International Journal of Innovative Research in Science and Engineering
Volume 7, Issue 06, 2021
www.ijirse.com
ISSN: 2454-9665

Design and Implementation of Surveillance Robot using Raspberry pi

Archana Singh, Anshima Pandey, Vandana Srivastava,

Arihant Jaiswal, Ayushman Kumar

Computer Science and Engineering, Buddha Institute of Technology, India

ABSTRACT

This paper introduces design and implementation of a surveillance robot based on Wi-Fi protocol and Raspbian operating system. The Human cannot video safely in critical conditions and environments mainly for the soldiers who are risking their lives for the sake for the Nation. Also, these conditions and environments may be buildings where the fire breaks out , Areas with poisonous gases or harmful radiation and the places where there is an exchange of fire such as a battlefield. The movement directions of the robot are controlled by a GUI designed using visual studio development environment. The robot streams live video to the user. In addition, there is also a GPS system on the robot to track its location .The current ongoing revolution of Internet of Things (IOT) is now integrated with Robotics in various diverse field of everyday life is making up new era i.e., Internet of robotics (IOR). Internet of Robotics is on the mature stage of development and is currently simulated by various challenges to be solved for more implementations i.e., design security ,sensors and long range communication system . The main objective of this project to purpose an Internet of things-based Internet of Robot .The robotics and automation industry which is ruled the sectors from manufacturing to household entertainments. It is widely used because of its simplicity and ability to modify to meet changes of needs. The project is designed to develop a robotic vehicle using android application for remote operation attached with wireless camera for monitoring purpose. The robot along with camera can wirelessly transmit real time video . This paper also shows general idea and design of the robot. Surveillance security robot provides safety like man.

Keywords: Microcontroller, Robot, Raspberry pi, Surveillance, Sensor

1. INTRODUCTION

The next wave dominating the computing era will be completely different from the present stage of computer and mobile computing. The next era wave transforming computing forever will be regarded as Internet of Things. Seeing the scenario from the past few months, a new term is always reflected in almost every component of research dominating the computing “Internet of Things” (IoT). Today, around five million people around the world use Internet for doing tons of tasks like browsing Web, e-mail, chatting, online gaming, multimedia streaming, social media. More and more people have access to the global information and communication infrastructure, i.e., Internet which is also becoming a strong backbone to communicate, compute, and network among each other for sharing of information. IoT a novel paradigm, is gaining rapid percentage. Seeing the current advancement and benefits of IoT, lots of IT organizations and research centers are investing lots of money in automation systems enabled via IoT. CISCO has projected about 30 billion

devices to be connected to IoT by 2020 [3], and Morgan Stanley estimated more than 80 billion devices by 2020, and lots of IT giants like Microsoft, Facebook, Google, and other robotics companies like Kuka are spending billions of dollars in research in IoT and are upcoming with various products like Microsoft HoloLens, Facebook, Oculus Rift, Google self-driving autonomous cars, and even various companies are working on IoT-based robots and drones. One of the main areas of prime focus of researchers and IT organizations throughout the planet is development of smart real-time robots based on IoT, facilitating real-time monitoring and doing day-to-day activities autonomously using smart sensors and even integrating the concept of "Cloud Computing" in their overall data management. In various areas there is a need of constant surveillance.

The current surveillance system includes monitoring by using CCTV cameras and other monitoring system. Mostly these systems are stationary and they can cover a limited area. These systems are mostly control manually or through a computer. They cannot be used to cover a larger area as well as they cannot be controlled using any mobile device. In short we can say that these systems arena dynamic enough much which gives the need for the development of a surveillance system which is more dynamic and can be controlled remotely. 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 the robot.

2. LITERATURE REVIEW

2.1 What is Surveillance robot ?

Surveillance robot is the robot used for the surveillance purpose. The remote areas are watched using the surveillance robots. A mobile robot is a machine that is basically place or mounted on a movable platform and can be with the help of certain instructions. In today TMs world a lot of fields use mobile robots. Many of the complex robots that we now see have originated from the simpler mobile robots. This technology has increased many new applications in the industry. The combination of mobile devices and robots are leading to new ideas in lots of fields. The mobile devices are now being used in many of the industrial applications this is mainly because of the reason that they are portable and have a longer battery life as compared to a laptop. Also they have a data plan through a cell phone carrier which is convenient as we can interact with the mobile robot once the connection is established. Mobile Robots: The mobile robots can be classified into different types. The track robot is the robot that uses tracks to move around. However such robots are costly to build. Also they are not as flexible as the wheeled robots. The wheeled robots are the robots which use wheels for moving. Such robots can move only on smooth flat surfaces. The third type is the legged robots which are based on human form. They have legs which helps them to move around. These robots are very difficult to design.

