UNMANNED GROUND VEHICLE FOR SURVEILLANCE

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Abstract--Remote worked spy-robots can be immensely helpful in the event that they can be controlled remotely over a bigger working reach. Availability of various modalities for their remote-control movement can furthermore upgrade their abilities and the extent of usages. The human lives are administered by automation industry and robotic world. The robots can be used widely mainly due to its simplicity and their ability to provide solution to the problems. The key intention of this paper is to create an automated vehicle for investigation by using progressive machineries like Wi-Fi. The robot containing the camera can continuously send the video. This class of surveillance robots can be mainly used for spying the enemy in battle.

Key Words: Robot, Wireless Camera, Node MCU, Wi-Fi module

I. INTRODUCTION

India is emerging as a major producer of defence technologies. Military forces need to improve themselves rapidly and prepare for modern day threats. India has been pushing for more prominent indigenisation of military equipment as India imports around 70 percent (by estimation) of its high-tech defence, for example, flying machine, ships, submarines, rockets and so forth for the most part from Russia, Japan, Israel and United States [1]. India is buying Russian Origin T-90 battle tank at a cost of 29 crores (per tank) which offers increase in firepower, mobility and protection. Instead buying this type of costly tank for military purpose it is advent to produce robot for surveillance in the war field. Since the robots are used in agricultural fields for many purposes [2]. Robotic is a type of machine that plays very complex & a multiple task by the commands this is saved on a programmable device routinely or by means of giving instructions externally [3]. It needs an interfacing device together with Bluetooth, Wi-Fi and so forth. for outside controlling. in this work our paper is to construct a surveillance robot. Due to the lack of surveillance in the indoor application 15 policemen and 2 NSG commandos were killed during Taj Hotel attack. This paper describes a new comparatively valuable solution of robotic control systems in indoor application. Generally, the robots are controlled via wired networks. This UGV can also be used in the place which have huge peoples like shopping malls etc.

Modern world provides with lot of technologies; particularly mobile phones forms a part of their day to day activity [4]. The people use it for every day uses which includes reading newspaper, getting daily updates, social networking, health maintenance, agricultural field etc. [20]. The daily using software has been designed in the form of packages which are easily installed in the people's hand held android phones. The key intention of this work is to make investigation in the war zone.

II. RELATEDWORKS

A. I. Bugaje, A. Z. Loko [9] had designed and implemented an unmanned ground Vehicle (UGV) for fumigation purposes. The UGV entails of the supervisory board, sprayer, DC based servo motor, and Bluetooth element. Bluetooth communication modules helps to establish a radio communication governor for the robotic vehicle, the sprayer, and sprayer container spin. The performance of the unmanned ground vehicle for fumigation purpose hardware prototype was tested during the real-time test. It was found that the system was perfectly working on both smooth and rough surfaces [21]. The stability of the four-wheel robot that contained the fumigating tank was maintained. The system could receive command remotely via Bluetooth from up to a radius of 8 meters' coverage. The sprayer has a capacity to spray the chemicals up to 2 meters' radius. The battery system in the prototype can work for 4 hours without recharging. The entire body of the system can enable the system to enter almost every corner without any obstruction. This prototype is developed to reduce human exposure to pesticides during spraying. In the future, the

ZigBee module can be used for wireless communication which may have a longer range.

Wai Mo Mo Khaing, Kyaw Thiha [10] had developed a spy robot system that is used to capture the images around the area with the help of transmitting and receiving antenna. The remote-operated robot is consisting of a wireless camera, an antenna, batteries, and four movable wheels. The spy robotic is managed through using a remote which could move to the desired location and capture the photos around the region. This robot isn't always relevant for an extensive variety of operations. The robot captures audio and video information from the surrounding environment and will send it to the remote station via RF signals. The robot makes use of RF circuits for transmissions of captured images which has a drawback of the constrained working range, frequency range, and confined control. The wireless camera has audio and video systems. This camera can move the left and right direction to see the survey around the robot. There is no USB port in this camera so that the saving and records process of the paper need a capture card. Similarly, the wireless camera may be upgraded with the 360-degree left and proper guidelines in order that the functionality is having a movement at many sides.

