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ScienceDirect

Procedia Computer Science 92 (2016) 404 – 409

Procedia
Computer Science

2nd International Conference on Intelligent Computing, Communication & Convergence
(ICCC-2016)

Srikanta Patnaik, Editor in Chief

Conference Organized by Interscience Institute of Management and Technology

Bhubaneswar, Odisha, India

An Automated System to Mitigate Loss of Life at Unmanned Level Crossings

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Abstract

Every life is precious and is worth saving. This paper proposes the design and implementation of a system to mitigate the loss of life at unmanned railway level crossings. This system uses the advancements in Communication, Embedded Systems and Internet of Things to develop a real-time, early warning system for unmanned level crossings across India. The outcome of this work is to provide an audio- visual indication to the commuter warning about an approaching train. The need for such systems and its design implementation and feasibility is discussed in this paper.

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Peer-review under responsibility of the Organizing Committee of ICC 2016

Keywords: early warning system; internet of things; cloud technologies; unmanned level crossings.

Nomenclature

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1. Introduction

The number of deaths caused by accidents at unmanned railway level crossings is increasing at an alarming rate across different parts of India. The existing methods that are in place to mitigate such disasters are by building Railway Over Bridges (ROBs)[3] or by converting these crossings into manned level crossings. Although the traditional methods are effective, it involves big budgets and takes a long time to become fully operational.

Train accidents at level crossings have always been a cause of concern for Railways. In 2011-12[2,6,17], Indian railways recorded about 15,000 deaths. Experts say, almost 70% of these took place at Unmanned Level Crossings. The aim of this work targets in saving thousands of lives that are lost in such tragic incidents. The prototype presented in this paper is designed with the motto, "Every human Life is precious! Each life is worth saving! ".

The contents of this paper are organized as follows: in Section 2, a study is done on the lives lost at level crossings and the shortcomings involved with the traditional solutions that exists. In Section 3, an overall design of the proposed prototype is discussed which is followed by the actual development of the prototype that is discussed in section 4. The results from simulations and the implementation are discussed in section 5. In section 6 we discuss the future works and extensions possible with this prototype.

2. A Study on the Existing Eco-System

In India there are about 13,530[2] Unmanned Level crossings. While the Indian Railways does not divulge the actual number of deaths at unmanned level crossings, a rough calculation can help us understand the gravity of the situation. An accident at Level crossings is a universal issue. At least 6,000 people die at level crossings every year. In India, 61% of railway related fatalities are attributed to accidents at Unmanned Level Crossings as shown in fig.1. Nearly two thirds of the total number of Level crossing accidents occur at unmanned Level Crossings and this proportion has been increasing ever since.

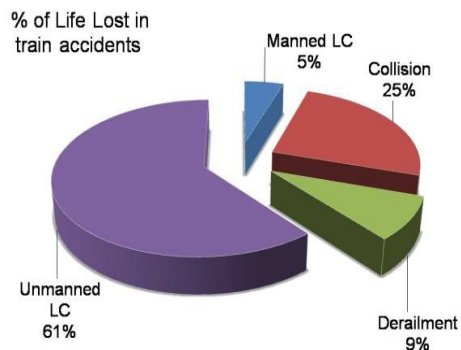


Fig.1. A chart showing the Loss of lives in train accidents (in percentage)

The current solutions proposed and implement to mitigate the loss of lives at Unmanned Level crossings is to build Railway over Bridges (R.O.B.) or by converting them to Manned Level crossings. These solutions bring with them a large overhead on financial, political and time constraints. For instance, the problem with R.O.B. is that it requires huge financial investment to build one and takes years to complete without any deadlocks. Consider this: Sixty crossings could not be closed despite commissioning of over bridges, due to technical difficulties and the costs involved. Ten thousand and five hundred lives a year—or even one for that matter—is too high a price to pay. Even people need to inculcate the seriousness about crossings to avoid these tragic accidents that are now occurring so frequently. The proposed prototype is a cost-effective solution and much easier-to-implement compared to the existing traditional methods. The time and financial overheads involved in designing and implementing this device is substantially lesser than building a R.O.B.

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