A Vision Based Speed Breaker Detection for Early Warning Notification

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Highlights: “A Vision Based Speed Breaker Detection for Early Warning Notification” will focus on identifying the road region and detecting the speed breaker on the road. The system will warn the drivers to slow down their car by producing a beep sound when they are approaching the speed breaker. With this system, the driver can slow down their car at the appropriate time. In order to collect the experiment data, a single camera model GDR 45 Asia was embedded on the car windscreen that used to record the speed breaker in front.

Key words: Speed breaker detection, Computer vision, Image processing, Driver assistant

Introduction
Speed breaker is a safety feature in the form of crosswise ridge that used to warn the drivers that they are approaching the danger area that requiring a precaution. Detecting the speed breaker has gain significance important since it can cause accident and injury when a car approaches a speed breaker at a speed greater than some threshold velocity. It is necessity to realize the speed breaker detection using computer vision because sometimes the drivers only notice the speed breaker when it is too late especially at night. The important of this work is to produce a simulation system that is able to detect the speed
breaker using a single camera. In this work, speed breaker is not about speed bump or speed hump, but it is about transverse rumble strips (TRS). Figure 1 is an illustration of speed breaker that related to our proposed work, which is TRS.

![Figure 1: Illustration of Speed Breaker](image)

**Implementation of Proposed Approach**

In order to accomplish our research, a few technologies have been used including hardware and software. There are two hardware involved, which are a single camera and a laptop. The camera is one of the important hardware because it used to record some videos that is taken while driving by attach the camera on the widescreen. This is to get a few samples of speed breaker for analyzation purpose, meanwhile the laptop used to install all related software and process the videos.

The recorded videos have been analyzed with the aid of three software. The main software involved is eclipse Mars.2. This software is a tool to develop a simulation system for this research using Java language and Java API OpenCV 3.1.0. The second software that involved in this work is Video Cutter and Joiner that used to cut the recorded videos for testing purpose. The sample videos are imported into MPEG StreamClip in order to set the pixel and size of videos and export it into AVI format so that the system can read and process the videos. We provide the details of the technologies that used in this work in table 1.
<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Tool</th>
<th>Specification / Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hardware</td>
<td>Single Camera</td>
<td>Model GDR45 Asia, Garmin 4.40, f/2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laptop</td>
<td>2.3 GHz Intel Core i5 processor, 8GB memory, OS X El Capitan</td>
</tr>
<tr>
<td>2</td>
<td>Software</td>
<td>Eclipse</td>
<td>Mars.2 With OpenCV 3.1.0</td>
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<tr>
<td></td>
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<td>Video Cutter &amp; Joiner</td>
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<tr>
<td></td>
<td></td>
<td>MPEG StreamClip</td>
<td>1.9.3b8 (2004-2012)</td>
</tr>
</tbody>
</table>

Our proposed algorithm involves binary image conversion and find contours method besides specifying the region of interest for detecting the speed breaker. The algorithm processes the videos frame by frame. Therefore, it needs to hold current frame and previous frame in order to get the video movement. The image will go through morphological process before it can identify a region and recognize the speed breaker. Since the algorithm detect the speed breaker line by line, so it must identify whether the detected line is for current speed breaker or upcoming speed breaker. If the detected line is an upcoming speed breaker, the system need to give a beep sound to warn the driver and display a message “Speed Breaker Ahead”, otherwise just ignore the detected line and display a message “Speed Breaker Detected”.

**Importance and Advantages**

Speed breaker detection is important to community in order to save the car and human life. When people drive their car and they not notice the speed breaker in
front, they will drive through the speed breaker without slow down their car, which might cause the car damage if the speed is more than some threshold velocity. Other than that, if the drivers just notice the speed breaker when they are too near to it and sudden break their car, it most likely cause a rear-end collision if the gap with car behind is close.

Usually, the speed breaker is embedded in front of a school and hospital. Imagine that the drivers do not focus on the driving and they drive through the school or hospital. They might violate the students or patients who are crossing the road, if they are driving with a high rate of speed. Therefore, this work is good because it can warn the drivers if they are approaching to the speed breaker. Although the system cannot control the car, but at least it can warn the driver to be aware. Since this system is a vision based, so it is compatible to any type of car.

**Conclusion**

A vision based speed breaker detection for early warning notification is a research work that attempt to detect the speed breaker using a single camera. This research is slightly different with others work because of the speed breaker itself. Most of the previous work propose to detect the speed bump or speed hump but this work relates to TRS. Although the TRS is not as thick as speed bump, but it still can damage the car and may cause a danger since a set of TRS contains multiple line. Based on the result evaluation, it shows that the system is able to detect the speed breaker very well either in day or night and give a correct warning if there are no obstacles.
References