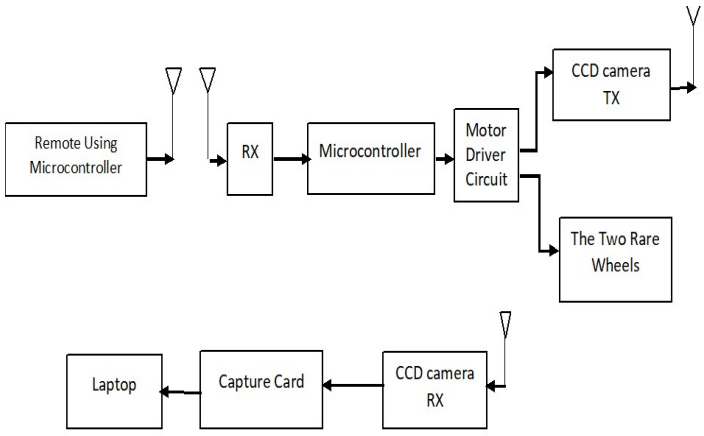

Fig.1. Remoted Operated Spy Robot System

Sung-Soo Kiml, Heechan Kang [5] developed a military robot of remote operation for the indoor environment.Fig.1shows the detailed information related to remoted operated Spy robot system. A camera-based remote operating machine of a 6X6 unmanned army robot has been advanced for indoor check surroundings. The device comprises of operator console, camera stabilizer unit, beam paper or providing virtual environment to the operator. Three-axis digital camera stabilizers include pan, tilt, and roll servo-vehicles. A virtual bump run guide is displayed in the front of the camera systems that are placed on top of the motion platform. Displayed virtual reality environment is captured by means of the camera device with a stabilizer and the digital camera is transferred into the operator's console [7]. It is anticipated that the distinct forms of the unmanned robot automobiles with a digital camera device can be effectively tested if the actual-time models are replaced. so as to acquire more stable pictures, the image processing method has to be included with the hardware stabilization.

Revati Pote [17] had developed a spy robot which includes fire detection and water sprinkling mechanism. The robot vehicle may be competently operated from any other android device. It gives a very good user interface for observing with respect to the car. The android system has been used to control the wireless bot in a decent Bluetooth overage range. The Bluetooth receiver placed on the vehicle is mainly used to transmit control signal from developed mobile application to vehicle. We additionally offer a temperature sensor to sense actual time temperature and provide output in the application. Such kinds of applications normally utilized in the navy system or any excessive temperature device to discover their situation. The robot makes use of an ultrasonic sensor to detect an obstacle and to find distance among the robot and obstacle. The fire detection system in the robot includes a temperature sensor LM35. The sensor located on the robot initially senses the signal and compares with the threshold value. Finally, the detected signal is passed to the controller. The robot and the android application are related to the usage of Bluetooth. Within the developed software and in the robotic, there is Bluetooth connectivity option. Since the connectivity is open, the robotic can be accessed through any third person. So, this open connectivity can be changed with Wi-Fi with username and password.

The author had proposed a war field robot that is controlled through Bluetooth with an android application [13]. In order to prevent the human lives, the developed robot includes a wireless camera which is used to transmit videos and images from the war area. Military persons have an enormous chance to loss their lives while entering into unknown territory. Spy robot mainly helps the armed peoples to known about the surrounding before entering into the area. The captured videos or pictures are sent through Bluetooth which has a confined range of operation. Android app is used for remote operation of the robotic. The main advantage of this spy robot is that the design is flexible. The main limitation of this surveillance robot is the range of operation. Since Bluetooth communication coverage is limited, this limits the range of operation of the robot. In order to increase the range of operation many different modules along with Wi-Fi module and ZigBee module may be used. In the future, the spy robot may have gas sensors live MQ135 which can be used to detect the poisonous gases inside the war area [22]. For further development bomb disposing kit can be introduced in the vehicle.

In the above papers, the robot is designed using Bluetooth or antenna for transmission of the signals. The above technologies are used only for short range of operation, not suited for far range of communication. So, in this paper Wi-Fi

is used as communication module which is safe and can operate for long distance.

III. OVERVIEWOFEXISTINGSYSTEM

In the above all methods, Bluetooth is used for wireless communication between the robot and android application. The major drawback of using the Bluetooth module is that it provides a short range of communication [13]. The camera which is used is not user portable. To enlarge the range of operation many technologies are available, for example, the Wi-Fi module, ZigBee technologies, and so on. In order to identify the amount of gas available inside the surrounding and to verify whether the person can be inside the surrounding gas, the sensor can be interfaced with the development system.

