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Border Security Robot using IoT

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ABSTRACT: The main objective behind this paper is to develop a robot to perform the act of surveillance in domestic areas. Nowadays robot plays a vital role in our day to day life activities thus reducing human labor and human error. Robots can be manually controlled or can be automatic based on the requirement. The purpose of this robot is to roam around and provide audio and video information from the given environment and to send that obtained information to the user. In this project, one can control the robot with the help of mobile or laptop through Internet of Things (IoT) and also can get the live streaming of video both in daytime as well as at night with the help of wireless camera from the robot. The robot can be controlled both in manual as well as in automated mode with the help of ESP32 microcontroller. This robot also uses various sensors that collects data and sends it to the ESP32 microcontroller which controls the robot behavior. Along with the obtained live streamed video output, user can also obtain the presence of metal bombs using metal detectors. Thus the action of surveillance can be performed. Further advancement in our project can provide surveillance even in defense areas.

KEYWORDS: Border, Robot, Security, and surveillance. Etc

I. INTRODUCTION

Technology has brought a dynamic and tremendous change in robotics and automation field which ranges in all kinds of areas. Surveillance is the process of close systematic observation or supervision maintained over a person, group, etc. especially one in custody or under suspicion. Thus surveillance is mainly required in the areas such as border areas, public places, offices and in industries. It is mainly used for monitoring activities. The act of surveillance can be performed both indoor as well as in outdoor areas by humans or with the help of embedded systems such as robots and other automation devices. A robot is nothing but an automatic electronic machine that is capable of performing programmed activities thus replacing human work, providing highly accurate results and easily overcoming the limitations of human beings. Thus replacing humans in the surveillance fields is one of the great advancement in robotics. The robot consists of ESP32 microcontroller which acts as the heart piece of the robot. This robot also consists of DC motors, wheel chassis, battery, Wi-Fi module (ESP8266 12e) and various types of sensors such as ultrasonic sensor for obstacle detection the robot can be either operated automatically or manually. User end communicates with the robot by implementing the concept of Internet Of Things. This can be achieved through ARDUINO software, which is used for IOT developing projects. The commands are sent to the robot by means of software and they are received by microcontroller via Wi-Fi since both are interfaced with each other. Thus the robot can be controlled in a wireless manner. In this project, we use wireless transmitting camera that provides audio and video information that can be received at the user end.

Existing System

- Already existing systems use robots that have limited range of communication as they are based on RF Technology, Zigbee and Bluetooth.
- Some existing projects use short range wireless camera.
- Some existing robots can only be controlled with a manual mode which needs human supervision throughout the whole surveillance process.

Proposed System

- By interfacing Wi-Fi module with Arduino, we can get unlimited range of operation.
- Robots can be operated in both manual and automatic modes. • By using Arduino microcontroller, the cost and complexity can be reduced.
- The communication with the robot occurs in a more secured manner.

