

Obstacle Detection On Railway Track For Avoiding Accidents

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Abstract

In this paper, a self-stopping technology developed for train. The localization system is constructed with GSM as well as GPS modules. Currently tasks including in system are person detection, Digital image processing, and accident avoidance has been implemented on this platform. In this framework, camera in front of the train can assist driver with the identification of obstacles on railway tracks. Image processing is used to detect the obstacle. Haar cascaded features are used to detect the person. These Haar features used for every image frame for the detection. If person is detected then SMS and Email send to user and frame will be store to FTP server.

Key Words: Raspberry Pi 3, Arduino, Open CV, GSM Module, GPS Module, Camera.

1 INTRODUCTION

Railway accident prohibition of transport safety which includes knowledge of railway level crossing accidents as well as suicides. Government have been implementing variety of countermeasures for the railway sectors to improve safety measures. Developing on-board automotive systems which focuses to give an alert about driving environments to the driver. Such systems take actions to avoid accidents. These operations are considerable and have resulted for decreasing the number of accidents. In this paper we proposed a suitable technique which is implemented using raspberry pi and arduino. System works in both manually and auto mode to control the engine of the system. Person or any other obstacle will be detected by using image processing Haar Cascaded algorithms. SMS and Email send to particular user with the GPS location coordinates. And the captured image save to FTP server with time and date.

2 SYSTEM DESCRIPTION

A. Software Specifications:

1. Python:

Python is a programming language which can be easily available. This programming language used in many areas of programming platform. There are thousands of programmers who uses this python programming language. Python is easy to understandable language as compare to other programming languages. Python is a high level programming language. Python has a designed such that it focuses on code readability and a syntax that allows programmers to express concepts. It provides constructs that enable clear programming on both small and large scales.

B. Hardware Specifications:

1. GSM:

GSM is a global system for mobile communication which is used for transmitting mobile voice and data services. It is differ from first generation wireless system that is uses time division multiple access transmission methods and latest digital technologies. Circuit switch of GSM system is divided into eight 25Hz time

slots of 200Hz channel. To connect the PC and micro-controller RS232 modem is allowed. To connect with internet GSM having internal TCP/IP stack. To connect wide range of unregulated power supply regulated power supply is used. Using GSM modem you can send SMS, Emails, attend internet act through AT commands. In our system we used GSM module for sending SMS and Emails with time and date to users when obstacle is detected.

2. GPS :

GSM(Global Positioning System) is used to locate the geographic location and time information to GPS receiver. GPS is created for locating systems using 24 and 32 satellites orbiting around the earth. GPS receiver which reads the satellite data and determines the location information. The GPS does not need transfer any type of available data by user, GPS can works independently of any telephonic or internet communication reception, though these technologies can extract the usefulness of the GPS positioning data.

3. L293D Drivers :

In this paper we are using L293D Quadruple Half-H-Driver IC. Driver pin 1 and 2 enabled by 1, 2 EN and by using 3,4EN we enables driver pin 3 and 4. When the associated drivers are enable means their enable input is high, in phase with their input their output are active phase. For inductive transient suppression external high speed output clamp diodes should be used. When we provide a low enable input to drivers those drivers are disables and in high impedance state their output are off. The pins 2, 7 and 10, 15 are the inputs of motor from the microcontroller. The outputs of the IC are taken from pins 3, 6, 11, 14. These pins are used to control the rotation of the motors according to the commands from microcontroller.

C. Image Processing:

Image processing has two types of methods used that is digital and analog. To perform an image processing to the digital image we used image processing algorithm. Image processing has many advantages over analog image processing. Thus image processing techniques influence digital images by using computers. Image

processing algorithm is used for obstacle detection using digital image photograph.

Image processing includes different stages:

- a) Import the image by digital photograph.
- b) Analyzing the image frames which includes image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- c) Output can be altered image that is based on image analysis.

D. Obstacle Detection:

In this paper we have used Haar Cascaded algorithm for obstacles detection. The dynamic as well as static obstacles are to be detected in front of the train for avoiding accidents.

We are applying Haar Cascaded features to all input image frames for detecting human features. The complete face detection cascading has 38 stages with over 6000 features. Faces are detected using an average of 10 feature evaluations per sub-window. The speed of the Haar cascaded detection is depends on the number of features analysis per scanned sub-window. For more accurate results cascading features uses MinNeighbors feature. MinNeighbors uses a moving window to detect objects. Before declaring the Human-Face, MinNeighbor is one of the detection feature that is used to define how many objects are found near the current one. In this way human's upper body detection also done with this Haar Cascaded features.

E. Algorithm For Image Detection :

- i. Import all parameters.
- ii. Generate UI.
- iii. Access camera signals.
- iv. Activate camera signal handler function.
- v. Call to thread.
- vi. Process thread initialization.
- vii. Initialized all parameter [camera, GPS, GSM, Test, Start, etc...]
- viii. Testing of all parameter are connected.
- ix. Apply Haar Cascaded feature on frames
- x. Convert frame from BGR to grayscale
- xi. Extract all Haar features like scale factor, Min neighbor.