IV. PROPOSED METHODOLOGY

The surveillance robot is controlled through an android application. The control is transmitted through the Wi-Fi signals from the mobile phone to the Node MCU module. These signals interpret the Node MCU module which is an in-built Wi-Fi module. The embedded coding is feed in the Node MCU module using Arduino IDE software. It starts to process the vehicle motor with the help of a motor driver. The level of signal safety is controlled by an Encrypted Password with high safety. Then the camera module is integrated with the Wi-Fi signal. The camera module is used to capture the real-time video in and around the vehicle. The captured video is transferred to the PC/ Laptop that is connected with the same IP address.

The Node MCU development board seems to be a potent solution for implementing Internet of Things (IoT). The Node MCU is based on ESP8266EX, which is an integrated Wi-Fi transmitter cum receiver. Node MCU supports several programming languages, which makes this device best suitable for IoT.

In order to identify the quality of air inside the surrounding, the air quality sensor is interfaced with the ESP8266. The value of the sensor is displayed in the developed android application.

The purpose of air quality i.e. gas sensor is to check the indoor quality of air. It may help the armed person or authorized person to get the details of the indoor before getting into the area. In helps the authorities to take care of their health before the entry into the area. Many peoples have health issues like asthma etc. this measure of quality of air will helps them a lots to take of their health.

V. INTERFACING METHODOLOGY

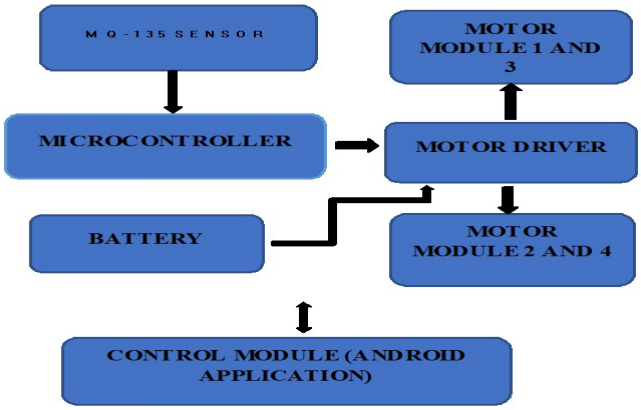

Fig. 2. Vehicle module

Fig. 2 represents the vehicle module that is developed for surveillance purpose. The surveillance robot is controlled using android application developed using MIT App Inventor. The control is transmitted through the Wi-Fi signals from mobile phone to the Node MCU module. These signals interpret the Node MCU module which is an in-built Wi-Fi module. It starts to process the vehicle motor with the help of motor driver (L-298n). The level of signal safety is controlled by an Encrypted Password with high safety. Based on the control signal from the android application the vehicle moves “forward”, “backward”, “right”, “left”. Then the camera module is integrated with Wi-Fi signal. The gas sensor MQ-135 is interfaced to know the air quality present inside the indoor environment.

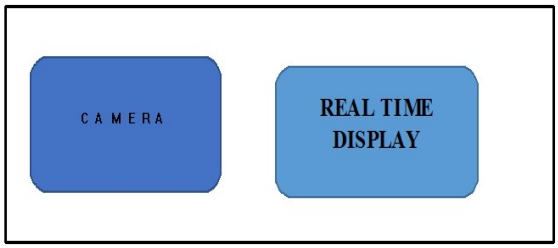

Fig. 3. Video module

Fig. 3 represents the video modules. In this module the wireless smart camera is used for continuously monitoring the surrounding. The camera is connected with either laptop/ mobile phone through Wi-Fi connections. The wireless camera is used in order to make the easy transmission of videos.

VI. STEPS FOR VEHICLE OPERATION

STEP 1: Connect the android phone and ESP8266 module with the same Wi-Fi connection.

STEP 2: Once both are connected with the same connectivity, open the android application which is developed to

control the robot and enter the IP address of the ESP8266 module.

STEP 3: The android application consists of "forward", "backward", "right", "left" for vehicle control. The controller can guide the vehicle by using these buttons.

