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HUMAN DETECTION IN RAILWAY TRACK USING CMOS SENSORS

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Abstract: ***In this project, we propose to develop an effective vision-based automatic rail inspection system. The objective of this system is to detect the presence of human & other heavy objects in rail tracks. By inspecting real images acquired by a digital CMOS camera installed under a diagnostic train. The novelty of this work is the use of new learning algorithms for human detection in rail inspection system***

INTRODUCTION

This Rail Track inspection is an essential task in railway maintenance. It is periodically needed for preventing dangerous situations and ensuring safety in railways.

At present, this task is operated manually by a trained human operator who periodically checks presence of objects along the track searching for visual anomalies. This manual inspection is lengthy, laborious and subjective. This project presents a new vision-based CMOS technique to automatically detect the presence or absence of human & other heavy objects in rail tracks.

This inspection system uses real images acquired by a digital line scan camera installed at front part of the train. Data are processed according to a combination of image processing and pattern recognition methods to achieve high performance automated detection. To date, we have attempted to apply the Human object detection framework to achieve automatic detection of rail track. The pre-liminary results are encouraging, revealing the presence of object with an accuracy of 98%. Furthermore, using human detection algorithm methods that may improve performance in terms of both detection accuracy and computation time.

First, Rail inspection consists in examining objects like human being and other heavy objects in rail tracks that could lead to severe problems like track failures and derailments to train and loss of life. It is a crucial task in railway maintenance, and is periodically required in order to prevent dangerous situations. This task is usually operated manually. With long distance increased rail track carrying heavier loads at higher speeds, rail inspection is becoming more important and railway companies are interested in developing fast and efficient automatic inspection systems instead of manual methods.

In the last decade, since computer vision systems have become increasingly powerful, smaller and cheaper, automatic visual inspection systems have become a possibility. These are especially suitable for high-speed, high-resolution and highly repetitive tasks. A large variety of algorithms for object detection problems have been studied by the computer vision community, especially for industrial inspection process. However, few works can be found on the use of computer vision in the specific area of rail inspection.

In this project, we propose to develop an effective vision-based automatic rail inspection system. The objective of this system is to detect the presence or absence of human & other heavy objects in rail tracks, such as heavy stone or other things in track caused by landslides or by any other natural disaster phenomenon. By inspecting real images acquired by a digital camera installed under a diagnostic train. The novelty of this work is the use of new learning algorithms for visual pattern recognition in a rail inspection system.

The rest of this report is structured as follows:

i) presenting the background of this project. It outlines the motivation for this project, and also provides an overview of

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the state-of-the-art in the areas of rail inspection and object detection.

ii) identifies the research methods involved in this project. It describes the methodology used to achieve the objectives, includes some preliminary results obtained by our inspection

EXISTING SYSTEM

At the present all human detection security systems continuously monitor using motion sensors like IR, Ultrasonic etc which detects motion by the movement and position of the object covered by the sensor, As a result even some static non moving objects or other moving objects other than human being are wrongly detected by the currently used system. Processing of these signal is not easy because it takes more time in calculation and report generation.

Disadvantages in Existing System:

- In this manual method, Detection is done manually by a trained human operator who periodically checks presence of human along the track. so it becomes time consuming lengthy task
- Task carried out using manual human operator makes this job laborious and subjective
- Continuous Data logging and location data is not possible in current existing system.

EXPERIMENTAL WORK

PROPOSED SYSTEM

Our new method of Human detection security system in railway track using latest high resolution CMOS sensor embedded with GSM module security system has several advantages compared to existing system

- Detection is accurate
- Cheap and easy to implement
- It saves more energy by activating and deactivating devices automatically
- Simple interface
- Automatic braking system can be added using Relay
- Loud siren for alerting monitoring team during detection

OBJECT DETECTION

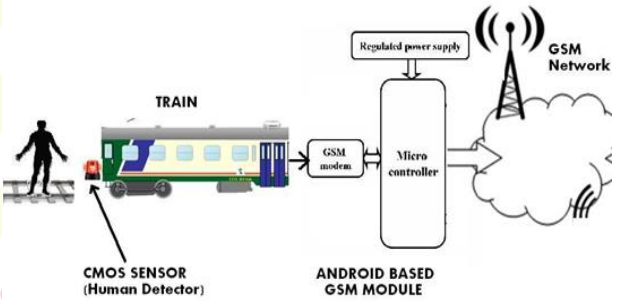
Inspection devices, such as sensors or cameras, measure a physical quantity that can be represented by a signal. In particular, visual inspection use cameras to acquire real images. In order to achieve the automatic detection of parts of interest, missing elements or defects, captured images must be processed by pattern recognition algorithms.

