Riyadisi - Intelligent Driver Monitoring System

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INTRODUCTION

Road accidents have become a major problem that causes nearly 1.3 million people die and 25-50 million people injured or disabled in each year all around the world. It has been calculated that 10% to 20% of traffic accidents with dead drivers are caused by driver inattention. Drowsiness and distraction of drivers have become the main causes for driver inattention. Drowsiness is something unavoidable and out of control of the driver. Sleepiness increases reaction time and generates the decreased vigilance level, alertness and concentration. Hence the quality of decision making may be affected. Reduced attention and raised reaction time increase the probability of road accidents. Distractions such as looking away, using mobile phone or navigation systems are also obviously cause to make driver loses his/ her focus.

Riyadisi has brought a solution for this tragedy. Riyadisi is an automated driver attention assistance system. The main significance of Riyadisi is, it operates in real time and it is totally non-invasive because Riyadisi uses typical visual features of a drowsy person: decreased eye blinking rate, yawning and nodding off, to detect drowsiness whereas eye-gaze movement and head movement in distraction detection. In the proposed system these visual cues are extracted by analysing a video stream in real time which is obtained through an IR camera mounted on the rear-view mirror. The architecture of the proposed system is as follows.

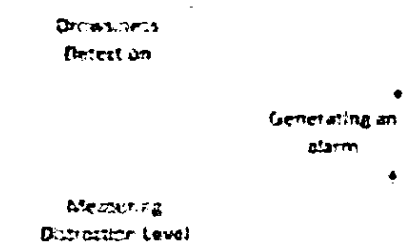

Figure1: Abstract Process Model

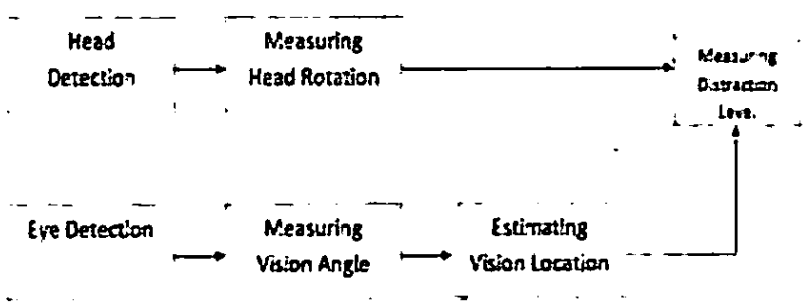

Figure 2: Distraction Detection Process Model

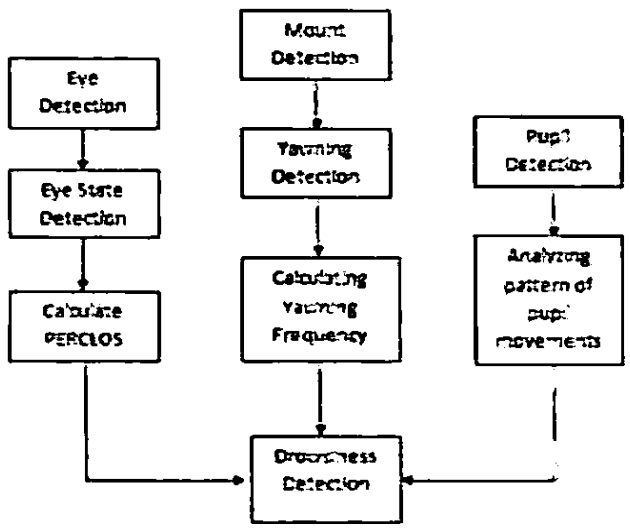

Figure 3: Drowsiness Detection Process Model

Background

Driver assistance technologies are evolving rapidly. Studies done on driver attention assistance systems can be broadly categorized into three sections - physiological methods, vehicle - based performance methods, visual cue based methods. Physiological methods provides the highest accurate as they depend their processing on bio-physiological data of the driver such as brain wave patterns, respiratory dynamics and heart rate variations. However the intrusive nature of these systems reduces its usability in real time. Vehicle - based performance methods use speed variations, angle of the steering wheel, standard deviation of lane position, etc for driver inattention monitoring. Some automobile companies have already developed their own driver assistance systems, using sensors and cameras. Drawbacks of these methods are, they are specific to a particular brand and they require advanced mechanical components. As well systems those are based on vehicle parameters to detect drowsiness, alerts the driver only after sleepiness of the driver adversely affects driving.

The issues of these two methodologies are eliminated if visual cue based methods are used to monitor driver inattention. Visual cues based methods are totally non-intrusive because they do not require the driver to wear any sensors. However visual cues based methods have to cope with different challenges. The main challenges is different illumination conditions, this system works both in day and night times. On the other hand these systems should be able to monitor human subjects of different ethnic backgrounds, gender and ages; with/without glasses.