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A Review on Night Vision Robot Patrolling and Monitoring System

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Abstract: The robot is playing important role in daily life. It can be used for security purpose, to reduce the time of work and increases the work efficiency. The security of road area, home, office and building is important aspect of human life. The paper gives an idea of improving the patrolling ability of police in a local area. This system contains a night vision camera mounted on the robot which can capture the images, record it and then it will send it to the control station. With this system it has the ability to transmit real time video and audio signal to the control station.

This type of project can be used in the night time as well as in day time. It consists of a mic and a camera which will record a high quality video and send it to control station. The system will mainly be used to detect different activities in the outside area and report it to the control station. Many of the police departments now are using the different types of robots for performing different dangerous activities.

Keywords: Night vision, Raspberry pie, Monitoring Patrolling.

I. INTRODUCTION

Robotics is an advanced technology which is changing the human life, because the control and automation is the main and advanced part in robotics. Robots works like a computer and it can be operated on remote control.

What is Patrolling?

Patrolling is nothing but to keep monitoring over an area by regularly moving or travelling a rout of the corresponding area.

Robot patrolling continuously works in the area which is allocated to robot. The robot captures the images in 360 degree rotation. These images are then sent towards the user in a real time, user will analyze it and if there is any problem observed then action will be taken.

With the help of motor of the camera we can collect the information from all sides of the outside area. We can control the robot in two ways, one with the wire and the second is with wireless. The wireless controlling helps us to control the robot from different locations. In this GSM module is used and for camera support raspberry pie is used. Robot patrolling is mostly used in military area, hospitals, shopping mall, national functions, industry area, agricultural area etc.

Fig. 1: Night vision robot Patrolling System

The main objective of our project is to reduce the human effort. We can even operate the robot from any location with the help of Wi-Fi. So it becomes user friendly system.

II.   LITERATURE REVIEW

J. Ghanem Osman Elhaj Abdalla, implemented a surveillance system with a spy robot with the raspberry Pi using internet protocol. It gives various ideas about the surveillance of border areas. The border armies need to patrols the border area cautiously, but even by working with high cautious it is not possible to locate every small incidents in the night every time. Therefore there is a need to design a system which can detect the activity in this region and provide a message to the nearby security control unit. In this system, they make a spy robot using Raspbian operating system with remote monitoring and control algorithm. The spy robot system is connected with three types of equipment's which is raspberry pi module, a night vision camera and sensor. The collected information regarding the acivities working on the front of the camera is sent to the users through the web server which can be posted on the webpage simultaneously. [1]

Takato Saito and Yoji Kuroda implemented a Mobile Robot using GPS with place recognition system. The paper suggests a survey of a mobile robot with GPS observations. GPS technology makes it important considering the tracking of the robot. In this we face some of the critical issues such as to get high accuracy, stability and also needs to improve few restrictions that GPS observations face such as multiple path and loss of signal, especially in the congested area and out of coverage area. This method is used with positional using GPS to neglect the errors. We use two types of observations derived from global positioning system and place recognition on appearance based system to mobile robot localization. This robot can be continuously monitored and the fear of loss of robot can be minimized. [2]

In 2013, Cheng Tang, Qunqun Xie, Guolai Jiang, Yongsheng Ou, make a road night based on a planar reflection model. It has given various ideas of road detection and different concepts of monitoring the monitor. Roads and street monitoring is always very important for performing different activities such as pedestrian detection, any questionable activity, etc. This method classifies the image pixels of the road. Till now, different designs are designed for daytime activities but for night there is no such kind of research is made. This development focuses the any unused activity detection at night. Since this system is vision based and can distinguish the road depending on the image, it may face difficulty when any other image such as bird or vehicle comes into the picture. Here a planar reflection model is functional to get the intensity distribution of different pixels with an infrared camera. With that, a pixel-based classification is used to check the different pixels belong to the road or not. If only it determines road surface then the further process gets started. [3]

In 2017, Kirk Mac Tavish, Michael Paton, and Timothy D. Barfoot, made night rider: visual odometry using headlights. This technology estimates relative motion with a sequence of camera images for mobile robotic system. A camera can be used for getting large amount of input data and are comparatively inexpensive sensors, which will make it as the highly usable sensors in moveable robots. However, since it is a passive component, it will be depend on external power supply, which can reduce their availability. Many of the other sources available for lightning purpose we can use such as headlights. Headlights can be used as an alternate light source, with this; the paper investigates the outdoor stereo VO performance with the conditions in lightning for mostly 10 km of driving area for 30 hrs. In this various challenges include the visibility range, a dynamic light source, intensity hotspots, etc. [4]

