night vision camera which can be seen in complete darkness by using infrared lighting.

2. PROBLEM STATEMENT

Stir control is abecedarian to numerous robotics operations, and is known to be a delicate problem. Prosecution in real world surroundings is confounded by noisy detectors, approximate world models and action prosecution query. There are numerous contributing factors to geste prosecution that are implicit targets for enhancement, for illustration bettered tackle to give more precise detector readings or more accurate action prosecutions. My exploration targets the enhancement of action selection paradigms; specifically, the development of further robust control programs, or mappings from world compliances to robot conduct. The service and police development remains a vital challenge within automation and specifically requires a high position of trouble and moxie. These conditions circumscribe both the volume and variety of developed robot actions, and I believe therefore also the growth of the field of robotics as a whole. From the viewpoint of the robotics- expert, the trouble needed limits the number of developed actions, as important time is devoted to details similar as parameter tuning. From the viewpoint of those who aren't robotics-experts, geste development is entirely inapproachable. By limiting the development of robot actions to experts, I believe that we limit the growth of the field with respect to both volume(smaller people developing actions) and direction(development from the shoes of masterminds only). The presence of robots outside of laboratory is getting ever the more common, from recreational robots in the home to disquisition rovers in space, and the number of implicit operation disciplines for robots is unbounded. As familiarity with robots outside of the lab becomes more current, it's anticipated that their drivers will include those who aren't robotics experts, therefore presenting a demand for more accessible policy development ways. Likewise, outside of laboratory or artificial settings, generally the complexity of the functional terrain increases, making policy development frequently intractable using classical ways like hand-modeling world dynamics, since numerous of the difficulties associated with policy development scale with robot and sphere complexity. A primary thing of my exploration is to develop ways for learning robot stir control programs, that reduce the conditions placed on robotics experts, in order to increase the extravagancy of robot actions and promote robot autonomy. A secondary thing is that these ways be accessible to non-experts as well. The work of my discussion and postdoc concentrated on perfecting policy development with mortal feedback, in particular corrective feedback, that dyads with schoolteacher demonstration and machine literacy ways to develop robot stir control programs. This approach takes alleviation from enabling humans to educate robots as they educate other humans, to more grease knowledge transfer from mortal to robot and therefore also the exploitation of mortal knowledge and task moxie.

3. OBJECTIVES OF THE PROJECT

- The main end is to make the robot to act as a defense soldier, bomb detector, also make the robot for the purpose surveillance in border areas.
- To minimize mortal losses in terrorist attack. For this we design a robot that can cover adversary ever when demanded.
- This design focuses on erecting a RF predicated spying robot attached with wireless camera that can reduce the mortal victim.
- This robot is it helps to keep the place under control by furnishing all time surveillance and also overcomes the disbenefit of limited frequency range by using the generality of Internet of goods for entering the data from the bot and also to control the movement of the bot.
- This makes soldier's life more secure on war field.
- The asset robot can easily move, capture images and wirelessly transmit them, thus giving the legionnaires an suggestion about the troubles and situations in the war field.
- The asset robot which we have proposed is to cover the adversary terrain thus our military people can stay in safer place to plan untoward attack.

4. METHODOLOGY

This is the internet of things (IOT) predicated design, where we are particularly uses the boo Pi, USB web camera and two DC motor with Robot chassis to make this Robotic bus setup. It has a web camera mounted over it, through which we will get live video feed and the interesting part also is that we can control and move this robot from a web cyber surfer over the internet. As it can be controlled using webpage, means it can also be controlled by using the other smart bias where we can control through the webpage. We developed a webpage through which we can control the stir of the robot in asked directions. The webcam will capture live data with felicitations to its surroundings and also shoot it to a asked device through internet. The user will be observing this data on the monitor at the user end. According to the asked movement, the user will control the robotic vehicle through the webpage available at the user end.