2.2 Wireless Operation of Surveillance robot

The new age of technology such as Android, GSM has redefined communication. Most people nowadays have access to mobile phones and thus the world indeed has become a global village. At any given moment, any particular individual can be contacted with the mobile phone. New innovations and ideas can be generated from

it that can further enhance its capabilities. Technologies such as Infra-red, Bluetooth, Wi-Fi which has developed in recent years goes to show the very fact that improvements are in fact possible and these improvements have eased our life and the way we live. Remote management of several home and office appliances is a subject of growing interest and in recent years we have seen many systems providing such controls. Mobile robots are robots which have the ability to move around and interact with their environment and not just hinged to a particular place. There are many labs and research groups from various universities and industries which are completely dedicated on researching mobile robots, because of their immense potential and varied application in industry, military, security, and entertainment. The robot is specially designed for surveillance purpose. The control mechanism is provided along with video transmission facility. The video transmission is practically achieved through high-speed image transmission. Initially, the robot will be equipped with an Android smartphone which will capture the scenario in front of it will transfer the images to the server on which the user will be controlling and watching the live feed. The Surveillance Robot uses Wi-Fi as a communication source through which we can connect to the Raspbian Operating system of our Raspberry microcomputer . The operations are such as movement and watching the live streaming of video through the USB camera that is connect to the Raspberry microcomputer

2.3 Pros and Cons of wireless Connection

2.3.1 Pros

- Live Stream video .
- Easy navigation on GUI.
- Live Location tracking.
- Can also hear voice from the camera as it has microphone inbuilt

2.3.2 Cons

- Limited range of Operation .
- Security reasons: This is the main disadvantage of using a RF circuit and the main reason why RF circuits are not preferred today. The RF frequency band is available for almost all the users for data communication. So there might be a scenario where more than one user is trying to accommodate channel for its own communication. In such case the frequency band may get interference from another user. Or worst case would be, some user intentionally trying to jam our communication network. The RF jammer circuits are very easy to design; hence the question of security arises when RF circuit is used in the circuit. This security loop hole can be very dangerous when the robot is being used for very confidential purposes. In areas of military these security threats can produce disastrous outcomes.

2.3.3 How we overcome Those problem in Project

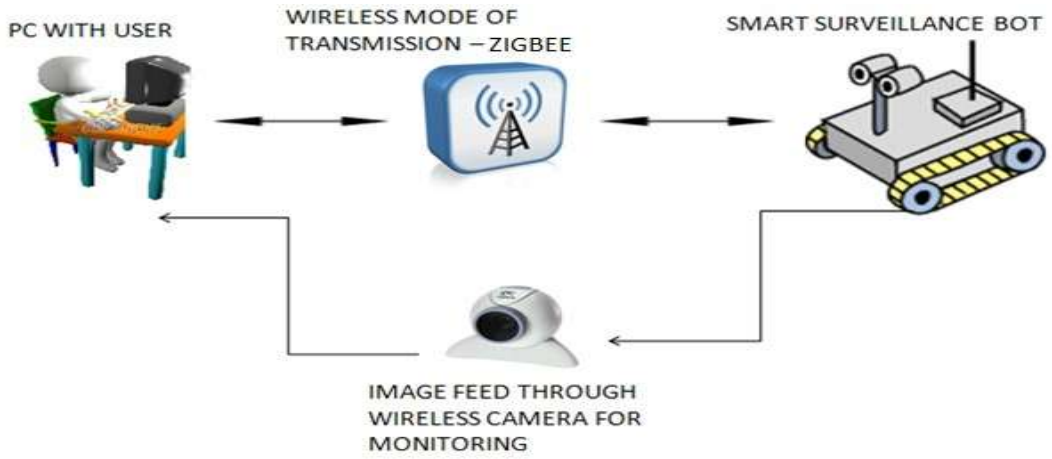
1. Wi-Fi connection is used for the operation of robot.
2. This gives the high security.
3. It also provides much more reliability of operation working range it also includes Wi-Fi.
4. N type Wi-Fi is used for higher security purpose as well as for better range.