II. RELATED WORK

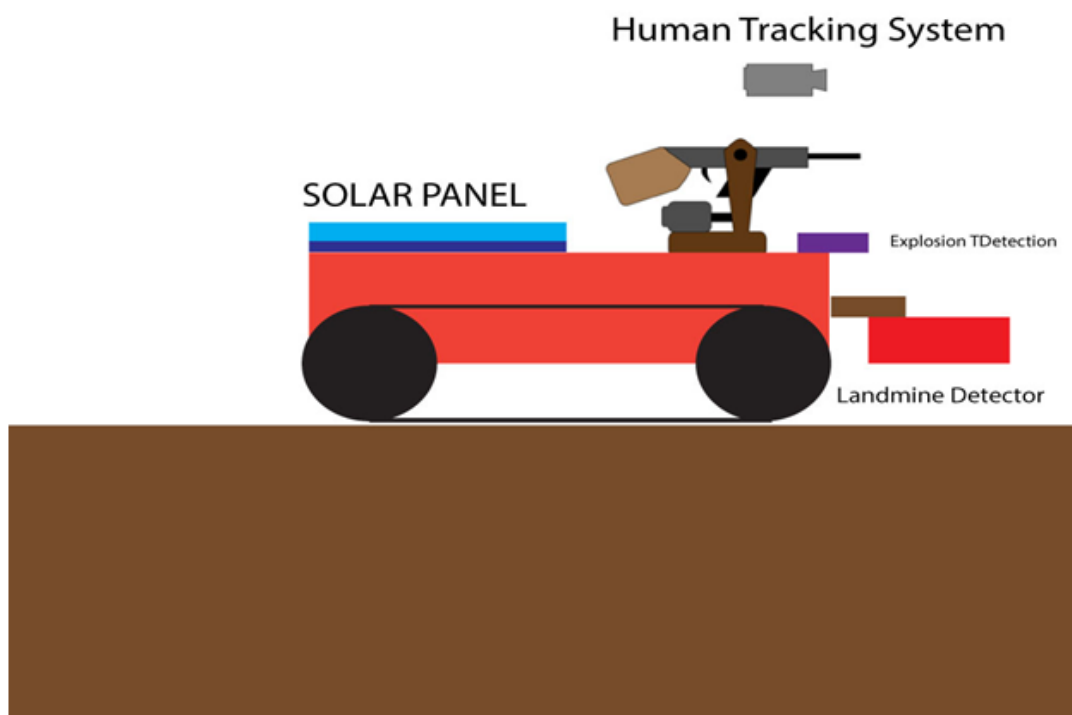
As we know that terrorist attacks have been, Increase rapidly in today's world so sue to this severe reason this is very important to know about the activities of that terrorist agencies and execution of the plan quickly. For security and sense, the author creates GPS base surveillance robotic system that is using ESP8266 this system can be controlled using a web browser and apps via wireless internet. All the surrounding environment is under consideration by a camera. In this author use an ultrasonic sensor and GPS module that will help in tracking the location continuously and measuring the distance of the object from the camera. This system is implemented on ESP8266 also which is use the Linux OS ad python language that writes many programs on different paraments of the robotics. Transfer of things and or exchanging of data is called the communication so IoT is the technique can be used for transfer of data with several other things. The internet systems or some devices reached to in billions till 2020. Using the little power of IoT safekeeping alert device spending little handling power which helps out to the observer when motion or gestures come and send images to the cloud server. When any gesture or any other indication comes then, IOT will observe the actions as well as acquire the warnings. These images will directly store in the cloud and as sometimes cloud id not accessible than at that time records will put in storage and close by on a ESP8266. ESP8266 has the number of advantages of image processing; control algorithms use for the attentiveness. The system uses the simple webcam. In June 2008, a journalist Evan Thomas published the article, "Up in the Sky, An Unblinking Eye" and Thomas explains that how the evaluation of aerial systems will come in dates bake in 1944.

In the start, many of the unmanned aerial systems were used in anti-aircraft exercises. In the development of 20 years, some additional functionalities have been entering in the aerial systems is data recording and photo imagery. Today's, unnamed aerial systems having the ability to projecting the live film for the air to the ground also giving the commanders a tool to making a most accurate decision in the time of wars according to see the situations. The legal and ethical problems are not expanding from the authors because this can affect the autonomous unmanned aerial systems. On the other hand, the unmanned robotics work as the extension of the human capabilities that will show that controller will continue to receive measurable data and get operating experience [7]. "Ultimate Fighting Machines" is the famous article that is published in March 2008 by Erik Sofge. In this article, the author defines the four different type of unmanned vehicles with their different abilities. Due to the land wars is many years ago the same concept is used to behind the process of implement unmanned vehicles. In the last century, the technology rapidly increases the number of real-world domains robots has been developed using different technologies like telecommunication and informatics, miniaturization and mechanical engineering. Also, there are many applications in assembly industry like mining industry, space explorations, defense organizations, in cars and electronic assembly lines belong to the most demanding users of robotic technology [1, 2].

