A Real-time Publish/Subscribe Driver Alert System for Accident Avoidance due to Red Light Running (Poster)

Deepti Thopte
EECS Department
Vanderbilt University
Nashville, TN
+16154738137

deepti.s.thopte@vanderbilt.edu

Tina Devkota
EECS Department
Vanderbilt University
Nashville, TN
+16159488864

tina.devkota@vanderbilt.edu

Aniruddha Gokhale
ISIS
Vanderbilt University
Nashville, TN
+16153228754

a.gokhale@vanderbilt.edu

1. INTRODUCTION

This poster presents Intelligent Traffic Light (ITL), which is a cyber physical system that combines information technology (e.g., real-time publish/subscribe semantics) and communications technology (e.g., mobility and wireless) with the transportation infrastructure (e.g., vehicles, traffic lights and road-side units) to address the red light running incidents. ITL behaves as the publisher and vehicles subscribe to warning messages published for them. ITL estimates when a traffic light will change to red, and warns drivers of approaching vehicles about when and how much to slow down to avoid red light running. ITL can account for road conditions, which increases its usability in challenging weather conditions.

2. ITL

2.1 Event Driven Architecture

Traffic signal, in fixed-time control system each phase of the signal lasts for a specific duration before the next phase occurs; this pattern repeats itself. We will consider this model for initial simulation.

Event Flow in the ITL system can be summarized as:

1. Subscribe: Vehicles detect approaching Traffic Light and subscribe to it for warning messages.

2. Publish: Publish is event driven. It is governed by the event of traffic light changing colors. ITL will estimate the time for light to turn red and send messages accordingly to the particular subscriber.

3. Information Dissemination among car fleet: Cars in a particular range that need to receive the same warning message will receive it from a vehicle chosen as fleet head.
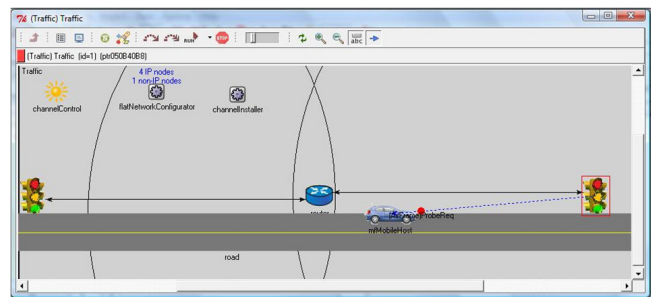
Figure 1. Simulation using Omnet++ where car receives messages from ITL

2.2 Estimating deceleration for vehicles

An ITL sensor per traffic light will track the state change of each light. The sensor relays an impending change in state to a road-side unit (RSU) in its radio range. The RSU senses vehicles in its range that are approaching the traffic light and analyzes their speeds. The vehicles also track the road conditions. The RSUs compute the desired deceleration for the vehicles which are then relayed back to them.

2.3 Publish/subscribe architecture

Publish/subscribe is an asynchronous messaging paradigm where publishers (ITL) of messages are not programmed to send their messages to specific subscribers. Rather, published messages are characterized into classes, without knowledge of what subscribers there may be. Subscribers (Vehicles) express interest in one or more classes, and only receive messages that are of interest, without knowledge of what publishers there are.

3. CONCLUSION

ITL considers adverse conditions like fog, rain which affects traffic light visibility and makes relaying of warning messages in these conditions possible too. Special vehicles like ambulance, fire brigade etc which need vehicles to modify their travel speed could be equipped with special equipment to converse with Traffic Light. ITL could warn vehicles about approach of these vehicles. ITL could also behave as congestion control unit by being part of RSU network and thus relaying relevant congestion information to vehicles.