

PAPER • OPEN ACCESS

Innovation as Road Safety Felicitator

To cite this article: S Sahoo *et al* 2018 *IOP Conf. Ser.: Mater. Sci. Eng.* **331** 012017

View the [article online](#) for updates and enhancements.

You may also like

- [Investigating the influence of a cyclist on crowd behaviors on a shared road](#)
Chuanli Huang, Lu Wang, Hang Yu et al.
- [Simulation of non-motor vehicle and pedestrian mixed crossing behavior](#)
Yi Zhang and Jing Ge
- [A new heuristics model of simulating pedestrian dynamics based on Voronoi diagram](#)
Xin-Sen Wu, , Hao Yue et al.



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Innovation as Road Safety Felicitator

S Sahoo ¹, A Mitra ¹, J Kumar ¹, B Sahoo ¹

¹ Kalinga Institute of Industrial Technology, Bhubaneswar

Email: subhangee.sahoo@gmail.com

Abstract. Transportation via Roads should only be used for safely commuting from one place to another. In 2015, when 1.5 Million people, across the Globe started out on a journey, it was meant to be their last. The Global Status Report on Road Safety, 2015, reflected this data from 180 countries as road traffic deaths, worldwide. In India, more than 1.37 Lakh ^[4] people were victims of road accidents in 2013 alone. That number is more than the number of Indians killed in all the wars put together. With these disturbing facts in mind, we found out some key ambiguities in the Indian Road Traffic Management systems like the non-adaptive nature to fluctuating traffic, pedestrians and motor vehicles not adhering to the traffic norms strictly, to name a few. Introduction of simple systems would greatly erase the effects of this silent epidemic and our Project aims to achieve the same. It would introduce a pair of Barricade systems to cautiously separate the pedestrians and motor vehicles to minimise road mishaps to the extent possible. Exceptional situations like that of an Ambulance or any emergency vehicles will be taken care off by the use of RFID tags to monitor the movement of the Barricades. The varied traffic scenario can be guided properly by using the ADS-B (Automatic Detection System-Broadcast) for monitoring traffic density according to the time and place.

1. Introduction

Walking on roads, Indian and all over the world, have been nightmarish for pedestrians owing to the risks involved in a task as simple as crossing a lane. A global status report by WHO ^[7], focusing on road traffic deaths in 2009-2010, states pedestrians account for 22% of the 1.24 million deaths due to road crashes. Coming to India, quoting data recorded by the ministry of road transport and highways in India, the report further highlights that 8.7% of the deaths of 1.33 lakh people in road traffic accidents during 2010, were pedestrians- that is equal to 11,571 people. This project is a humble attempt to suggest a workable design that would enhance road safety.

2. Existing Systems and Loopholes:

Many of the roads in India have manually-operated traffic signals, with the technology of countdown timers catching up fast. But still, the number of casualties has increased by 8.7%, prompting the glaring question: where are the loopholes? The following ambiguities have been identified by the team those are addressed by this project.

2.1 A Few Observations

- Most of the vehicles stop on the zebra crossing (rather than before it), allowing little space for the commuters to pass.
- Some pedestrians still try to cross when the signal is Green for the motor traffic.
- The clearance time durations each for the pedestrians and the motor vehicles are not exclusive and isolated due to the spatial overlapping considerations resulting in confusion.
- Indian Traffic, where the situation is anything but stagnant, is not adaptable to fluctuating traffic density.



3. Proposed Idea As The Solution:

In busy road crossings to prevent accidents caused by the carelessness of the motor vehicle drivers and the pedestrians the proposal recommends:

- To erect a “2-rod” and one “single-rod” barricade.
- To build a barricade about 3/4 feet away from the zebra crossing, intended to prevent further movement of the vehicles when the signal is Red, allowing the pedestrians to cross the road, with their safety assured.
- The normal position of the barricade rods being vertical (allow) and automatically bend down across the road (stop) operable by the photo sensors from the traffic signal to form barricade for the motor vehicles.
- The Green light for the motor vehicles and the single –rod barricade for the pedestrians would operate simultaneously and they will be coupled with interchangeable automatic and/or manual operations. The single –rod barricade for the pedestrians will be at a horizontal level with the ground, preventing their forced movement, and the traffic will be allowed to pass. As the road traffic eases off (for manual control) or according to the timer, with the onset of yellow light, the status of the two barricades will interchange, and with the Red signal, pedestrians will be allowed to move and the vehicles will be restricted. For the last few seconds of the Red signal, the motor vehicles’ side will be blocked too, to allow the last bunch of pedestrians to cross over safely. As soon as the Green light turns on, the roads will open up for the vehicles again.