International Journal of Innovative Research in Science and Engineering
Volume 7, Issue 06, 2021
www.ijirse.com
ISSN: 2454-9665

3. METHODOLOGY

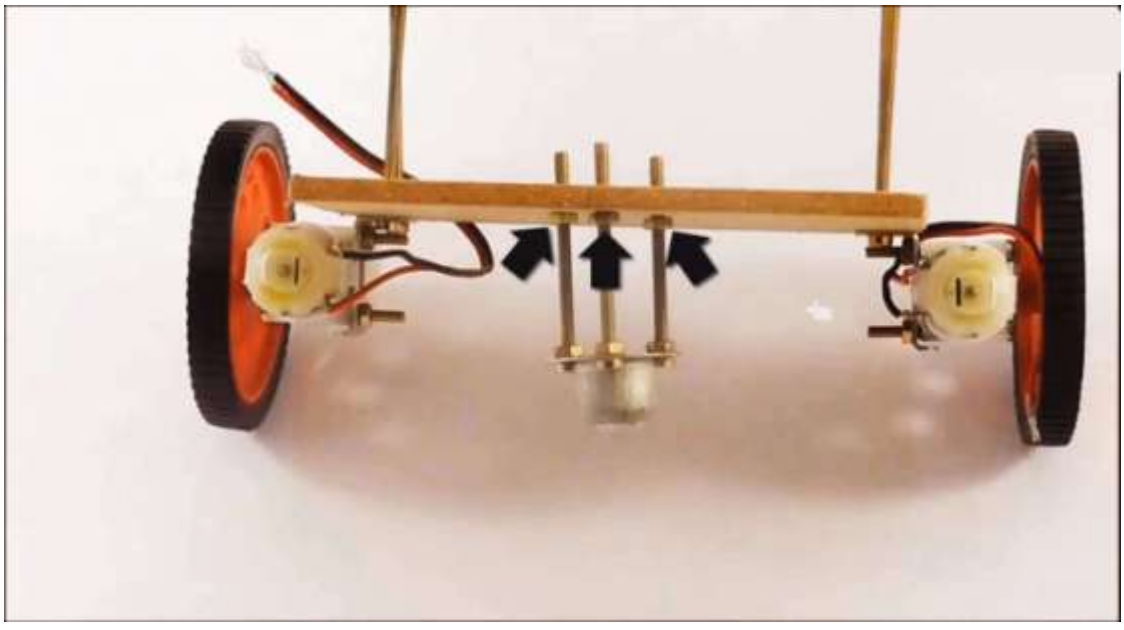
3.1 The Setup

The four wheeled robot mechanisms , employs differential motor speed control. The concept of obstacle avoidance and autonomous movement is achieved by designing with three IR proximity sensors to detect obstacles and move accordingly based on the "left hand on wall" technique. Wireless transmission technique would be incorporated for data transfer and control from the main station. The monitoring duties would be taken care by the camera mounted in the front and this would be assisted by a head light to provide proper lightning effects.