In the military domain, we can see now a day some robotics assets have been deployed in the field. There are some famous examples of this field of robots is aerial vehicles, chemical sensors or cameras, seismic, different type of acoustic, unattended ground sensor, unmanned cars, autonomous underwater vehicles, multi-rotor helicopters, different rotorcrafts and conventional fixed-wing aircraft. In many planes, the army uses different size of equipment and robots also use in the rescue operation and also law enforcement. Such as providing the firefighting, provide situational awareness, mapping, security surveillance in urban areas and exploration of areas that stricken natural disasters. Also, a task in those unutilized areas that damaged by nebular reactors like after an earthquake. Robots we can use for different purposes of humans we can use this either for manipulation tasks or by collecting the information from human's awareness we can provide some situational awareness this could be acquiring static imagery, analysis of the chemical or nuclear hazards and continuous video streaming. Technology advancement is rapidly increasing in different scenarios of robots such as service robotics and autonomous cars, so the high-level control of robotic assets still mainly relies on teleoperations [3]. Teleoperation is the good in many scenarios, but the main problem in this method is where the need of some robots for in joint missions a teleoperation is not more scalable then there is the limit of employed resources. A single operator can be used directly to control the number of small robots but if the number of deployed assets has been increased and control of robots by humans this could be too costly for humans in term of human resources. It can say more clearly that if the number of robots increases and for control this also some humans require the financial cost or logistics cost has been increased rapidly. A high-level control robot is a best and significant solution for this problem that will increase the autonomy of the individual robot and as well as robot team as well. On the place of a human, some multi-robot teams can be used for executions like camera pointing and movement in a terrain [4]. IoT connectivity in the previously presented work. Dynamic team formation and live update on the map facility by the robots

III. WORKING

The robotic vehicle is Autonomous robotic vehicle. The robotic vehicle can be activated from the control panel and when triggered will be put up in surveillance mode. The robotic vehicle performs surveillance in the assigned area, continuously capturing the video feed from the onboard camera. The video feed is sent to the controlling end from where it can be viewed over the local network. The Video feed is processed by the raspberry pi using image processing techniques to determine the presence of the humans. If the human is detected, the system automatically commands the servo to target the position of human and move as the target moves. The same will be sent the control panel for verification and if the fire command is receives the robotic vehicle also fires the target automatically. The figure below shows the line diagram of the project. The robotic vehicle also includes landmine detection system which can detect the land mines in the path of the robotic vehicle and alert the base station. The explosion sensor is also mounted on the robotic vehicle which will automatically detect the explosion and trigger the alert. The GPS system will send the live location of the robotic vehicle to the Base station which makes it easy to track. The working principle of the targeting system can be understood from the line diagram of the below.



The Human tracking and shooting system is explained below.

As shown in the line diagram the project setup consists of a video camera interfaced with raspberry pi which can capture live video feed. The video feed is split into frames and checks if the person is present near the gun by analysis of frames using Deep learning techniques. As shown in the line diagram the controller consists of a image processor and an controller board to move the gun.

When the enemy is detected, the enemy tracking system is activated and the gun tries to aim the target at the enemy and trace it even if the enemy is moving. This is done using image processing algorithms which can trace the presence of human motion in front of camera.

IV. CONCLUSION AND FUTURE WORK

In this paper, the framework for making a robot for surveillance purpose is proposed. It overcomes the problem of limited range surveillance by using the concept of IOT. We can control the robot with the help of laptop/mobile manually. Automatic monitoring can also be done. Our proposed robot is small in size thus maneuvering into area where human access is impossible. Wireless technology is one of the most integral technologies in the electronics field. This technology is used to serve our project as a supreme part of surveillance act. This provides highly efficient and a cost effective robot that replaces human work and reduces human labor and performing monitoring works in a well effective manner.



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