

Intelligent Surveillance Robot

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Abstract: Robotics is an interesting and fast growing field. The concept of Mobile robot is fast evolving and the number of mobile robots and their complexities are increasing with different applications. Nowadays robots are in wide usage due to their high level of performance and reliability and which is great for human beings. The Surveillance Robot is a vehicle robotics is used for live viewing or monitoring the required area and follows the instructions given by us to move. The Surveillance 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. For remote operation attached with wireless camera for monitoring purpose. The robot along with camera wirelessly transmit real time video with low light vision capabilities. Metal detecting sensor and PIR sensor coupled with motors, microprocessor and few other components combined gives an intelligent live viewing with movement. They can also be used in dangerous environments, where human penetration could be fatal.

Keywords — Arduino, IoT, Robot, surveillances, Obstacle Detection, Metal Detector.

I. INTRODUCTION

Surveillance is a real time collection and analysis of data that is timely distributes the information to the operator. Surveillance in Defense Applications plays an important role for keeping an eye out in order to protect its citizens and take necessary actions. Surveillance is the task of monitoring the set of conditions. This generally occurs in a military scenario where surveillance war areas, adversary territory. Human surveillance is carried by experienced work forces in close sensitive areas so as to continually monitor for changes. Whereas there is always added risks of losing work force in the time of getting caught by the adversary. With advanced technology in pasted years, there it is possibility to monitor areas of importance remotely by the use of robots instead of human. Apart from the given advantages of not losing any work forces, physical and elegant robots can be used detect subtle elements that are not conspicuous to people. A surveillance robot is a partially automated machine that works as per instructed by operator and move to destination, Streaming video or pictures which can then analyzed by the operator. Surveillance is a crucial task, we cannot put someone life to risk, instead of that we can use this kind of robots which do not need sleep, they don't get hungry, they don't have emotions, they are just stick to their duties and follow the orders. Nothing can be more important than human life. Use of such robots can help to save many lives on border areas. And we can use this manpower in other tasks. Here we use an android device to control the robot. Connection is established to the micro-controller using wifi. The base part of robot consists of wheels, so they can travel on rough & watery surfaces also. So the one who is sitting on the output screen can have all the records of opponent activities. This kind of robots can easily replace the soldiers and industrial workers where human access is impossible at that time this robot perform their duty with better modifications. So in the future the warfare are handled by this kind of smart robots. Which minimize the life threats during wars. and in future instead of security guards we will use this kind of robots. The device Surveillance Robot is designed in a way to control robot through instruction given by us and follow according via any browser and also in a particular application. The connection between the mobile and the vehicle is facilitated with internet technology. The aim of the device is to perform required tasks by receiving the commands of the user. The controlling can be done by any smart phone, tab, iOS device or laptops etc. on any internet enabled devices which we use in our day to day life. The commands from the mobile are transmitted through the internet from the input given by mobile device from any range the commands forward, backward, right, left and stop are used to control the device. After receiving the commands given by user the microcontroller then operates the motors to move using the motor driver. The movement of the robot is facilitated by two 100 RPM motors connected to the motor driver.

Also, there will be space available to store the things or objects and will be having a door like design controlled using servo motor. Surveillance is a real time collection and analysis of data that is timely distributes the information to the operator. Surveillance in Defense Applications plays an important role for keeping an eye out in order to protect its citizens and take necessary action as needed. Surveillance is the task of monitoring the set of conditions, an area or a person. This generally

occurs in a military scenario where surveillance war areas, adversary territory or hostage situation is crucial to a nation's security. Human surveillance is carried by experienced work forces in close sensitive areas so as to continually monitor for changes. Whereas there is always added risks of losing work force in the time of getting caught by the adversary. With advanced technology in pasted years, there it is possibility to monitor areas of importance remotely by the use of robots instead of human. Apart from the given advantages of not losing any work forces, physical and elegant robots can be used detect subtle elements that are not conspicuous to people. By embedding the robots with high resolution cameras, it is manageable to gather information about the designated location remotely.

A surveillance robot is a partially automated machine that works as per instructed by operator and move to destination, Streaming video which can then analyzed by the operator. Surveillance is a crucial task, we cannot put someone life to risk, instead of that we can use this kind of robots which do not need sleep, they don't get hungry, they don't have emotions, they are just stick to their duties and follow the orders.

II. LITERATURE SURVEY

1. Wireless Control Surveillance Robot, done by Shaikh Shoeb, Mir Ibrahim, Ansari Asagr Ali published in International Journal of Advance Foundation and Research in Science and Engineering, 2015. This project describes a new economical solution of robot control systems

.In general; the Robots are controlled through wired network. The programming of the robot takes time if there is any change in the project the reprogramming has to be done. Thus, they are not user friendly and worked along with the user preferences. To make a robot user-friendly and to get the multimedia tone in the control of the robot, they are designed to make user commanded work. The modern technology has to be implemented to do this.

