A Public Transport System Based Sensor Network for Fake Alcohol Detection

Maneesha V. Ramesh and Riji N. Das

Amrita Center for Wireless Networks and Application, AMRITA Vishwa
Vidyapeetham(Amrita University), Kollam, Kerala, India
maneesha@am.amrita.edu

Abstract. Illicit and spurious alcohol consumption is leading to numerous deaths in rural India. The aim of this paper is to reduce the death due to the consumption of spurious alcohol by reducing the production of spurious alcohol. A Vehicular Ad-Hoc Sensor Network, MovingNet, is used to detect the production of spurious alcohol. Multiple sensors capable to detect the presence of methanol content or diazepam in a wide geographical area, is incorporated on the available public transport system that traverse through the rural areas of India, where high rate of spurious alcohol production is observed. The data received from the wireless sensors will be transmitted using the delay tolerant, public transport vehicular ad-hoc network, and analyzed at the central data management center. The results of the data analysis will provide the details of geographic information, the amount of presence of methanol content or diazepam, and the warning degree. This will be sent to the excise department which will help them to locate the position and stop the production of spurious alcohol. Thus the implementation of MovingNet will reduce the production of spurious alcohol and contributes the reduction in hazards due to the consumption of spurious alcohol. MovingNet is a cost effective solution since it uses a very few sensors and the available public transport system for data collection and transmission.

Keywords: Alcohol Sensorl Fake Alcohol, GPS, MovingNet, Sub Stations.

1 Introduction

The production and consumption of spurious alcohol causes severe health problems or even leading to death in rural parts of India. Statistical studies proved that the rate of the casualties is increasing day by day. The objective of this paper is to control the production of spurious alcohol and thereby cut down the deaths due to the consumption of spurious alcohol. In order to control the production of spurious alcohol, a wide geographical area needs to be monitored in a periodical basis.

A Vehicular Ad-Hoc Sensor Network, MovingNet is used for the monitoring of geographical area to detect the production of spurious alcohol. In many countries, the public transport buses cover almost all areas of a territory[1]. In the MovingNet architecture, multiple sensors which are capable of sensing the presence of methanol or diazepam content in air is incorporated on the public transport system.

In MovingNet, each vehicle can be considered as a mobile unit that consists of sensor node and external memory. Each sensor node consists of one or more sensors for the detection of alcohol content and the GPS for locating the coordinates of the place being monitored. The data collected by the sensor nodes is being aggregated in a central place, analyses it and issues warning whenever necessary. Depending upon the sensors used in the sensor nodes the MovingNet architecture can be used for variety of terrain monitoring applications that are delay tolerant in nature.

MovingNet alerts concerned authorities to the existence and location of spurious alcohol; thus, enabling the much needed reduction of the production, consumption and hazardous effects of spurious alcohol.

2   Related Works

The DakNet[3] provides digital communication services to remote villages using buses as a mechanical backhaul [4] for data transfer. The use of buses in DakNet is purely for data transfer between Internet access points and Internet kiosks in villages. In MovingNet the buses provide the means to sense, collect and transfer data necessary for reduction in alcohol hazards.

DataMULEs[5] architecture uses mobile entities, including buses, to collect data from sensors deployed in an environment and ferry them to access points. In contrast the buses in MovingNet are not simple ferries; they carry the sensors and they are the data collection source. DakNet and the Data MULEs are examples of delay tolerant networks [5]. They are proposed as solutions for the lack of better communication infrastructure. However, the MovingNet is proposed purely as a low cost solution, and uses the capability to reach most appropriate place data collection such as rural India.

Even if a good communication infrastructure exists, the data collection and transporting buses in the MovingNet are the most natural form of communication infrastructure for the road surface monitoring system. MovingNet provides physical security for the sensors, reduces the cost of deploying sensors, and also simplifies the management and maintenance of the sensors.

In ZebraNet [6] Zebras carry collars that contain sensors and the collected data are transferred to other Zebras and collection points opportunistically. ZebraNet is conceptually closest to the MovingNet. However, there is a crucial difference between ZebraNet and MovingNet. Whereas ZebraNet is an ad-hoc opportunistic network, in the MovingNet there is a stable fixed infrastructure for data transfer. The bus routes are regularly serviced by scheduled buses barring a major disaster which is an exception rather than the rule. Therefore, the MovingNet is a stable network and it has stable network routes. If not for the mobile buses it can even be called a fixed network.

Zhao et al.[7] also present a vehicle assisted data delivery system for vehicular ad-hoc networks. In that work the vehicles are used as data carriers and the route to the destination is set up based on the ad-hoc connectivity of the vehicles. In contrast, the MovingNet not only delivers data it also generates data and furthermore in MovingNet we use the stable transport infrastructure and does not rely on the ad-hoc connectivity between vehicles.

MovingNet, which implements a sensor network on top of the public transport network, is ideal for monitoring the road surface condition; the sensor mounted buses use the very roads that we want to monitor. We designed the road surface monitoring system based on the MovingNet. In this system one of the heavy users of the road system and hence a major contributor to the deterioration of the road surface helps in