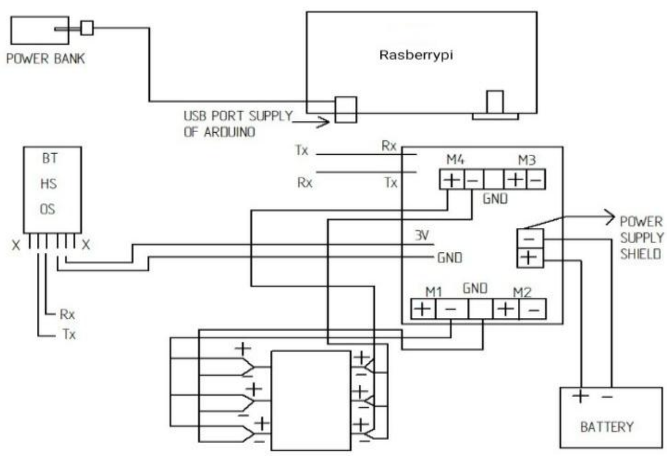

Fig: Raspberry Pi with motor shield

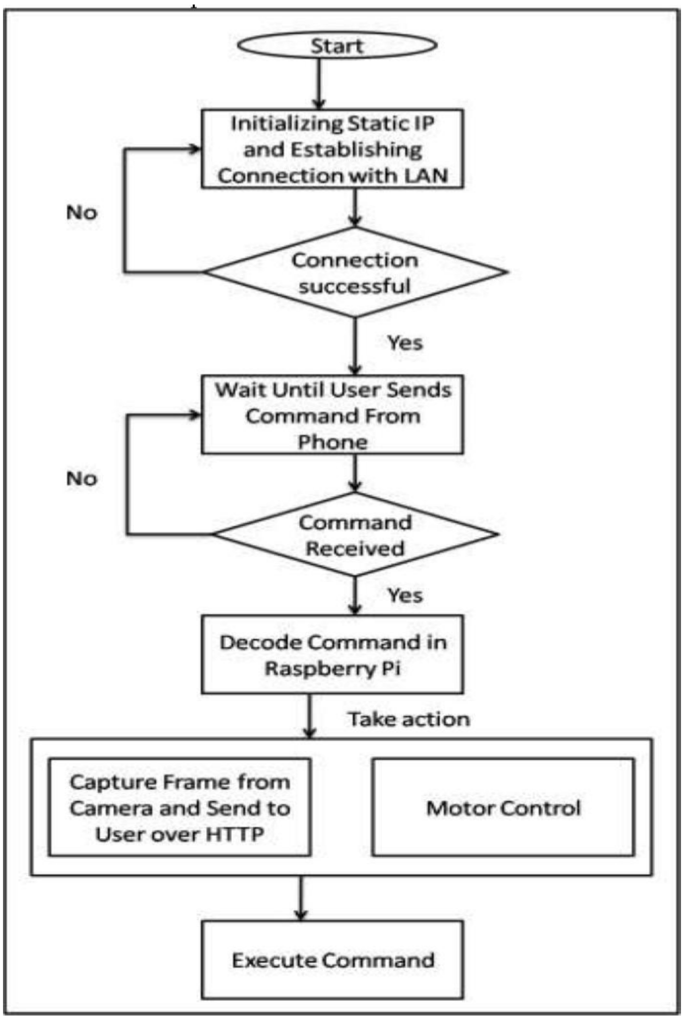

Fig: Flow chart

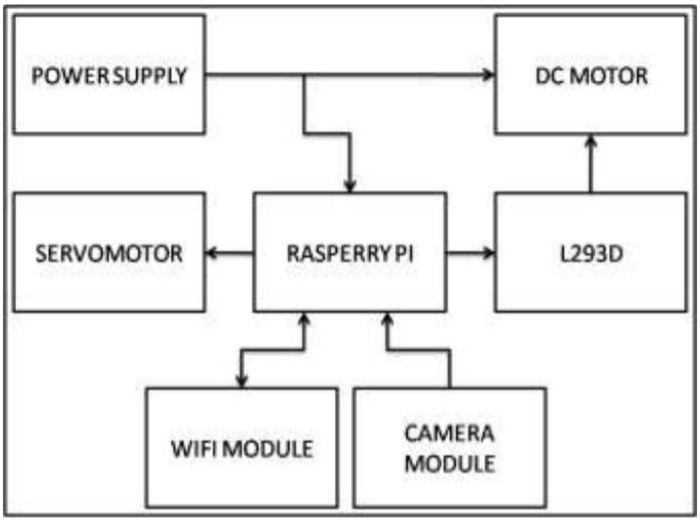

Fig: Block Diagram

4.1 Flow Graph:

4.1.1 DFD Level 0:

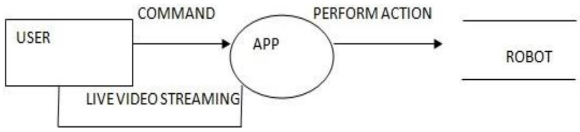

Fig: DFD Level 0

4.1.2 DFD Level 1:

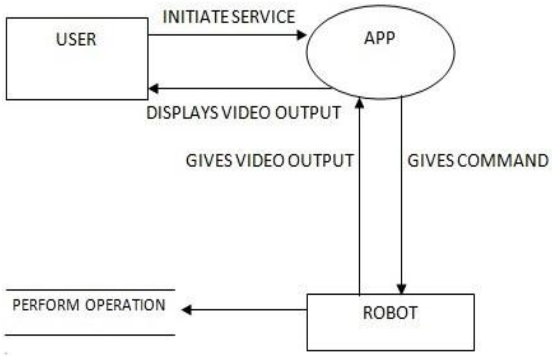

Fig: DFD Level 1

4.2 Parts Specifications:

4.2.1 Raspberry Pi 4:

Raspberry Pi is used for making robot wireless and web and also the vids are transmitted wirelessly from the robot to the stoner's examiner, from where the stoner can accessibly control the robotic vehicle's movement and also the robotic arm movement.Raspberry pi is connected with the dongle which enables boo pi to transmit over the web network. Raspberry- Pi Module Raspberry Pi uses an SD card for booting and for memory as it has an inbuilt hard scrap for store house. It has Quad- core Cortex- A72(ARM v8) 64-bitSoC@1.8 GHz processor, 1 GB, 2 GB, 4 GB or 8 GB LPDDR4- 3200 SDRAM(depending on model).2.4 GHz and5.0 GHz IEEE802.11 ac wireless, Bluetooth5.0, BLE. Gigabit Ethernet; 2 USB3.0 harbors; 2 USB2.0 harbors. Raspberry Pi standard 40 leg GPIO title(completely backwards with former boards). 2 ×micro-HDMI harbors(over to 4kp60 supported). 2-lane MIPI DSI display harborage; 2- lane MIPI CSI camera harborage. 4-pole stereo audio and conflationvideoharborage.H.265(4kp60 decode), H264(1080p60 decode, 1080p30 render). OpenGL ES3.1, Vulkan1.0. Micro-SD card niche for lading operating system and data storehouse. 5V DC via USB- C connector, 5V DC via GPIO title. Power over Ethernet(

PoE) enabled(requires separate PoE headpiece). Operating temperature 0 – 50 degrees C medium.

Fig; Raspberry Pi 4 Iso View

4.2.2 Robotic Arm:

A robotic arm is a mortal like of mechanical arm, generally programmable, with analogue functions to a mortal arm; the arm may be part of a more complex robot. The links of a robotic manipulator are connected with joints allowing it in either rotational stir deportation.(1)(2) The links of the robotic manipulator can be considered as a kinematic chain. The boundary of the kinematic chain of the manipulator is called the end effector and it's analogous to the mortal hand. still, the term " robotic hand " as a reverse of the robotic arm is constantly interdicted. Forward kinematics is the process of determining the position and exposure of the end effector in Cartesian space with the help of the common angles"(10). Inverse kinematics is the process of calculating the common angles with the help of the position and exposure of the end-effector.

