Video based Object Detection System for Improving Safety at Level Cross

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Abstract: **For the betterment of safety at level crossing the video surveillance is implemented. It allows for the automatic recognition and evaluation of critical situation at level crossing environment. The video surveillance system directly implemented at the traffic centre helps the approaching trains to stop them immediately. Wireless camera kept at level crossing which gives information about traffic occurring over there. It will guide people away from few kilometres to be aware of it and to take an alternate path. The gear motor automatically closes the gate if it found any object at level crossing. Wireless camera will intimate any object at the level crossing using zigbee.It is helpful to reduce the accident at level crossing.**

Index Terms— Level Crossing (LC), Railway Safety, Train-Car Collision, Track Obstacle Sensor, IR Sensor, traffic LED.

I. INTRODUCTION

Railway safety is crucial aspect of rail operation all over the world. This paper aimed at helping the railway administration concerned to strengthen their safety culture and developing the monitoring tools required by modern safety management system are used in the level crossing channels of the system. In France several dramatic accidents have occurred. When an accident occurs, the transport operator waits for a road user noticing the accident to use a very old Telephone installed at the LC premises to warn the traffic centre that something bad is happening at the LC. Then, the operator at the traffic centre calls all the approaching trains to tell them to stop immediately without any additional information on what is going on. In the meantime, at the LC level, the situations becoming worse, because of the wounded users and/or the blocked traffic. This is a "blind" way of managing LC incident in road and railway infrastructure, and then, a high level of safety requirements constitutes a significant concern for rail companies and road organizations. Road and railway safety stakeholders plan to explore new technologies to reduce LC accidents because of the number of horrible fatal accidents. A very high of collisions is caused by the negligence incompetence or incapacity of road vehicle system drivers. The goes on the all rules and regulations are followed on progressive reaction road user of its level crossing the safety and effective and to take both corrective and proactive measures to implement the safety of their level crossing installations. Two equipment are implemented. One equipment dedicated to the detection of potentially dangerous situation. Another one equipment of communication whose role is to send the users approaching the LC.This idea is to generate the status of the LC due to surveillance system and to return it dynamically to the users on their road navigation terminals.The dynamic information on the status of the LC could also be sent on board approaching train or a control room. This communication must continue to operate even during high speed practiced by the trains.

II. AN OBJECT DICTION AND SEPARATION

In this paper different algorithms have been developed to detect, separate, and track moving objects in a video surveillance zone. These algorithms are applied to robustly track moving objects in real scenarios. To perform object tracking without loss of information, we try to precisely track all object pixels (or most of them) in real and relatively complex scenes. The method starts by detecting pixels affected by motion as a pre-treatment phase. To detect and separate objects, this method consists in clustering moving object in the display on control room Detecting and separating moving objects is an important task in many computer vision applications such as in video surveillance

III.NECESSITY

In general it appears that, Railway safety and particularly safety at intersections between roads and railway lines, is perhaps not accorded the priority it deserves. Much of this has to do with the lack of a strong safety ethos. Personal safety is not highly valued and hence safety consciousness is not generally something which is stressed in educational program, either in schools or in the wider community. There is little doubt that road accidents and their associated casualties have increased almost in parallel with the explosive growth in the vehicle populations of several countries of the region. The evidence is that, accidents at the intersections between road and rail contribute only a very small proportion of total road accidents in most countries of the region. However, it is a growing proportion as increasing road construction and road vehicle populations create greater opportunity for level crossing accidents to happen. Additionally, level crossing accidents tend to have casualties which are disproportionate with their number and frequency within the overall road safety picture. For example, where accidents involving collisions between two or more motor vehicles usually generate limited casualties, collisions between road vehicles and trains at level crossings can, and often do, generate multiple casualties of both rail and road users, particularly when such collisions result in train

derailments. Therefore, too much is at stake to allow level crossing accidents to grow uncontrolled. Of paramount importance in any program is to improve level crossing safety and the need to have access to continuously updated information – to detailed level crossing inventories, to details of accident circumstances, causes and casualties as well as to details of the growth in the road and rail traffic passing level crossings.

