EARLY WARNING SYSTEM FOR A SPEED BREAKER

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Abstract

In low visibility circumstances, such as at night, or when there is fog, rain or snow, speed-breakers are inconspicuous. The risk of accident or injury is significant when a car approaches a speed breaker at a speed higher than some limit speed. We suggest an early warning system using a smartphone-based application to warn the driver in advance when a speed breaker approaches the car. Furthermore, the app tracks the smartphone accelerometer continuously to identify earlier unknown speed breakers.

Key words: Speed breaker, speed limit, warning system, accelerometer.

Introduction

Speed breakers are intended to be driven through at a comfortable velocity predetermined[1], while at greater speeds causing excessive discomfort. Reducing average vehicle speed makes the safety of people in neighboring areas significantly improved. Although there is proof that speed breakers decrease accidents[2] linked to speed, accidents and injuries were also known to occur. Whenever an automobile passes a speed breaker at speeds above a threshold speed, the danger of accident[3], [4] or injury to passengers becomes significant. A motorcyclist who struck a speed hump in Isleworth in 2001, for instance, was expelled from the bicycle and suffered severe injury (paralysis). In another incident, a 20-year-old woman was murdered in 2012 in Pune, India, following a high-speed motorcycle breaker.

Methodology

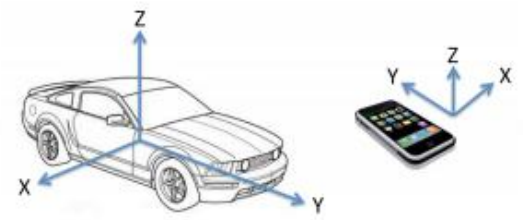

Figure 1: The three axes of a car and a smartphone. The Z-axis of the phone does not always align with the z-axis of the car, e.g., when the phone is in the driver's pant pocket.

The SWAS implementation gathers a total of 3 RT samples in a specified time period of T seconds (1 RT samples from each of the 3 axes) if the sampling rate is set at R samples / sec. A given set of 3 RT samples, were obtained, the request was made decide whether or not there was a speed-breaker. T's value was set to 2 seconds based on the assessment that crossing a speed-breaker generally takes less than 2 seconds (assuming some set maximum velocity). The axles of the smartphone do not always align with the axles of the vehicle (as seen in Figure 1), as travelers can position their smartphone wherever they are, e.g. pant pocket, purse, car seat, dashboard, etc. Even though street anomalies such as potholes and speed breakers mainly occur along the vehicle's z-axis, prior works tried to reorient the axes of the telephone with that of the vehicle using some other sensors. Because the amplitude includes forces encountered along all three axes, it already has a component of forces encountered along the z-axis of the vehicle. Therefore, speed breakers from time series of amplitude information should be detected.

Conclusion

The paper suggested an early warning system that could alert the driver in advance when a speed-breaker approaches the car. Because the suggested detection algorithm does not involve reorientation of the accelerometer, this work shows that it is possible to detect differences along the z-axis of the vehicle using very easy techniques.

References

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