Fig: Robotic Arm

4.2.3 L293D Motor Driver:

A motor driver is an intertwined circuit chip which is generally used to control motors in independent robots. Motor motorist act as an interface between Arduino and the motors. The most generally used motor motorist IC's are from the L293 series similar as L293D, L293NE,etc. contemporaneously 2 DC motors can be controlled by this L293D correspond of two H-ground. A low current rated motor can be controlled by this motor motorist. A H- ground which is a simplest circuit in a motor automobilist. We'll be pertaining the motor motorist IC as L293D only. L293D has 16 legs.

Fig: L293D Motor Driver

5. DESIGN PARAMETERS

5.1 Specifications:

5.1.1 90 Degree & 45 Degree PVC Elbow:

Diameter: 4.2 cm
Material: UPVC material

5.1.2 Hose Clip Clamp:

Diameter: 40 mm
Material: stainless steel=W4 (304 Grade Stainless steel)

5.1.3 Metal:

Length: 153 mm
Width: 25 mm
Thickness: 3 to 5 mm

5.1.4 12 DC Gear Motor:

Speed: 30 rpm
Gear used: Helical gear

Shaft length: 20 mm
Casing: Plastic & sheet metal

5.1.5 Power Supply:

a) Power bank and b) 12 volt 5 Amp battery

a) Power bank:

Capacity: 10,000 ma
Weight: 250 g

b) 12 .4 volt 5 amp battery:

Capacity: 62 watt
Weight: 1950 gm

5.1.6 Wheel:

Wheel diameter with grip = 95 mm
Wheel diameter without grip = 85 mm
Wheel width = 20mm

5.1.6 Top Platform:

Length of the top platform =110 mm
Width of the top platform = 100 mm

5.2 Calculations:

5.2.1 Wheel Design:

For the wheel design, using the formula of velocity. Find out the wheel diameter on the basis of velocity & speed which is considerable.

$$V = (\pi.D.N)/60$$

Velocity 8 cm/sec		Velocity 10 cm/sec		Velocity 12cm /sec	
RPM (N)	DIAMETER	RPM (N)	DIAMETER	RPM (N)	DIAMETER
10	15.277	10	19.096	10	22.915
20	7.638	20	9.548	20	11.458
30	5.092	30	6.345	30	7.638
40	3.819	40	4.774	40	5.729
50	3.055	50	3.819	50	4.583

Table: Wheel Design

We have to choose 30 rpm motor, from the above the table, for 12 cm/sec, the wheel diameter is 76.38 mm, but we used 85 mm diameter wheel for the model because of the availability.

5.2.2 Calculation of Tilt Angle and Wheel Base:

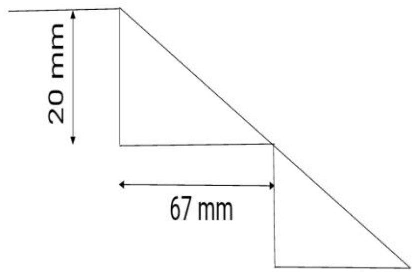

Fig: Calculation of Tilt Angle and Wheel Base

Consider, step height & length
Height -20 cm
Length – 67 cm

5.2.2.1 To Find Out the Tilt Angle:

Tilt angle (θ) : 〖tan〗 ^(-1)⁡ 〖(y/x)〗
= 〖tan〗 ^(-1)(20/67)
= 16.62

5.2.2.2 To Find Out the Wheel Base:

Wheel Base. =Total length (radius of front + radius of rear wheel)
= 67 – (8.5+8.5)
= 50 cm

5.2.3 Calculation of the Link:

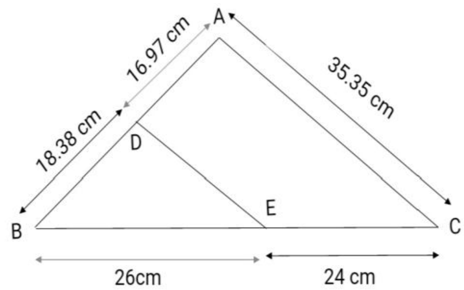

Fig: Calculation of the Link

5.2.3.1 Length of the Link AC:

In ΔBAC, By Pythagoras theorem

$BC^2 = AB^2 + AC^2$

$BC^2 = AB^2 + AB^2$ .... (AB=AC)