Survey Table

Author & year	Paper title	Advantages	Disadvantage
Takako , Saito and Yoji Kuroda, December 2015-2017	Mobile Robot Localization by GPS and Sequential Appearance-based Place Recognition.	DDF estimation is more accurate.	Difficult to track edge's robustly
Cheng Tang, Qunqun Xin Guolai Jiang, Yongsheng August 2013	Road Detection at Night Based on A Planar Reflection Model	Easy to monitor from year to year	Many disturb the birds if not done carefully.
Gijs Dubbelman12, Wanes van der Mark1, Johan C. Oct 29 - Nov 2, 2007.	Road Detection at Night Based on A Planar Reflection Model Obstacle Detection during Day and Night Conditions using Stereo Vision.	It is low cost circuit	It is time consuming project. It is used for short distance only.
Jignesh Patoliya1, Hard Mehta2, Hitesh Patel3. 2015	Controlled War Field Spy Robot using Night Vision Wireless Camera and Android	Video streaming without light. Can switch ON & OFF IR lights when required	Operation distance is limited (50ft). Video is only streaming live but not recording.

| Author & year	Paper title	Advantages	Disadvantage
James Mount and Michael Milford May 16-21, 2016.	2D Visual Place Recognition for Domestic Service Robots at Night	It can move from one location to another location. Robotic workers never get tired.	The beacon placement imposes all other performances.
Kirk Mac Tavish , Michael Paton, and Timothy D. Barfoot 2017	Night Rider: Visual Odometry Using Headlights.	Cameras can be used in day as well as night	Passive sensors are of limited use.
Ghanem Osman Elhaj Abdalla May 19-2017.	Implementation of Spy Robot for A Surveillance System using Internet Protocol of Raspberry Pi.	The number of gear motor is less so it minimizes the power consumption.	The system is operable only on smooth surfaces but not on rough surfaces.

III. METHODOLOGY
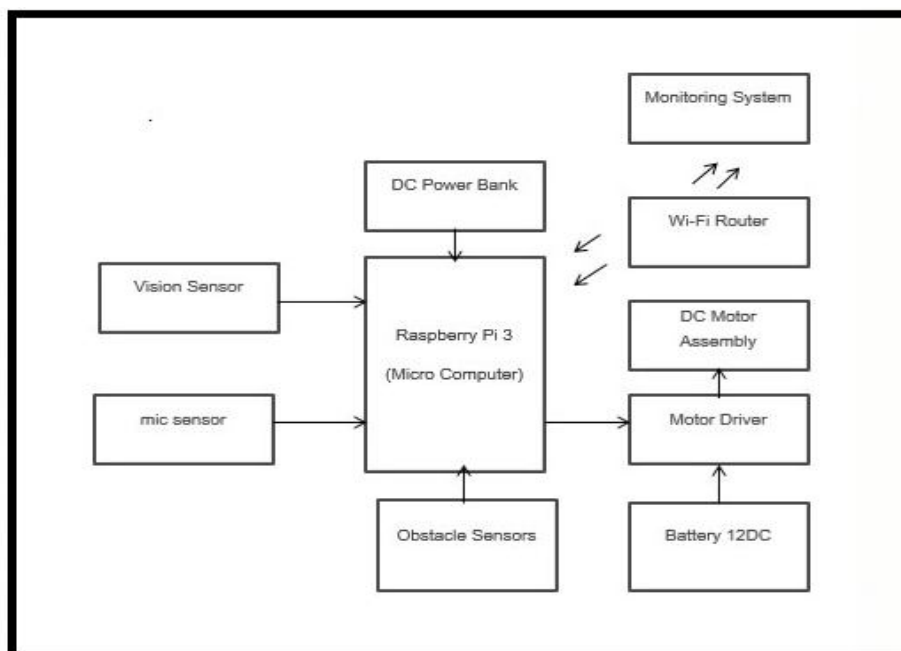
Fig.2: Block Diagram Night Vision Patrolling System

The robot has diverse intelligience to cover the lergest area. This robot uses two infrared sensors which can senses the obstacles from both sides of the robot path. When the obstacle is in front of robot it will turn its direction to its opposite side. Mic is used to sense the real time sounds in the robotic environment and sends it to the moitoring system. The vision camera captures the live images and videos. For the movment of robot, two motors are sufficient to drive the module. With this we can supply specific amount of input current to the motors, which will helpful to protect the raspberry pi model from damage of excess current. As the number of gears in the motor are minimum, it will get less amount of power consumption.

IV. CONCLUSION

The paper concludes with a design of security robot for patrolling which uses night vision camera to securing its premises. The robot moves with particular intervals in the same direction. It is also equipped with night vision camera and sound sensors. It is used by a predefined path which is given to the controller for the movement of patrolling. It captures and sends the images directly to the control monitor room, for further actions.

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