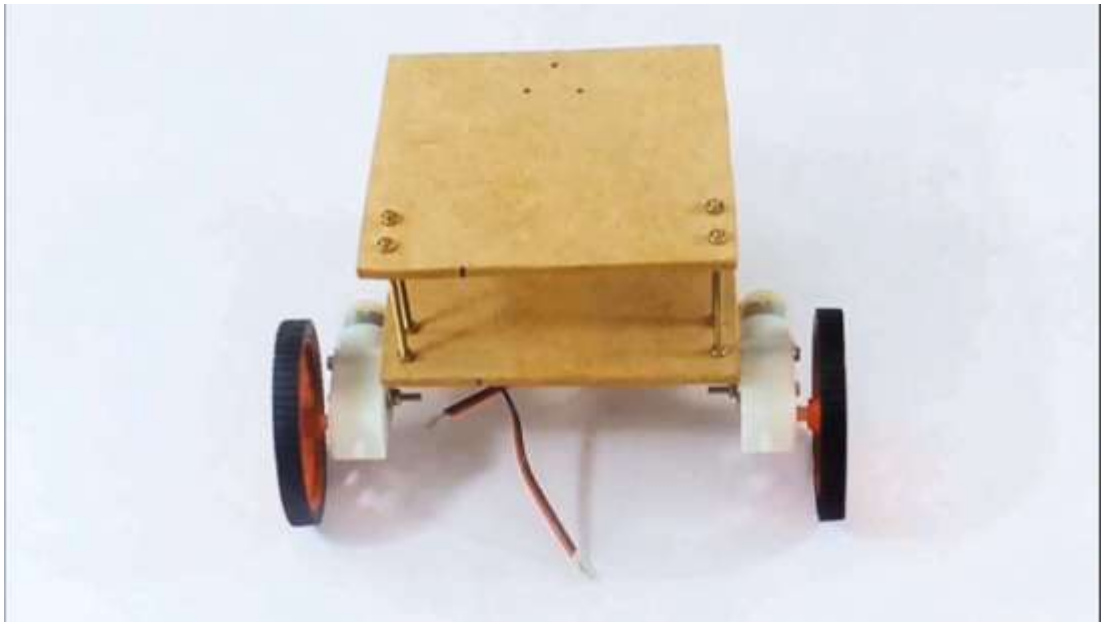
3.2 Initial Work

Here we have assembled the chassis of the robot step by step and also installed an interface that is the operating system of the raspberry pi so that we can connect to the robot wirelessly as well as via wire .

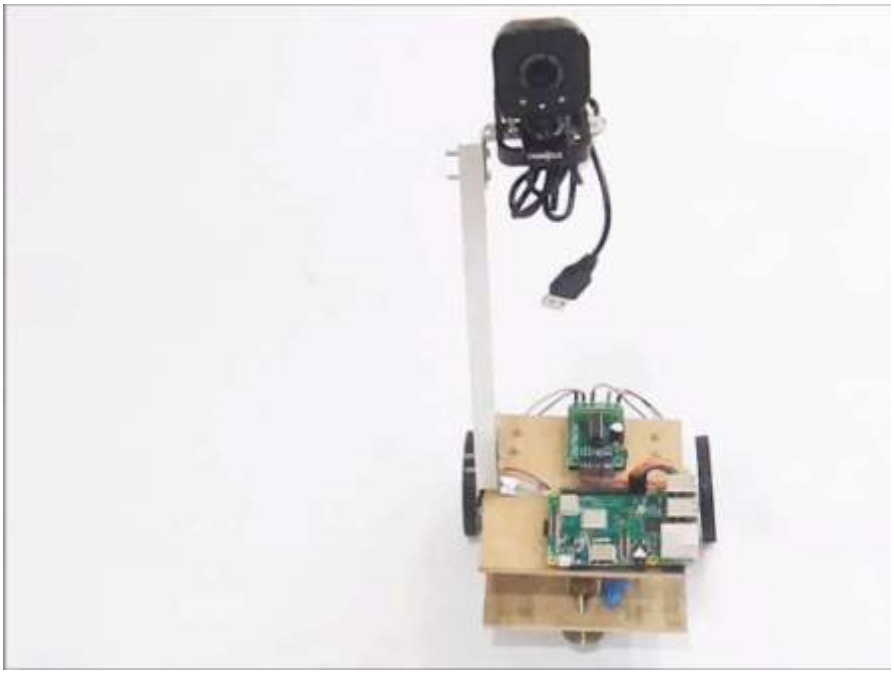


International Journal of Innovative Research in Science and Engineering
Volume 7, Issue 06, 2021
www.ijirse.com
ISSN: 2454-9665

An all-around wheel is attached at the front to make turns left and right for the robot .



