Driver Drowsiness Detection System

Software Requirements Specification

Document

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1. Introduction:

The following subsections of the Software Requirements Specifications (SRS) document provide an overview of the entire SRS.

1.1 Purpose :

The Software Requirements Specification (SRS) will provide a detailed description of the requirements for the Driver Drowsiness Detection System. This SRS will allow for a complete understanding of what is to be expected in Driver Drowsiness Detection System. The clear understanding of it and it's functionality will allow for the correct software to be developed for the end user and will be used for the development of the future stages of the project.

This SRS will provide the foundation for the project. From this SRS, the Driver Drowsiness Detection System can be designed, developed and finally tested.

1.2 Scope:

- The system records the videos and detects driver's face in every frame by employing image processing techniques.
- The system is capable of detecting facial landmarks, computes Eye Aspect Ratio (EAR) and Eye Closure Ratio (ECR) to detect driver's drowsiness based on adaptive thresholding.
- This system deals with automatic driver drowsiness detection based on visual information.
- System will capture the video through camera and after processing, it will alert the driver based on the results.
- A camera will be placed inside the car and it will be continuously filming the driver's face.
- If the eyes are shut for more than 0.25 second then the system beeps to alert the driver.
- System will use Dlib library to detect facial landmarks and a threshold value(taken as 0.25) will be used to detect whether driver is drowsy or not.

1.3 Definitions, Acronyms, and Abbreviations:

SRS – Software Requirements Specification
Subjective satisfaction – The overall satisfaction of system
End users – The people who will be actually using the system

1.4 Overview:

The SRS is organized into two main sections. The first is the overall description and the second is the specific requirements. The overall description will describe the requirements of the system from a general high level perspective. The specific requirements section will describe in detail the requirements of the system.

2. The Overall Description:

This describes the general factors that affect the product and its requirements. This section does not state specific requirements. Instead it provides a background for those requirements, which are defined in section 3 i.e in Specific Requirements section , and makes them easier to understand.

Every year many people lose their lives due to fatal road accidents around the world and drowsy driving is one of the primary causes of road accidents and death. Fatigue and micro sleep at the driving controls are often the root cause of serious accidents. However, initial signs of fatigue can be detected before a critical situation arises and therefore, detection of driver's fatigue and its indication is ongoing research topic. Most of the traditional methods to detect drowsiness are based on behavioral aspects while some are intrusive and may distract drivers, while some require expensive sensors. But in our project the system records the videos and detects driver's face in every frame by employing image processing techniques. The system is capable of detecting facial landmarks, computes Eye Aspect Ratio (EAR) and Eye Closure Ratio (ECR) to detect driver's drowsiness based on adaptive thresholding. Machine learning algorithms have been employed to test the efficacy of the proposed approach.

3. Specific Requirements:

This section contains all the software requirements at a level of detail.

External Interface Requirements

User Interfaces:

First of all, the system will capture the video of the driver i.e the system will capture the image frames continuously. After that, the system will detect the face and eyes of the driver. If the system detect the drowsiness for more than set period of time then an alarm will alert the driver.

Hardware Interfaces:

- Computer with a webcam OR Laptop.

Software Interface:

- Python
- Different libraries
- Operating System : Windows or Ubuntu

4. System Requirements:

4.1 Functional Requirements:

Functional requirement define the fundamental actions that system must perform.

1) Calculating Real Time Video

The system will capture frames and frames will be pre-processed.

2) Facial Landmark Detection

We will use Dlib library to detect facial landmarks and a threshold value is used to detect whether driver is drowsy or not. These facial landmarks are then used to compute the EAR (Eye Aspect Ratio).The EAR value will be compared with the threshold value taken as 0.25. If the EAR value is less than the threshold value, then this would indicate a state of fatigue .After calculating EAR, ECR(Eye Closure Ratio) will be calculated.

3) Output

Based on output, the system will decide whether the driver is drowsy and generate an alarm.

4.2 Non- Functional Requirements:

Functional requirements define the needs in terms of performance, design constraints, reliability and maintainability.

1) Reliability

The system is self-reliable.

2) Extensibility

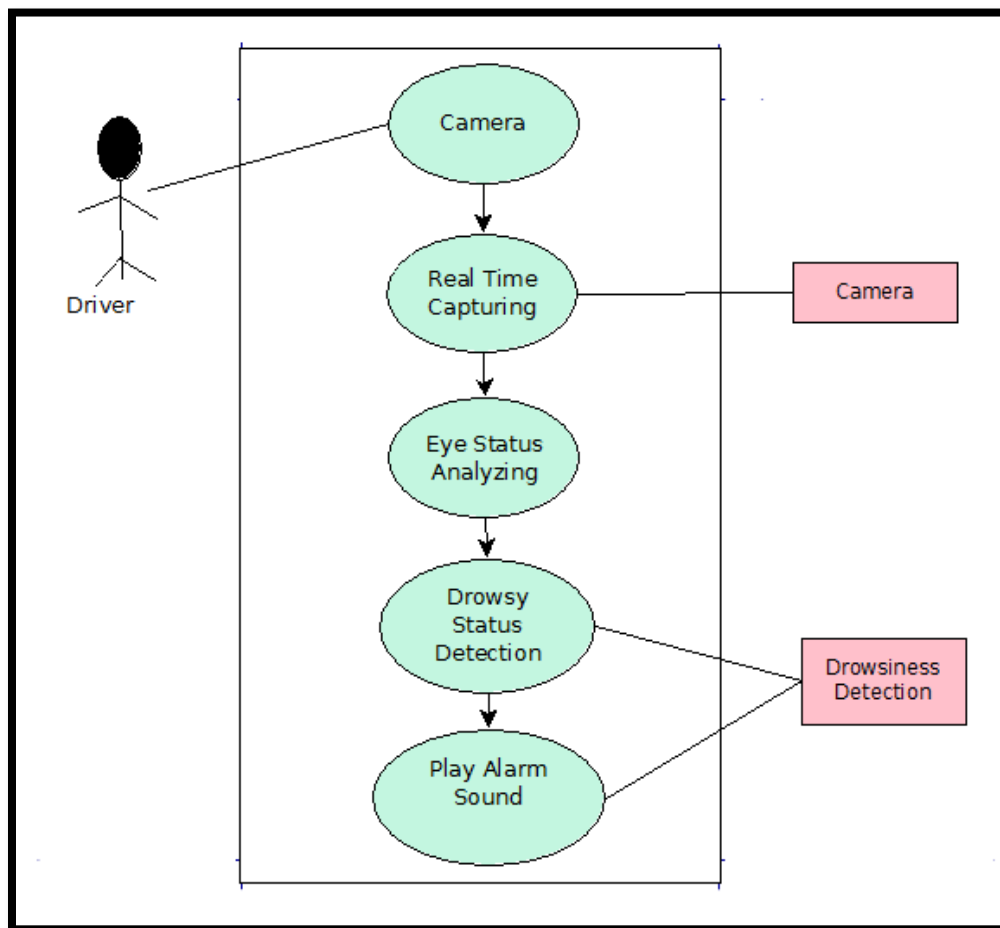New modules can added in future versions.

3) Usability

System is easy to learn and very efficient to use.

4) Cost Effective

System is cost-effective.

5. System Design:

- **Use Case Diagram:**

- **DFD(Data Flow Diagram):**

Fig. DFD