IV.METHODOLOGY

This systems are used on track obstacle sensor used on the process the sensor are connected in the level crossing area the track underside on the processing the detected on the signals from train rangers and intimated on the signals in the red signals. The automatic detection are speed of train in block the sections at approach to a level crossing. They installed only near unmanned level crossing and usually consists of a series of transponders in track train at certain intervals and interlocked and with level crossing barriers and warning signals. These types of devices are generally installed at unmanned level crossing. Their function is to provide signal warnings to train drivers when level crossing are blocked on the motor vehicles and other obstructions. The advanced video based system method are used on the process are constructed the video surveillance are used on the level crossing areas are connected on the camera the systems pass the signals from control room they will some control and avoid train accidents on the progressive method. This system may be overridden by train controllers in the event of equipment malfunctions .The proposing method in the level crossing areas the vehicle are stand in long series are emergency vehicles are not goes on the cross in railway track. The method used in all emergency vehicles is hope to use pull on the process.

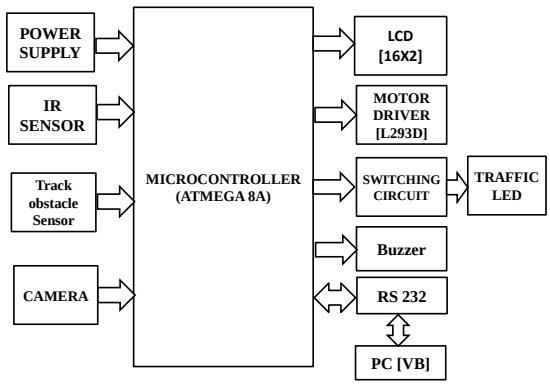


Fig 1: Block diagram of transmitter

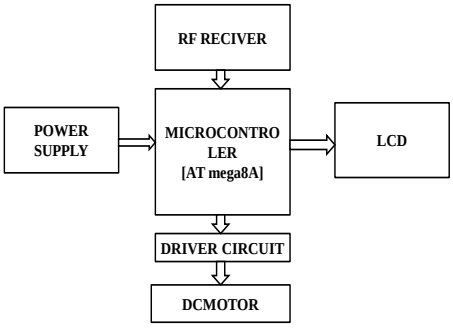


Fig 2.Block Diagram of Receiver

The following analyses are considered: Evaluation of the requirements of a Safety Management Information System which adequately addresses the needs of railway management for information on level crossing safety performance. Review of the essential and effective safety, enhancements, measures and priorities for level crossings Assessment of level crossing safety performance and safety measures in some countries. Examination of Cost Benefit Analysis of investments on level crossing safety enhancement; Review of the technical attributes and suitability of Networked Anti Collision System (ACD) for level crossing protection system. Recommendations and guidelines for adoption of networked ACD Systems by railways.

i.Manned or operated level crossing protection system:

In case of Manual operated Level crossing protection system, the man at the gate actuates the Level crossing protection, acts when he receives communication from the signal room by means of a telephone call. Since it is mainly based on human operations, there is every likely hood that it may fail due to human errors. However, since this system is being cost effective it is very much in place in the developing countries like India, Bangladesh, Iran, Egypt etc.

ii.Train sensor based Automatic Level crossing protection system:

This system is based on Rail wheel sensors viz., Track Circuits, Proximity Sensors etc., which are located at about 2 km/s from the Level crossing and provides a time lag for about 2 kemps for a bullock-cart in rural areas to cross the Level crossing, but the system has no parameters which make the system cumbersome and available. The system demands extension of power supply to remote places to run long cables from sensor to the system, which is expensive and reduces reliability.

iii.Video based level crossing:

The tracking process starts by computing optical flow of corner points, extracted by Harris operator, using the Lucas–Canada algorithm. We consider that these particular points have a stable optical flow.The optical flow of Harris points is then propagated to compute the optical flow of the remaining pixels.To make the tracking process

more robust against noise and to rectify the optical flow for each pixel, a Kaman filter (KF)-based iterative process is designed. The system is therefore capable of protecting the travelling Public as well as the road users and vehicles at level crossings from the Danger of collisions and related accidents.