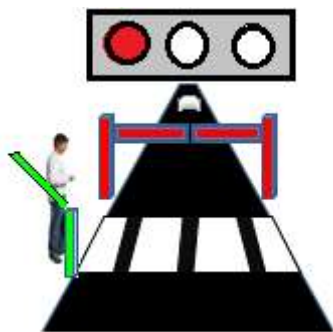


Figure 1. When the Traffic Signal is Red for motor traffic, the Barricades for the vehicles are Closed. The Barricade for the Pedestrians are Open. This allows the movement of the Pedestrians without the vehicles invading the Zebra Crossing. (Colours of the Barricades are Symbolic only).

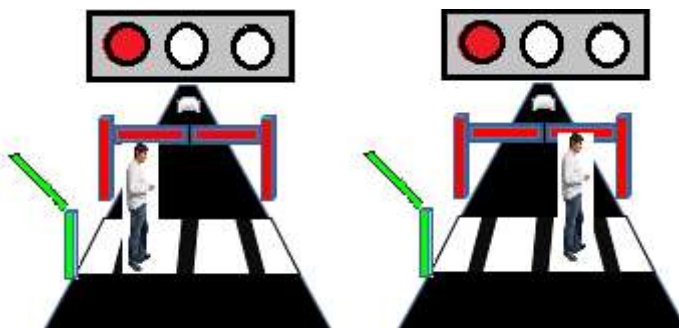


Figure 2. The Pedestrians can cross the road hassle free when the Signal is Red for the Vehicles. (Colours of the Barricades are Symbolic only).

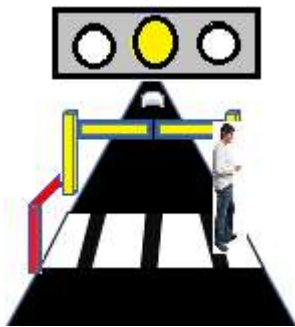


Figure 3. When the Signal turns Yellow for the motor traffic, the Barricade for the pedestrians is closed. This will prevent incoming pedestrians who tend to cross the road at the last moment. (Colours of the Barricades are Symbolic only).

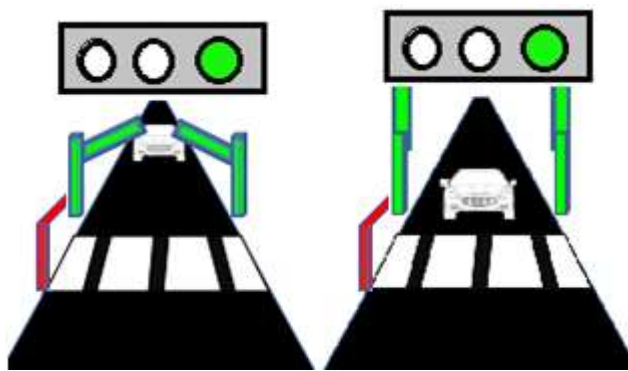


Figure 4. When the Signal is Green for the motor traffic, the barricade for the pedestrians is closed and the barricades for the vehicles are closed. (Colours of the Barricades are Symbolic only).

3.1 In Case of Emergencies/ Special Scenarios

- 3.1.1 *An ambulance is stuck in the traffic when the Vehicles' barricade is closed.*
- 3.1.2 *Any other important vehicle such as Fire Brigade and Escort vehicles have a long stretch covered by vehicles in front of them.*
- 3.1.3 *(SOLUTION for points 3.1.1 and 3.1.2):* The RF module of 315 or 433 MHz ASK module ^[3] will have its transmitter on the emergency vehicles and the receiver on the barricades. The modulated tag code is demodulated in the reader. The electronic control unit then takes the necessary control action and opens the barricade.

When the tag from the emergency vehicles are detected, the barricades will be programmed to lift (if the current signal is Red), and as the distance between the vehicle and the system becomes zero, within two seconds, the pair of rods will drop again after 3 or 4 seconds (decided on the basis of the distance between the Tag and the Reader, as long as the emergency vehicle crosses the barrier).