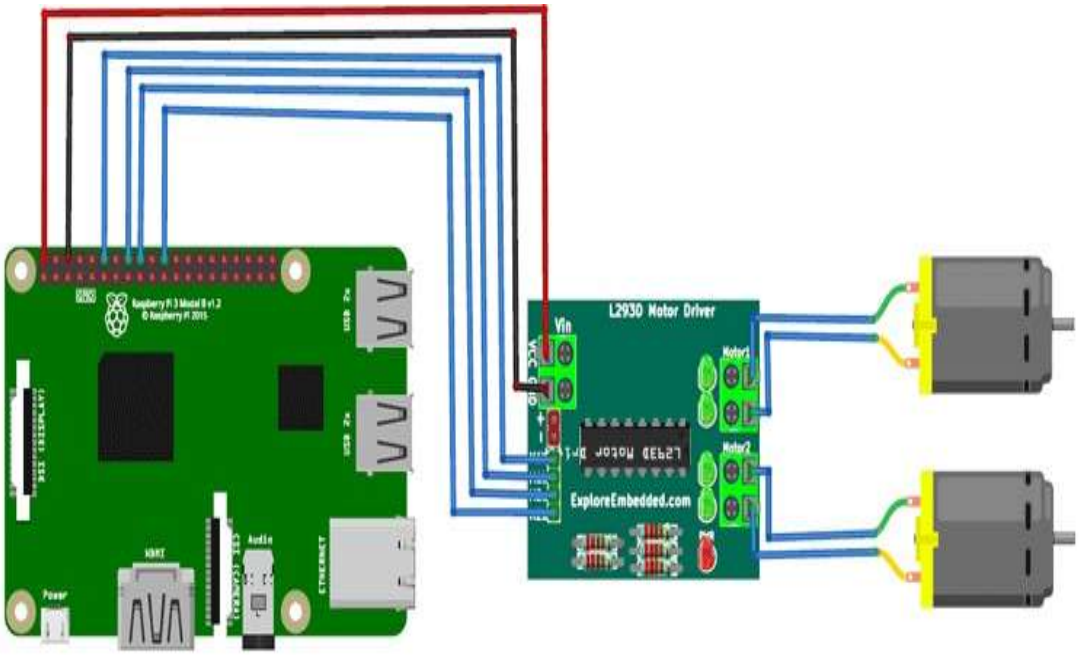
After the basic chassis of the robot is ready we have placed all the electronic components such as raspberry pi , motor controller , camera , power bank on the chassis and make connection of all the components.



3.3 Project Implementation

- Install the Raspbian OS into the SD card, and boot the Raspberry Pi.
- Connect the Raspberry Pi to a Wi-Fi network and check for the IP address of the Pi.
- Connect the Pi camera and enable the camera option in the settings.
- Write a python program to capture image, view live streaming, and also record the video from your smartphone.

- Write another for the movement of the robot .
- Make a GUI for the controls of the Surveillance robot.
- In order to view the live streaming of the surveillance camera you need to do port forwarding of your network.
- Use GUI that helps you to control your robot and also to view live streaming, capture image and record remotely.



4. CONCLUSION

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.

1.There are a thousand things we can do with such a surveillance cam basic setup now. Sending Growl notifications when some motion was detected or we could easily add a temperature-sensor to the command can be integrated very easily.

2.If you want extra security, you could also add a battery pack to the camera. The one that is able to charge. Simultaneously while powering the Raspberry. This would enable you to detect if some bad guy cuts the

ISSN: 2454-9665

power strips of your camera and send some alert messages to you (i.e., SMS or email) including the video of the disturber.

5. REFERENCES

[1] Stigler, G. The Economics of Information, Journal of Political Economy, Vol. 69, pp.213-225, Iss. Jan-Feb, (1961).

[2] Robot-Neil MacMillan, River Allen, DimitriMarinakis, Sue Whitesides,Range-based navigation system for a mobile IEEE 2010.

[3] Nolan Hergert, William Keyes, and Chao Wang ,Smartphone-based Mobile Robot Navigation spring 2012.

[4] Phey Sia Kwek, Zhan Wei Siew, Chen How Wong, BihLiiChua, Kenneth Tze Kin Teo ,Development Of A Wireless Device Control Based Mobile Robot Navigation System. IEEE 2012.

[5] Sebastian van Delden and Andrew Whigham , A Bluetooth-based Architecture for Android Communication with an Articulated Robot IEEE 2013.

[6] T. Maria Jenifer, T. S. Vasumathi Priyadharshini, Raja Lavanya S. Raj Pandian, Mobile Robot Temperature Monitoring System Controlled by Android Application via Bluetooth IJACTE 2013.

[7] Article ID 197105 Indoor Surveillance Security Robot with a Self-Propelled Patrolling Vehicle Volume 2011.

[8] Shingo Ito and Andrew A. Goldenberg ,A mobile robot with autonomous climbing and descending of stairs

[9] Phey Sia Kwek, Zhan Wei Siew, Chen How Wong, Bih Lii Chua and Kenneth Tze Kin Teo Development Of Wireless Device Control Based Mobile Robot Navigation System 2012 IEEE Global High Tech Congress on Electronics.

[10] Pavan.C, Dr. B. Sivakumar Wi-Fi Robot For Video Monitoring Surveillance System International Journal of Scientific Engineering Research Volume 3, Issue 8, August-2012