Surveillance Unmanned Ground Vehicle

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ABSTRACT

In this paper, the Cost Effective and Efficient Surveillance Unmanned Ground Vehicle is made using Raspberry pi 3b. Nowadays the human-machine interaction is growing at a very high pace and UGV is used as base/foundation technology for human security and surveillance system, etc. This paper shows the design and development of UGV for surveillance. The main purpose of the surveillance UGV is to provide real time video streaming with its GPS location. The Raspberry pi is mounted on the ground vehicle with pi camera and GPS module and vehicle is driven using motor driving circuit.

Keywords-GPS (Global Positioning System);

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I. INTRODUCTION

An unmanned ground vehicle (UGV) could also be a military robot used to augment the soldier's capability. this sort of robot is typically capable of operating outdoors and over an honest kind of terrain, functioning in place of humans. UGVs are used in aerial warfare (unmanned aerial vehicle) and naval warfare (remotely operated underwater vehicles). Unmanned robotics is actively being used for both civilian and military use to perform dull, dirty, and dangerous activities.

There are basically two general classes of unmanned ground vehicles:

1. Tele-operated: A Tele-operated UGV could also be a vehicle that's controlled by an individual's operator at a far-off location via a communications link. All cognitive processes are provided by the operator on the basis of sensory feedback from either line-of-sight visual observation or remote sensory input like video cameras. A basic example of the principles of Tele-operation would be a toy remote car. Every vehicle is unmanned and is controlled from a distance via a wired/wireless connection. As the user provides all control required based upon the observatory performance of the vehicle. There are an honest kind of Tele-operated UGVs in use today. Mainly these vehicles are used to replace humans in hazardous situations. Examples are explosives and bomb disabling vehicles.

2. Autonomous: An autonomous UGV is really an autonomous robot but is specifically a vehicle that operates on the surface of rock bottom.

II. METHODOLOGY

The basic methodology of this system is given as follows:

a. To provide real time video streaming data using raspberry pi cam which is connected to the ARM cortex of raspberry pi 3b board.

The real time video is serially streamed using raspberry pi cam over the wi-fi on the laptop through SSH protocol. Website is created over which the data is accessed on the laptop.

b. To provide location co-ordinates in terms of longitude and latitude with the help of GPS system connected to ARM cortex of raspberry pi 3b board.
The co-ordinates which are fed through GPS are then directly fed to google maps using reverse geo-coding. This procedure is done automatically using raspberry pi 3b.

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III. SYSTEM DESIGN

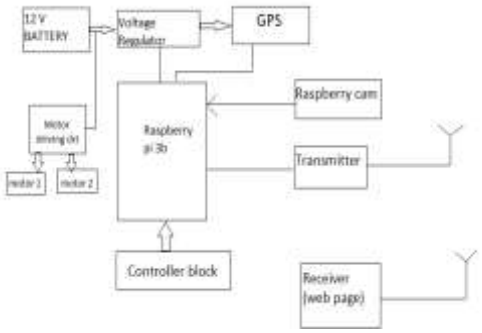

Fig. 1: Block diagram of Surveillance UGV

This Robot comprises of the Raspberry Pi 3, GPS and therefore the Raspberry Pi camera module.

The whole system uses following components:

- Raspberry pi3
- GPS
- Raspberry Pi camera
- Motor driver circuit
- Voltage regulator circuit.
- Motors
- Receiver circuit (laptop/cell phone is employed for viewing the info which is received from raspberry pi)

Battery & Voltage regulator: A 12v battery is employed which supplies voltage to the entire circuit. As motor driver circuit requires a 9V & raspberry pi requires 5V as operating voltage. Hence, we've used transformer to convert 12 V voltage to specified voltage.

Software: The Apache HTTP Server Project is an attempt to develop and maintain an open-source HTTP server for contemporary operating systems including UNIX and Windows. The goal of this project is to supply a secure, efficient and extensible server that gives HTTP services in synchronisation with the present HTTP standards.

RASPBERRY PI 3B:
The raspberry pi is basically used as a controller for controlling and manipulation the inputs and outputs of GPS and raspberry pi cam module.
In this system we used raspberry pi 3b because of the requirements of advance features.

GPS:
GPS stands for Global Positioning System which is basically a satellite-based navigation system used to find the location of current position.
GPS is aligning as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for the purpose of accurate location. GPS receiver does not release any information to the satellites. GPS receiver has many applications like smartphones, Cabs, Fleet management etc.

GPS receiver module produces output in standard (National Marine Electronics Association) NMEA string format. The output is provided serially on Tx pin with default 9600 baud.

RASPBERRY PI CAMERA:
There are mainly two versions of the Camera Module: The common version, which is designed to take pictures in normal daylight.

And the another one, NoIR version.this version does not have an infrared filter, so one can use it at the same exact time with an infrared light source to take pictures in the dark.

Raspberry Pi Board has a module namely CSI (Camera Serial Interface) with which one can join the Pi Camera module directly. The module is connected with Raspberry Pi's Camera Serial Interface port using 15-pin ribbon cable.

IV. RESULT

The robot is controlled through website by using raspberry pi. The real time video capturing is done by Ip camera which is placed on robot. The data of camera is collected by raspberry pi and sent to the website over Wi-Fi. Also, GPS is monitoring the current location of the robot and sending it to the website over Wi-Fi. The robot which has raspberry pi mounted on it, this raspberry pi and our pc/mobile are connected wirelessly through SSH protocol.

Fig. 2: GPS location on google map

Fig. 3: GPS co-ordinates shown on terminal

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Fig. 4: Real time video streaming on laptop on the website

V. CONCLUSION

From the experimental results it can be inferred that the surveillance UGV is a cost-effective and efficient bot that can be used for navigation purpose in different terrains. It is a prototype demonstrating the ever-expanding need for sophisticated technology and precision driven vehicles catering to the present-day needs. A person from a remote place can easily control the motion of the robot wirelessly. The command centre control computer allows the remote user to see the direct video stream and control the various features of the bot, such as GPS etc.

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