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Terrain Surveillance & Autonomous Docking Robot

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ABSTRACT

This paper presents the development and characterization of a surveillance robot with automatic docking and recharging capabilities for terrain area. The proposed system is composed of a surveillance robot and docking station .These robots communicates with PC through Bluetooth device. The robot design has partitioned into sensor, control and planning subsystem. Our project is about developing a wireless surveillance robot which can navigate through obstacles with the help of sensor, embedded system and programming, it will be able to capture the footage of area with its camera and send them back using wireless transmission technology using Bluetooth .The docking station has a trapezoid structure with an arc shaped docking interface A docking method is based on self localization of the robot. The robot can return to the docking station when the on board battery is below threshold level.

Keywords: Robot, Surveillance, Docking, Terrain

I. INTRODUCTION

This project is aimed at developing a surveillance system which can be controlled remotely by using an Android App. It includes a robot with a Wireless Camera attach to it. This robot captures the high resolution video feed and transmits it to the connected Android device which is used to control robot. Surveillance is the process of monitoring a situation, an area or a person.. It is possibly to remotely monitor areas of importance by using robots in place of humans. By equipping them with high resolution cameras and various sensors. Building a small robot for testing and research purposes proves to be extremely expensive. It has a monitoring camera on front of it, so that we can even see everything through Remote server On the other hand the robot is capable of detecting the low threshold battery level and search the docking point for recharging the battery so as to provide the uninterrupted services. When the threshold battery voltage is low then it should navigate back to the docking region and join through the docking station.

The suggested network has a docking approach whichever is predicated on the self localization of the robot. It is observed that the robot can come back to the docking station when the on-board threshold battery is too low. Monitoring is easily done through the Computer. Automatic recharging has to be done to the robot to deliver uninterrupted surveillance.

Thus, it is our aim to build a fully-featured surveillance robot using an easily available Android phone, which can be remotely controlled by the Bluetooth.

II. METHODOLOGY

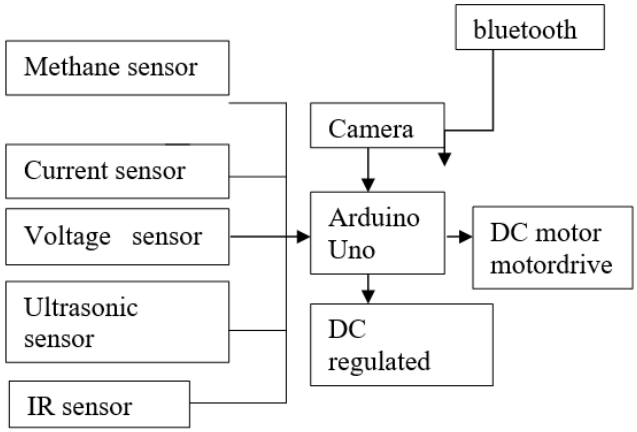

Figure 1. Block Diagram of Terrain Surveillance & Automatic Docking Robot

In that figure we can see that Bluetooth will send commands to Arduino Uno by decoding it first, then Uno will perform operations on the basis of commands provided by the user & will give the output to Motor Driver Shield which will drive the respective DC motors. To make more useful & efficient surveillance system, we are using one transmission modules i.e., Bluetooth .We are using Bluetooth Module to communicate with the system by using commands with the help of an Android Application. As we know to transmit data such as pictures & videos through live field requires more bandwidth, for that only reason we are using Bluetooth module. Robot consists of different module such as microcontroller, camera, RF transceiver; DC motor, DC motor driver circuit etc. Microcontroller controls the angle of rotation of two Servo Motors. The cannon is positioned aiming at the intruding object. At last cannon will get fired. DC motor is used for the movement of the robot in left, right, forward, backward direction. DC motor driver IC is IC L293D.Digital section includes the ARM – LPC2148 Controller along with required interfaces like Display Keypad and communication drivers.

The Power section include the power supply, design required for various parts of machine like controller, motors etc. The Firmware part include writing the software, which required controlling various operation, also it helps to program various parameters and setting of machine. Also it covers the communication with PC.

Docking system

If the surveillance robot wish to recharge with its individual and the battery voltage is low then it should navigate back to the docking region and join through the docking station repeatedly. Various key methods include local and global lane planning, self-localization, docking and charging status recognition, and fault-tolerant proceeding. In docking system, we are using ultrasonic locker to set place of robot at docking as shown in Figure 1.

III. CONCLUSION

We have presented the design and implementation of a surveillance robot with automatic docking and recharging capabilities for terrain. A docking method based on the self-localization of the robot and the infrared detectors of the docking station is proposed. The robot can navigate back to the docking station for recharging operations when the on-board battery is too low. The prototype robot achieved a success rate of 90% after 60 different docking attempts. In a nutshell we can conclude that wireless surveillance robot can certainly be a future market for many mining areas ,surveillance in hot spots, search and rescue operations or maneuvering in hazardous environment. This can save valuable human lives as well as time and resources need for such operations. We can use both Bluetooth for manual control and transmission of video footage depending on the purpose of the surveillance. Further enhancements can be added to improve functionality and features, which will further reduce human efforts and resource.

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