$\therefore 50^2 = 2\, AB^2$

$\therefore 2500 = 2\, AB^2$

$\therefore AB = AC = 35.35$

5.2.3.2 Length of the Link DB:

In ΔBDE, By Pythagoras theorem

$BE^2 = BD^2 + DE^2$

$BE^2 = BD^2 + BD^2$ ...... (BD=DE)

$\therefore 26^2 = 2\, BD^2$

$\therefore 676 = 2\, BD^2$

$\therefore BD = DE = 35.35$

6. RESULT

The Passive Infrared detector senses the stir for a range of 3 to 7 meters around the robot's air. After the robot's algorithm is executed the detected signal is fed as an input to the jeer pi3 which notifies the camera to turn on. Once the camera is turned on it starts recording the videotape of the meddler. The videotape is transmitted through Internet Of effects to the web runner created by the stoner. Once the videotape is uploaded, he can login to the jeer Pi by knowing its IP address and using VNC bystander software. For this purpose, the Pi's IP address should be made static, that is, it shouldn't change whenever it reboots and connects to the network again.

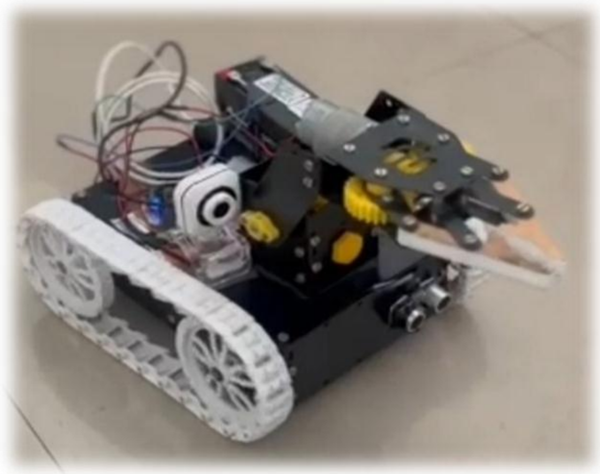

Fig: Multipurpose Warfield Surveillance robot using IoT

6.1 Applications:

- Mobile robots can be used in several application dangerous area operations such as high temperature zone.
- Robot will become part of life to solve our problem like handicap person to go over the slide without any help of the other human being.
- It is used to survive on surface irregularity without any shock & vibration.
- It also used for bomb diffusing squad such that it can be able to cut the wire for diffusing the bomb.

7. CONCLUSION

The Surveillance Robot has been designed in such a way that it can feed to the conditions of the bomb disposal platoon, the service, the police and also for the labor force who handle radioactive paraphernalia. It has innumerable operations and can be used in different surroundings and scripts. For case, at one place it can be used by the bomb disposal platoon, while at another case it can be used for handling mines. While another operation can be to give up to date information in a hostage situation. This is wide field of study and is truly less explored. So this conclusion gave us the incitement for the development of dread suspension system in a cost effective manner. Our concern during the development of the rover will be to optimize the speed analogous that the rover do not flip and may travel a little hastily too and make it bring effective with maximum possible inflexibility and ruggedness. With certain development the dread system can be used for defense related operation and also in wheelchairs for climbing stairs.

8. FUTURE SCOPE

The system that we've erected is a working prototype of a robot, which should be compact, fast and accurate. This prototype may not have the features and trustability of the original design. It's only being developed to insure that the design is doable, not impracticable and can be enforced on a much larger scale in a more it can still perform some position of object manipulation. Hence the unborn advancements may include a important effective way.

Some of these advancements are described below.

- COMPACT DESIGN.
- QUICK MOVEMENT.
- Advanced trustability.
- REMOVABLE GRIPPER and MULTI-GRIPPER ROBOTIC ARM.
- ARTIFICIAL INTELLIGENCE.

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