Figure 5. Emergency Vehicles exception to be detected by RFID Tags

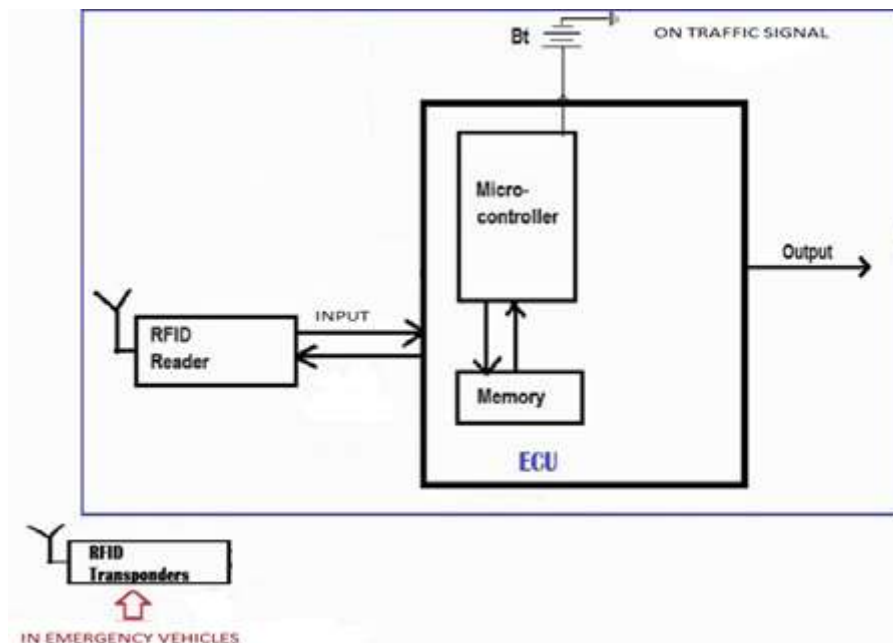


Figure 6. The RFID reader is placed in the traffic signal which detects the tag within a particular range. The RFID Tag on emergency vehicles modulates and transmits the beacon signal to RFID reader (in the traffic signal) and then to the ECU (Electronic control unit).

3.1.4 Varying traffic density

(SOLUTION):

- ADS-B (Automatic Detection System- Broadcast) to calculate the traffic density at a particular time and place and hence adjust the mechanism accordingly.

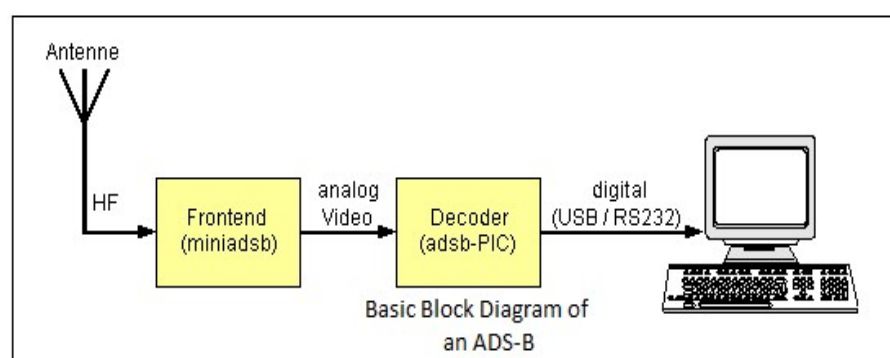


Figure 7. The ADS-B detects the Traffic Density at a given location and time.

- STEPS for the Process of Managing Real Time Traffic^[5]:

STEP 1: The Antenna receives the electromagnetic wave, converts it into an electric signals and feeds this through the coaxial cable into the receiver.

STEP 2: The Receiver selects, amplifies and demodulates the signal. Its output signal is a so-called video-signal.

STEP 3: The Decoder converts the analogue video signal into digital signals and detects inside the received signal-chaos the replies from ADS-B-transponders.

STEP 4: Output of the Decoder is forwarded to the PC via USB (or RS232).

STEP 5: The Computer receives the ADS-B-data and extracts all interesting information. This is used to draw the radar picture.

STEP 6: PC-Software adsbScope (Windows): The PC-software receives ADS-B-frames from the decoder (via a virtual COM-port) and decodes the data. It will identify and calculate their positions. All the important parameters will be shown in alphanumeric form in a table and/or on a graphic display.

4. References

- [1] Department of Transport, The Welsh Office, The Scottish Office and The Department of the Environment for Northern Ireland April 1995 *The Design Of Pedestrian Crossings, Local Transport Note 2/95*
- [2] Automation of Railway Gate control using Microcontroller August 2015
www.electronicshub.org.
- [3] Iyer S (I.I.T, Bombay) RF-ID: Technology and Application.
- [4] Ray A October 2015 WHO reports 1.37 lakh road deaths in India in 2014
- [5] Houston S May 2017 What's the Difference Between ADS-B Out and ADS-B In?
- [6] www.ndtv.com
- [7] www.who.int