Applying Intelligent Speed Adaptation to a Road Safety Mobile Application – DriverSafeMode

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Abstract

During the last decades, Sri Lanka has experienced a highly accelerated growth level of motorized transportation with the rapid urbanization due to the economic development. However, the increasing motorization has also placed a significant burden on people's health in the form of uncontrollable growth rate of road accidents and fatalities. We have focused on excess speed and mobile distraction which are two major factors that have caused majority of road accidents. Exceeding the speed limit, which is enforced under the traffic law, increases both the risk of a road crash as well as the severity of the injuries by reducing the ability to judge the forthcoming events. Use of mobile phones distracts a driver in the means of visual, physical and cognitive. These factors are largely preventable but are unlikely; due to the lack of adequate mechanisms in existing road safety plans in Sri Lanka. Especially in rural areas, roads are poorly maintained which has led to faded, hidden, foliage obscured speed limit signs and absence of appropriate signs at vulnerable locations (schools, hospitals). Existing plans also lack alert systems to avoid drivers from using phones while driving. Proposed application uses Advisory Intelligent Speed Adaptation (ISA) to ensure drivers' compliance with legally enforced speed limits by informing the driver on vehicle speed along with speed limits and giving feedback. There exist many ISA systems deployed using various methods such as GPS, Transponders, compasses, speed sensors and map matching, based on native traffic infrastructures of other countries.

Google Fused location provider API web service was used combined with GPS sensor of the smartphone to obtain continuous geo location points (latitude, longitude). Distance between two location points was calculated using Haversine Algorithm. Using the distance and time spent between two location updates, vehicle speed was calculated. Google Maps Geocoding API was used to obtain the type of road on which the driver is driving. Accepted speed limits were stored in a cloud hosted database according to each road type and vehicle type. Application establishes a connection to the database to gain the accepted speed limit whenever a new road type is detected. It compares real-time speed Vs speed limit and initiate audio and visual alerts when the vehicle speed exceeds the limit. Google Places API was used to identify schools and hospitals within 100m and informs the driver using audio and visual alerts. Application uses in-built GSM service to reject incoming calls and in-built notification service to mute distracting notifications. A test trial was carried out to evaluate the accuracy of speed detection. Mean speed of the test vehicle speedometer was 14.4122kmph (Standard Deviation=14.85891) and that of the application was 13.7488kmph (Standard Deviation=14.31279). An independent-sample t-test proved that the speed values of the test vehicle and the application are not significantly different at 5% level of significance. User experiences of 30 randomly selected test drivers were evaluated. 80% of light-motor vehicle test drivers had stated that the application is very effective. 10% of the heavy-motor vehicle drivers and 20% of tricycle test drivers had found it difficult to perceive the audio alerts due to the noisy surrounding. Evaluations prove that the usage of the proposed system can impose a direct and positive effect on the road safety of Sri Lanka as expected.

Keywords: *Intelligent Speed Adaptation, Road safety, Mobile phone distraction*