Comparison graph

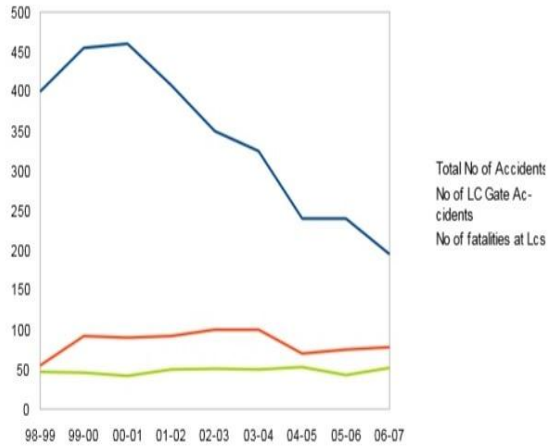


Fig 2:The accidents at LC, during 1996-2006 increased by 23 %, compared to the previous decade, and so also the fatalities increased to 49 % from 43 %. Amongst these, 85 % accidents occurred at unmanned LCs and 15 % at manned LCs. Fifty percent of the accidents at manned LCs were due to 'Gates Open'/improperly closed gates, inspire of 40% of the manned LCs are inter-locked. If all unmanned level crossings are to be manned, Railways require approximately Rs. 2450 crosses (US $0.7 Bin) as Capital cost to man them and approximately Rs. 700 cores (US $0.17 Bin) per annum will be required to meet the maintenance and operation cost. The cost of manning with interlocked signals will be around Rs.5500 cores (US $ 1.4 Bin) However, to eliminate probability of any accident at manned and unmanned level crossings, construction of Road Over Bridges (ROB's) and Road Under Bridges (RUB's) may be envisaged, but it will involve staggering amount of Rs.4,00,000 cores (US $ 400 Bin).

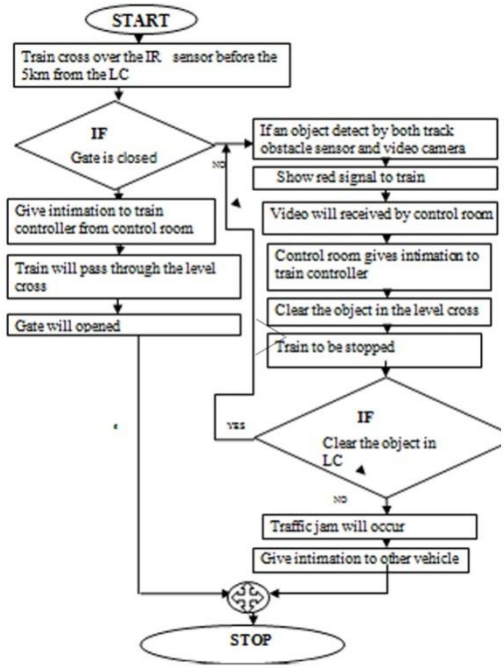
Tab 1:

Types of LC Gate	% of Share of total accidents on IR	% of share of fatalities
Manned	4%	9%
Un manned	17%	40%
Total	21%	49%

Fig 3: Showing a typical video based Gate System at anUn-Manned Level Crossing with ACD Accessories – Tower having the Hotter-Flasher Unit, Solar Power Panels (Close-upView) & the Location Box hosting the ACD UnitLegend:

1. Hotter & Flasher Unit – Both sides
2. PV Power Supply Module
3. Location Box

MLCG ACD acts as a safety shield to prevent or minimize collisions between trains and between trains and road vehicles in Indian railways.MLCG ACD is installed at manned level crossing gates. If the gate is open or damaged, MLCG ACD warns the approaching trains which regulate their speeds to minimize collisions at level crossing gates. It is also provided with a Hotter and Flasher to provide an Audio-Visual Warning to road users at Level crossings, when train is approaching the level Crossing. Manned non-Interlocked Level Crossing Gate ACD monitors the gate 'open' / 'closed' status with the help of Gate position sensing devices, and communicate this status to the approaching train. The Loco ACD will Impose speed limit of 30 Km/h when it detects through the Gate ACD That Gate is in 'open' condition.