2. Surveillance robot using Arduino, done buy N. Pugazhenth, K.Vinu Lakshmi, V. Preneeth published in International Journal of Innovative Technology and Exploring Engineering, 2019.

Surveillance is the method for observing a location, an area or a person for protection and security purpose. This activity always happens in a military, police, public places and even in houses nowadays for monitoring and to control the illegal activities. Especially, the surveillance activity is used mainly for human because the people were doing all illegal work against the government and at the same time to protect them from those activities. The advent of technology has brought a revolutionary change in the field of robotics, especially in the automation sector. The usage of robotics is increasing day by day, which reduces the human work.

3. Surveillance Robot using IoT, done by T.Akilan, Princi Kumar, Satyam Chaudhary published in International Journal of Research in Engineering, Science and Management, 2020.

Surveillance of human activities or any suspicious activities in war field and border lines with the help of a robot based on IoT technology as human access is not possible everywhere and if possible, can lead to risk of losing life. Surveillance takes place through wireless camera interfacing with Arduino and various sensors. WIFI/Bluetooth module is used for communication that is controlled from a distance by Smartphone or a PC. Wireless camera sends the real time video signals. Robot also collects data from various sensors send it to micro-controller. The movement of robot is controlled by the user through a Smartphone or PC. The robot is fully capable to work as required in defence areas as it can be controlled automatically and manually both. According to security perspective this robot is very useful not only in defence but also in domestic areas too.

4. Border Surveillance Robot, done by Sabiya Sultana, D. Shalini, Prashanth Varma, V.SriCharan published in International Journal of Advance Research, Ideas and Innovations in Technology, 2020. Border security provides regional monitoring, immediate warning and border patrolling management. For a long time, this has been a major problem to protect the country's boundaries against terrorists, illegal immigrants, illegal trades etc. Currently, most of the military monitoring services lack the required standard's which is not up to expectation, leading to border soldiers lives being put in constant danger. So as to decrease the soldier lives being lost and to improve the surveillance standard's there is need for a system which can effectively monitor the border with locomotion and surveillance capabilities.

5. Military Surveillance Robot, done by Abhijeet Dhule, Neha Sangle, Supriya Nagarkar, Asmita Namjoshi published in International Research Journal of Engineering and Technology, 2020. Surveillance plays an important role in border areas to keep eye on enemies. In such situations it is difficult to allow duty of surveillance to a soldier, which may cause dangerous to the life on one. Rather we can use an robot to keep eye on border areas. So in such cases this kind of robots are very useful they are small in size and provided with many abilities so they can perform the duty of surveillance and spying perfectly. In case if they found by the combatant, they have no identity to whom they belong. Military on border area are facing many problems so this kind of technology help them too aware about the opponent activities, so they can take further decisions.

III. EXISTING METHOD

Security is very important in day to day life and with growth in technology; a security system can be made with features in accordance with the user's necessities. This system is very user friendly and is very efficient. A wide area can be captured due to the motor control set up in the project. The system has two individual circuits which provide automatic and manual operation of the device, different sensors are user friendly and is very efficient. A wide area can be captured due to the motor control set up in the project. The system has two individual circuits which provide automatic and manual operations of the device, different sensor are used to make the robot automatic and the robot can be manually controlled using raspberry pi set up.

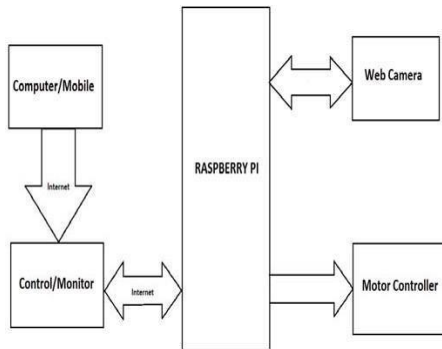


Fig. 1. Manual Operation Schematic

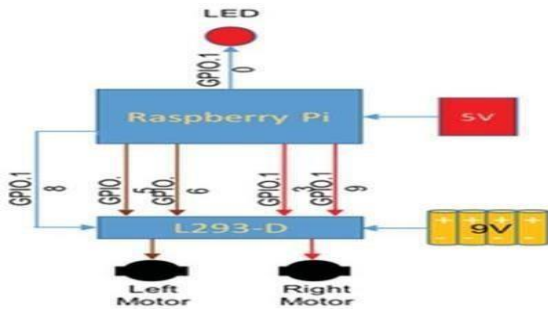


Fig. 2. Automatic Operation Schematic

DESIGN AND IMPLEMENTATION:-

This System of the security surveillance robot can be operated in two ways i.e. the robot can be used in automatic mode or it can also be controlled manually through the web. This facility helps the user to get a video feed at all times which can be seen live or through recording. Both the operations are implemented using separate circuits, the manual operation is done using a circuit that uses a raspberry pi as its core and the automatic operation is done by using Arduino as its core. But both modes cannot be used simultaneously they have to be preset to working a particular operating mode. The circuits are constructed considering the drawback; each circuit has its own drawbacks if taken individually but if used together they eliminate most of the drawbacks.

