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Improvement of Availability of Level Crossing System by Autonomous Surveillance Camera

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Abstract: Indian Railways is facing lots of problems in peoples safety. More than half of the accidents is occurring in the level crossing systems which should be avoided in future. This is because of unmanned level crossing systems. So, in order to avoid these accidents in level crossing systems, we have designed autonomous surveillance camera which uses motion detection method to give alert message to the loco pilot and nearby station master about the motion in the railway level crossing in the image format. So, based on the type of emergency the loco pilot will decide whether to stop the train or not. This will surely avoid the major accidents in the level crossing systems.

1. INTRODUCTION

Improvement of level crossing became an important field of academic research. Nearly 44% of level crossing users are facing with accidents. In France several accidents were happened in recent years. Which includes buses with children onboard. There is no technology in the level crossing system to communicate with the loco pilot and the station master to avoid these accidents. The lives of those children lost only due to lack of technology in the level crossing system. Indian Railways has nearly 35000 level crossings in which 23000 level crossings are unmanned level crossings.

Objective of the Project:

In this project we have two sensors placed 0.5 kms forward and backward from the level crossing. We are going to implant camera in the level crossing.
Camera and sensors are connected to the raspberry pi chip.
So now when the train passes through the sensor which is 0.5kms backward from the level crossing system, the railway gate will get automatically closed. As soon as the railway gate is closed, camera will switched on and search for any motion in the level crossing area. This is done by using motion detection method.
As soon as the motion is detected, it will capture that image and send that image to the loco pilot and station master with an alert message in video output installed in the loco and the control room. Based on the type of motion detected in the level crossing, the loco pilot and station master will decide whether to stop train or not.

Materials Required:

Software Requirement

Language: Embedded c, openCV
Compiler: arm-linux-gcc 4.4.6
OS : LINUX(Ubuntu12.04)

Hardware Requirement

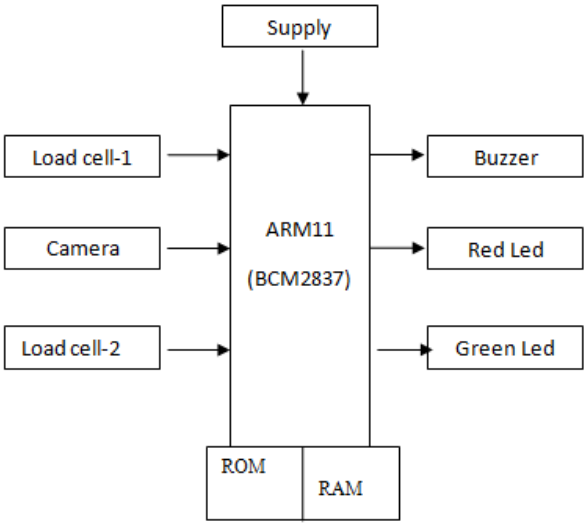
ARM11 (BCM2837)
MCP 3008 IC's
Buzzer and Leds (green, red)
Internet source
Load cell 2 (20kg)
USB Camera

2. CONSTRUCTION

The load cell will be place 0.5 kms backwards from the level crossing. The load cell 2 will be placed 0.5 kms forward from the level crossing system. The camera will be placed in the level crossing system. These load cells and camera will be connected to the raspberry pi chip which will be placed in the level crossing system. GPRS will be connected to the raspberry pi device to connect to the loco pilot and the station master about the emergency via webpage. Webpage will be refreshed every 5sec. when the train passes through the load cell 1, the red signal will be displayed in the level crossing system and the gates will get closed automatically. As soon the gate closes automatically, the camera will get switched on and it search for any motion in the level crossing system. This is happening based on the motion detection concept. If it detects any motion, then it will capture that image and send to the loco pilot and station master with an alert sound. The loco pilot and station master will look into the video output device which displays the captured image in the level crossing system in the webpage format. The webpage will be refreshed every 5 seconds so that they can able to know whats happening every 5 seconds in the level crossing. Based on the type of danger, the loco pilot and station master will decide whether to stop the train or not.

After the train passes through the load cell 2, the camera will be turned off and the gates will get automatically opened and the signals will turn to green.

3. WORKING



The above block diagram shows the working of the autonomous level crossing system. It consists of ARM11 microprocessor chip as a main source of the system. The load cell 1 and load cell 2 is connected to the left side of the microprocessor chip and camera is also placed in the left side of the chip. Whereas buzzer , green led and red led is palced on the right side of the microprocessor chip. The supply to the chip will be given at the top and there will be RAM and ROM in the bottom of the chip to store the image which id captured using the motion detection method. The GPRS will also be connected to the microprocessor chip to transmit the images to the loco pilot and the station master.

4. CONCLUSION

Our paper clearly deals with the level crossing systems problems in the country and automation is the only way to avoid those problems and make the safest nation in terms of level crossing systems. If this syatem is installed in every level crossing it will save man energy and works very efficient than men power in low cost.

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