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Automatic Beam Controller and Dash Cam using Raspberry-pi Zero

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ABSTARCT:-

In this article, we present an effective system for detecting vehicles in front of a camera-assisted vehicle during night-time driving conditions in order to automatically change vehicle head lights between low beams and high beams avoiding glares for the drivers. Accordingly, high beams output will be selected when no other traffic is present and will turn low beams on when other vehicles are detected. In addition, low beams output will be selected when the vehicle is in a well lit or urban area. Light Beam Controller is used to assist drivers in controlling vehicle's beams increasing its correct use, since normally drivers do not switch between high beams and low beams or vice versa when needed. Dash cams support continuous recording of external views that provide evidence in case of unexpected traffic-related accidents and incidents. Recently, sharing of dash cam videos has gained significant traction for accident investigation and entertainment purposes. Our work aims to identify the major motives and concerns behind the sharing of dash cam videos for urban surveillance.

Key Words: Raspberry-pi Zero, Raspberry-pi camera, GPS Module.

INTRODUCTION:-

Modern automotive vehicles include a variety of different lamps to provide illumination under different operating conditions. Headlamps are typically controlled to alternately generate low beams and high beams. Low beams provide less illumination and are used at night to illuminate the forward path when other vehicles are present. High beams provide significantly more light and are used to illuminate the vehicle's forward path when other vehicles are not present. Daylight running lights have also begun to experience widespread acceptance. Vehicle dashboard cameras (i.e., dash cams) enable high-quality continuous recording of external views that provide evidence in case of unexpected traffic-related accidents and incidents.

ALGORITHM AND RELATED WORK:-

a. Our method comprises the following steps: the input images are obtained from the vision system using a Pi Camera which is mounted behind the windscreen inside the camera-assisted vehicle. In order to choose the optimal lens for this application, we did a geometrical study using a pin-hole model.

We performed some experimental tests using Pi camera for obtaining the best option in an experimental way. The results of these experiments concluded that for the lens of 6 mm bright objects appear in the image very close to the horizon line and the variation in vertical pixels from the frame where the vehicle appears in the image to the frame where it leaves this, is smaller than using the 4.3 mm lens. Then, the number of frames where the vehicle is in the field of view of the camera is lower for the 6 mm than for the 4.3 mm focal distance. On the other hand, for uneven roads vehicles can be seen with a 4.3 mm lens before than using a 6 mm one due to its higher field of view. Finally, when a vehicle is overtaking the assisted car, with a 4.3 mm lens the vehicle is detected before than with a 6 mm one, minimizing the glare of the driver. As conclusion, the optical lens was set to 4.3 mm, because its field of view is closer to the human one and with this lens, vehicle detection performance is higher. In addition, with our camera settings we can use the same camera configuration for other driver assistance applications

b. Dash cams are relatively new recording devices, and though there is limited research directly related to dash cam video sharing context, increased research is being conducted related to vehicle-based sensor data and dash cam technology, such as anticipating accidents or moving object detection algorithms in dash cam videos. Along with recording, GPS location is also recorded in order to get location updated.

SOFTWARES/LIBRARIES TO BE INSTALLED:-

- Raspbian
- Python 3
- OpenCV
- Pi Camera
- Psutil
- Pynmea2

RASPBERRY-PI ZERO:-

Raspberry Pi ZERO is the latest addition to Raspberry Pi Family. It is the low cost and least expensive board costing about $5. Raspberry-Pi Zero, being compatible to run Raspbian and all other applications being supported by other Pi's. The size is almost half of A+ model and utilities are double in number.

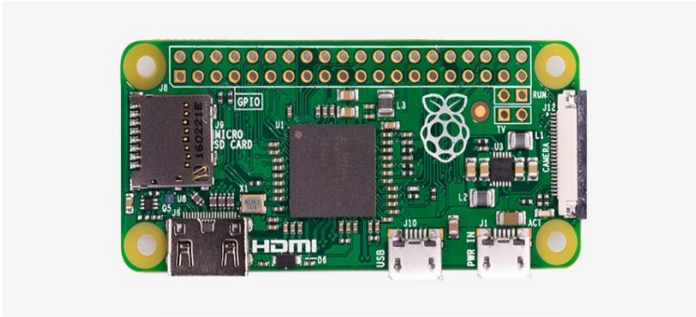

Fig 1 Raspberry-pi zero

RASPBERRY PI CAMERA MODULE:-

Raspberry Pi Camera Module is equipped to take HD video as well as still photos. Provides good utility for beginners and also offer widen scope for projects for advanced users. Specifications: Raspberry Pi Camera has Effective Resolution of 5 Mega-Pixel and supports video recording at: 1080@30fps, 720p@60fps and Vga@90fps. It comes along with 15cm ribbon cable to be connected via CSI port of Raspberry Pi. Raspberry Pi works with all generations of Raspberry Pi models. The camera can be accessed via MMAL and V4L APIs and other third party software's like Picamera Python Library.

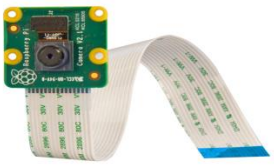

Fig 2 Raspberry-pi Camera

NEO6MV2 GPS MODULE:-

The NEO-6MV2 is a GPS (Global Positioning System) module and is used for navigation. The module simply checks its location on earth and provides output data which is longitude and latitude of its position. It is from a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature (16 x 12.2 x 2.4 mm) package. The compact architecture, power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. Its Innovative gives NEO6MV2 excellent navigation performance even in the most challenging environments.

Fig 3 GPS Module

BLOCK DIAGRAM OF THE PROJECT:-

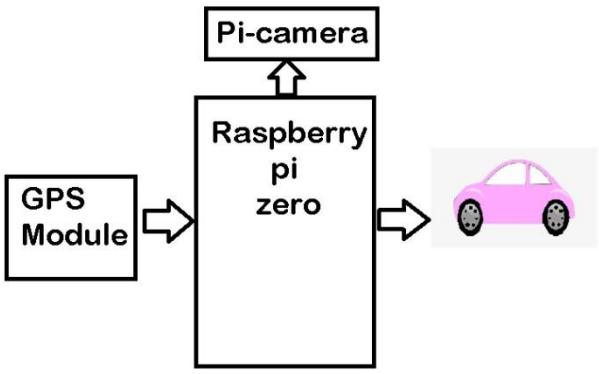

Fig 4 Block Diagram

HARDWARE REQUIREMENTS:-

- Raspberry-pi Zero W
- Raspberry-pi Zero Camera module
- GPS Module

SOFTWARE REQUIREMENTS:-

- Remote Desktop Connection
- Python Open CV

APPLICATIONS OF THE PROJECT:-

- Dash board camera
- Position Tracking
- Automatic beam switch to reduce dazzling

CONCLUSIONS:-

Above system would help in automatically converting the high beam to low beam when required which could decrease accidents mainly in hilly areas and also record footage in emergency along with position and system parameters.

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