IV. PROPOSED METHOD

The proposed method for Here, proposes surveillance robot with adding some important features. Live streaming method used in camera for the visibility of the area required using the internet. Using PIR sensor, can detect human and by using Metal detecting sensor, can detect metals and buzzer on detecting human or metal. Cam module is a WIFI camera, which is capable of doing live stream to the output screen. This camera connects to the internet where we can actually see the live feed by camera. This camera covers the activities in its field and display it to the user. This type of technique can be better in some cases than human eye, we can record all the activities by the opponent, hence we have proof of all of its activities.

App or Browser for viewing live area view of the required area where the internet is available for the device and the controlling system, so that it can be connected and the information will be telecasted from the device to the required monitor or screen. Esp-32 for controlling the device this is the heart of the device where the whole information will be send and received and this will be sending to which sensor the information is to be send.

PIR sensor can detect human movement in a requirement range. PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation.



Fig. 3. Pir Sensor

The detector itself does not emit any energy but passively receives it. It detects infrared radiation from the environment. Once there is infrared radiation from the human body particle with temperature, focusing on the optical system causes the pyroelectric device to generate a sudden electrical signal. Simply, when a human body or any animal passes by, then it intercepts the first slot of the PIR sensor. This causes a positive differential change between the two bisects. When a human body leaves the sensing area, the sensor generates a negative differential change between the two bisects.

Pin1 corresponds to the drain terminal of the device, which connected to the positive supply 5V DC.

Pin2 corresponds to the source terminal of the device, which connects to the ground terminal via a 100K or 47K resistor. The Pin2 is the output pin of the sensor. The pin 2 of the sensor carries the detected IR signal to an amplifier from the Pin3 of the sensor connected to the ground.

V. WORKING PRINCIPLE

The passive infrared sensor does not radiate energy to space. It receives the infrared radiation from the human body to make an alarm. Any object with temperature is constantly radiating infrared rays to the outside world. The surface temperature of the human body is between 36°C - 27°C and most of its radiant energy concentrated in the wavelength range of $8\text{ }\mu\text{m}$ - $12\text{ }\mu\text{m}$. Passive infrared alarms classified into infrared detectors (infrared probes) and alarm control sections. The most widely used infrared detector is a pyroelectric detector. It uses as a sensor for converting human infrared radiation into electricity. If the human infrared radiation is directly irradiated on the detector, it will, of course, cause a temperature change to output a signal. But in doing all this, the detection distance will not be more. In order to lengthen the detection distance of the detector, an optical system must be added to collect the infrared radiation. Usually, plastic optical reflection system or plastic Fresnel lens used as a focusing system for infrared radiation. In the detection area, the lens of the detector receives the infrared radiation energy of the human body through the clothing and focused on the pyroelectric sensor. When the human body moves in this surveillance mode, it enters a certain field of view in sequence and then walks out of the field of view. The pyroelectric sensor sees the moving human body for a while and then does not see it, so the infrared radiation of human body constantly changes the temperature of the pyroelectric material. So that it outputs a corresponding signal, which is the alarm signal.

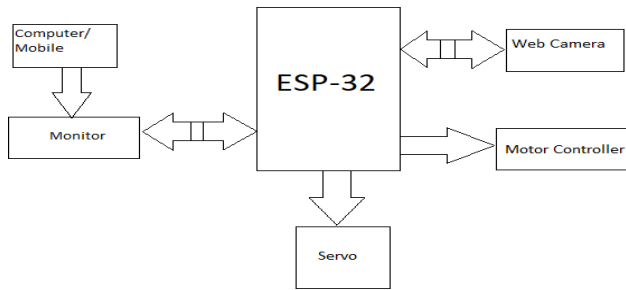


Fig. 4. Manual Operation Schematic

A. Metal Detecting Sensor

Detects metal objects up to 7 cm giving active low output with LED indication & buzzer on detecting metal.



Fig. 5. Metal Detecting Sensor

B. Operation

The heart of this sensor is the inductive oscillator circuit which monitors high frequency current loss in coil. The circuit is designed for any metallic body detection by detecting the variations in the high frequency Eddy current losses. With an external tuned circuit, they act as oscillators.