VIII.HARDWARE IMPLEMENTATION:

Power supply

Transformer: A transformer is an electro-magnetic static device, which transfers electrical energy from one circuit to another, either at the same voltage or at different voltage but at the same frequency.

Rectifier: The function of the rectifier is to convert AC to DC current or voltage. Usually in the rectifier circuit full wave bridge rectifier is used.

Filter: The Filter is used to remove the pulsated AC. A filter circuit uses capacitor and inductor. The function of the capacitor is to block the DC voltage and bypass the AC voltage. The function of the inductor is to block the AC voltage and bypass the DC voltage.

Voltage Regulator: Voltage regulator constitutes an indispensable part of the power supply section of any electronic systems. The main advantage of the regulator ICs is that it regulates or maintains the output constant, in spite of the variation in the input supply.

Microcontroller – atmega8

1.High-performance, Low-power AVR® 8-bit Microcontroller**.**

2. Advanced RISC Architecture

3. High Endurance Non-volatile Memory segments

4. Peripheral Features

5. Special Microcontroller Features

6. I/O and Packages

Operating Voltages

2.7 - 5.5V (ATmega8L)

Speed Grades

0 - 8 MHz (ATmega8L)

0 - 16 MHz (ATmega8)

Power Consumption at 4 MHz, 3V, 25°C

IR Sensor

IR sensor have two blocks IR transmitter and receiver when the infrared rays are interrupted by any vehicles, Relay communicate with low power signal. When it reaches the other side of the IR sensor, it will cause the stepper motor to automatically close the gate in any one direction.

Track obstacle sensor

The basic concept of obstacle detection to transmit IR signal in a direction the signal receiver at IR receiver when the IR receiver bounce back from a surface of the objectWe need to understand now transmit IR signal using commercially available electronic componentSame way also needed in understand the IR receiver .

Programmer

The programmer used is a powerful programmer for the Atmel 89 series of microcontrollers that includes 89C51/52/55, 89S51/52/55 and many more. It is simple to use & low cost, yet powerful flash microcontroller programmer for the Atmel 89 series. It will Program, Read and Verify Code Data, Write Lock Bits, Erase and Blank Check. All fuse and lock bits are programmable. This programmer has intelligent onboard firmware and connects to the serial port. It can be used with any type of computer and requires no special hardware. All that is needed is a serial communication port which all computers have

LCD Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector.Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular..

ALGORITHM:

STEP1:Start the level cross sensor

STEP2: Train crosses both the IR Sensor

STEP3: If gate will be closed then go to step 9

STEP4: Some object is identified in railway track the track obstacle sensor detects

STEP5: Red signal shows to train by the use of traffic light system

STEP6: Train will be get stopped

STEP7: The video signal is passed to the control room in level crossing area

STEP8: After that clear the all objects in level cross

STEP9: Train passed through the level cross

STEP10: The traffic jam occurs in front of gate

STEP11: Give intimation to other vehicles by zigbee

STEP12: Emergency vehicles find alternative path

CONCLUSION

In this paper, four typical LC accident scenarios (presence of obstacles, zigzagging between the barriers, stopped cars line, and fall of a pedestrian) acquired in real conditions have experimentally evaluated by applying the proposed dangerous situation recognition system. A risk index has been defined to assess the risk of objects detected in LC environment. The method starts by detecting and tracking objects seen in the monitored Zone by a video camera. The second stage of the method consists in predicting for each tracked object the ideal trajectory allowing avoiding potential dangerous situations. The ideal trajectory prediction is based on an HMM. The third stageis concerned with the analysis of the predicted trajectory to evaluate the danger related to each tracked object. These stages performed by considering different sources of dangerousness and applying a Dumpster–Shafer-based combination.

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