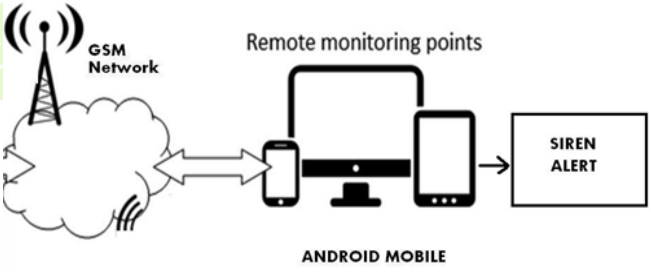
This section describes the principles of these algorithms and outlines the main approaches to achieve object detection. Basic principles of object detection

The objective of object detection is to identify, in the captured images, image areas (sub windows) that contain the patterns to be detected. To reach this goal, a basic method consists in exhaustively sliding a sub window on

a captured image. Data contained in each scanned sub window are preprocessed with match to human and action is triggered.

SYSTEM ARCHITECTURE





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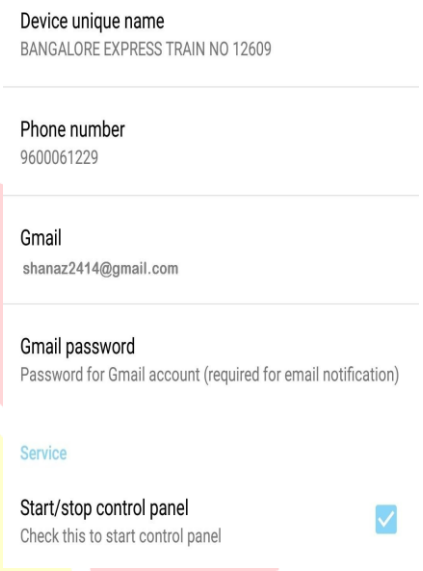
MODULES

- User Registration & Login
- Setting Pattern Lock for startup
- Configuring Destination setup
- Web control security
- Detection preference
- Storage settings

User Registration & Login

- In this module, a user who wanted to user this app first registers by giving the details like Train Number / Device unique Name for easy identification.
- Additional options like Email ID and password may be entered for security settings and can be used as an alternate login if authentication fails or can be used as a backup during emergency



Setting Pattern Lock for startup

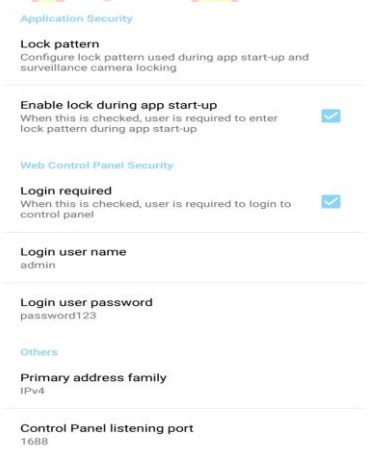
- Passwords are a bit harder to use than pattern locks because you actually have to type out your password. In this we have to set the pattern lock for accessing control panel of main program.
- There is also an option for two step verification which uses both password and pattern for administrator privileges

Configuring Destination setup

- In this module, we need to set 10 digit mobile number to which alert needs to be sent and then default SMS gateway, Proxy, port number can be set
- Enable the Start/Stop control panel service to get the URL and port number of the local control panel service

Web control security

- In this setup, we can set Login required for accessing Control Panel settings over IP
- The Default password user name is admin and password is password123
- In Others tab, we can set Primary address family and CP listening port



Detection preference

In this we can set the following parameters

1. Type of detection needed
2. Outline thickness

3. Detection size
4. Detection Algorithm
5. Detection calibration

CONCLUSION

- Manual monitoring for rail inspection is unacceptable for slowness and lack of objectivity. Nowadays, railway companies over the world are interested in developing automatic inspection systems
- These automatic systems are to increase the ability to detect human . The aim of this project is to develop an effective vision-based automatic rail inspection system, which is able to automatically detect human by inspecting the images acquired by a CMOS installed under a diagnostic train.
- Therefore, we propose in this work to build up an automatic vision-based rail inspection system based on one of these frameworks. We will focus human detection using CMOS image sensor, which is relatively easy to implement and because the preliminary results obtained with it are encouraging.

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