- xii. Detected Min neighbor frame which having maximum person features.
- xiii. Get person detected frame.

F. Figures:

A. System Flow Diagram:

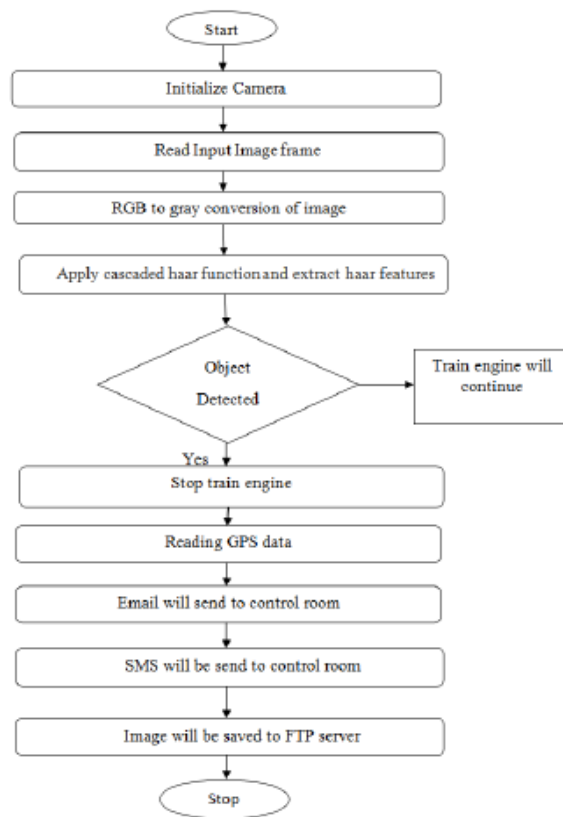


Fig1.System Flow Diagram

System flow diagram Description:

When Person is detected. It will check detection count, whether the person is stable or moving. If Person is stable DC motors will get OFF (Engine Stopped) by using arduino. Reading

the GPS data by using GPS Module. GPS data gets in string format. Conversion of that string into readable format i.e. latitude and longitude. Sending captured image and GPS co-ordinates via email to the control room. Checking the credentials of e-mail id. If credentials are correct, login to the mail account. Uploading of the captured image with date and time. Sending GPS co-ordinates via SMS by using GSM Module. SMS contain text message as Person Detected with GPS co-ordinates. Uploading captured image to FTP Server with date and time. Checking the credentials of FTP. If credentials are correct, login into the FTP account. Uploading of the captured image with date and time. System will stop and return to Main-Application of the system.

3 PROPOSED SYSTEM

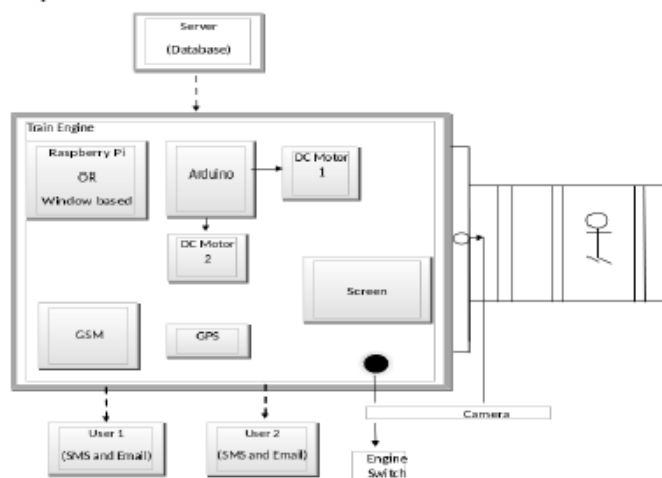


Fig2.Proposed System Diagram

Proposed system consists of Raspberry pi, camera module, Arduino, two dc motors, GSM modem and the PC with OpenCV. L293D driver drives two dc motors which is required for train engine mounting with display. Camera is connected to the

raspberry pi which continuously captures the video and its input frames are sent to raspberry pi. On raspberry various operations are performed on the image. Image is preprocessed by using cascaded Haar features which detects object/person on railway track. Whole algorithm of the object tracking is implemented on raspberry pi or windows based system. Data from raspberry is send to PC end for display. If the person or object gets detected according to the detected objects alert to user. Also live streaming will be provided on screen which is inside the train. SMS and email will be send to users through GSM modem with the GPS location Co-ordinates.

4 CONCLUSION

This paper proposed a method of person detection for autonomous train for avoiding accidents on railway track. The dynamic as well as static person can be detected on track using image processing Haar Cascaded algorithm. Due to high speed motion of train there are many difficulties for obstacle/person detection and to track the moving obstacles. Various challenges like changing environment weather, blurring due to dissemination of forms, etc. which complicates extraction of images.

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