Output signal level is altered by an approaching metallic object. Output signal is determined by supply current changes. Independent of supply voltage, this current is high or low according to the presence or the absence of a close metallic object. If the metal object is near the searching coil, the output current will flow more. On the other hand, the current will be decrease when the object is far from the searching coil.

C. Design and Implementation

This System of the security surveillance robot can be operated in two ways i.e. the robot can be used in automatic mode or it can also be controlled manually through the web. This facility helps the user to get a video – feed at all times which can be seen live or through recording. Both the operations are implemented using separate circuits, the manual operation is done using a circuit that uses ESP-32 as its core and the automatic operation is done by using ESP-32 as its core. But both modes cannot be used simultaneously they have to be preset do work in a particular operating mode. The circuits are constructed considering the drawback, each circuit has its own drawbacks if taken individually but if used together they eliminate most of the drawbacks.

VI. RESULTS AND DISCUSSION

- Today we are in the world of robotics. Knowingly or unknowingly, we have been using different types of robots in our daily life.
- The project is “ESP-32 based Surveillance Robot for Military Applications” is practically proved by using the Camera for live telecasting Motor Shield Driver for the driving the dc motors, dc motor is used for the movement of the robot with the help of the Esp-32 Microcontroller.
- A lot of factors determined the accuracy of the robot we designed. These factors were the environmental phenomenon in which the robot was tested, the number of obstacles present making the test space crowded or relatively less crowded the type and shape of the obstacle (the robot is designed for a uniform shaped obstacle). These factors majorly affected the sensors.
- The accuracy of the robot is dependent on the sensors used. Thus, the nature of the sensor and its accuracy defined the accuracy of my robot.

VII. CONCLUSION

The integration of both a metal detector and a human detection sensor into a surveillance robot significantly enhances its functionality and effectiveness. By combining these technologies, the robot can detect metallic objects and human presence with high accuracy, making it an invaluable tool for security and surveillance operations. This dual capability ensures comprehensive coverage and threat detection in various environments, ranging from public spaces to high-security areas. Overall, the surveillance robot equipped with a metal detector and human detection sensor provides a powerful solution for enhancing safety and security measures.

Future Scope

This technique can also be used as a vision belt for blind people by adding a kinetic sensor, which is a type of microwave sensor whose sensing range is very high and the output of this sensor vary in according to the object position changes. This technique enables blind people to navigate obstacles easily by placing three vibratos in left, right and the center of a belt named as Vision Belt. In this project, we made the surveillance robot used in war areas & industrial areas. In this project we design webpage to control the robot. our robot is small in size & light in weight so it is easy to operate into area where human access is impossible & this kind of robot also saves humans lives. We use WIFI technology which capture live image & immediately send to the organization by using ESP32 camera.

REFERENCES

- [1] F. Tang, Y. Ying, J. Wang and Q. Peng, "A novel texture synthesis based algorithm for object removal in photographs", . LNCS, vol. 3321, ASIAN2004 ASIAN2004 pp. 248-258.
- [2] Haritaoglu, D. Harwood and L.S. Davis, "W4: “Real-Time Surveillance of People and their Activities”, IEEE Transactions on Pattern Analysis and Machine Intelligence, 2020.vol. 22, pp. 809-830.
- [3] J. Schiff, M. Meingast, D.K. Mulligan, S. Sastry and K Goldberg, "Respectful cameras: Detecting visual markers in real-time to address privacy concerns", Protecting Privacy in Video Surveillance, 2019, pp. 65-89.
- [4] M. Md Athiq UR Raza Ahamed and Wajid Ahamed, "A Domestic Robot for Security Systems by Video Surveillance using Zigbee Technology", international Journal of Scientific Engineering and Technology, May 2021, vol. 2, no. 5, pp. 448- 453.
- [5] P Kumar, A. Singhal, S. Mehta and A. Mittal, "Real-time moving object detection algorithm on high resolution using GPUs", Journal of Real-Time Image Processing, International journal of computer application, Mar. 2019, vol. 11, no. 1,pp. 93-109, 2020. vol. 117.
- [6] P. Vamsi krishna, S.R. Hussain, N. Ramu, P.M. Rao, G. Rohan and B.D.S Teja, "Advanced Raspberry Pi Surveillance (ARS) system", Proceedings of the 2015 Global Conference on Communication Technologies (GCCT), 23–24 April 2019, pp. 860-862.
- [7] Tasleem Mandrupkar and Manisha KumariRupali Mane, "Smart Video Security Surveillance with Mobile Remote Control", International journal of Advanced Research in Computer Science and Software Engineering, 2021, vol. 3, no. 3.
- [8] V Meenakshi, Ch. Lakshmi Saketh and K. Kalyan Kumar, "Secured Spy IP Control Robot Using Raspberry Pi", International Journal of Emerging Technology and Advanced Engineering, 2018, vol. 5, no. 2, pp. 513-518.