STEP 4: Then connect the wireless smart camera and the PC/Mobile with the same connectivity. The camera is cable of rotating 360 degrees upon the person movement. The camera is remotely controlled using the same android application.

STEP 5: Air Quality sensor is interfaced with the ESP8266 module to continuously monitor the surrounding environment. The value is continuously transferred to the mobile application through a Wi-Fi connection.

STEP 6: The entire set is monitored with the help of a Wi-Fi connection in order to have a high range of security.

VII. ANDROID APPLICATION DEVELOPEMENT

The android application is developed for controlling the surveillance vehicle. The application is developed by using the MIT App Inventor which is shown in Fig. 4 App Inventor is a cloud-based tool, which helps the user to build an App right in your web browser. The developed application contains some buttons to operate the vehicle. Once the Application is opened, the operator needs to enter the IP address that is to be connected. Once the IP address is connected, the vehicle comes under the controller of Operator. Blocks are connected accordingly based on the movement of vehicle. The developed android application also displays the quality of air inside the environment.

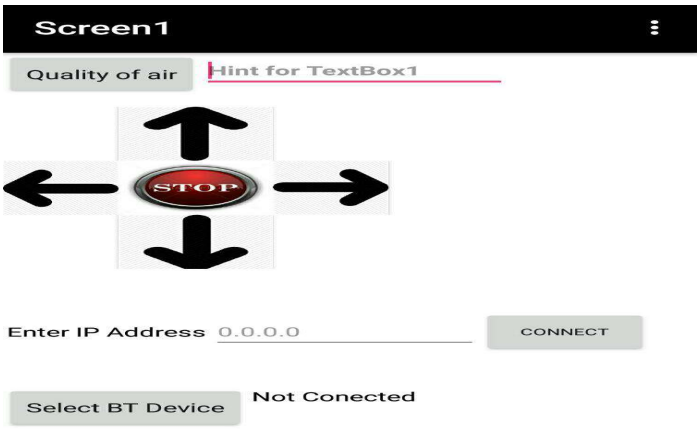

Fig. 4. Android application

VIII. DEVELOPED PROTOTYPE

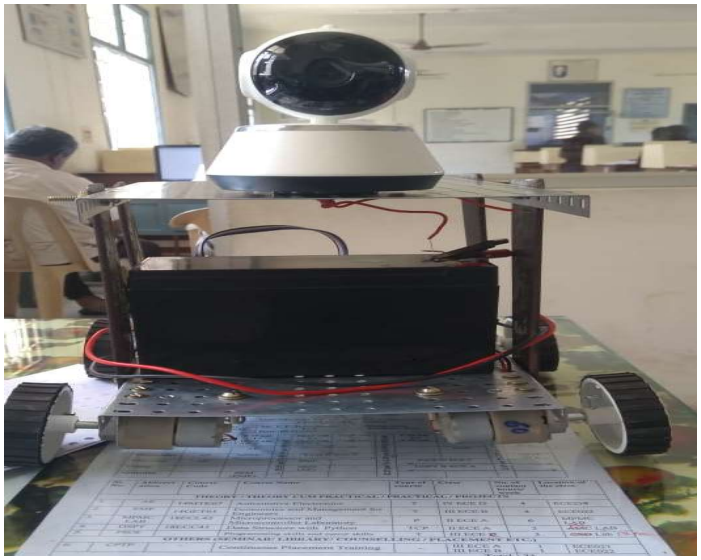

Fig. 5. Prototype

Fig. 5 represents the solution for indoor application. The camera on the top of the vehicle continuously sends the videos of surrounding to the respective authorities. The presence of gas sensor sends the quality of air in the environment to the developed mobile application. The entire setup is controlled with the help of android application.

IX. CONCLUSION

The pace of technological advancement seen over the last three decades can be expected to be the same for the next three decades. For a ground based armed force to be superior in combat, it needs to heavily dependent on technology. To achieve superiority, the Army must have a solid innovation base program. So, this paper provides a necessary solution required by the armed forces. The developed vehicle continuously captures the video and transfers the video to corresponding authorities. This may prevent the death rate in many situations. The developed prototype had tested under laboratory conditions. It had met with the necessary criteria of the objective. It provides multifaceted operation of robot controller which does not require to modify the hardware. The camera used here cannot be used for mini robot. Further, if the pi-camera can be interfaced for developing small vehicles.

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