

AN Intelligent Based Dynamic Drowsiness Alert Monitoring System

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30%. Drowsy driving is the most dangerous aspect of road accidents. The methods for drowsiness detection are classified into subjective and objective detection methods. In the objective detection no feedback is given to drivers and detection takes place according to the drivers' physical aspects but subjective detection is all about physical aspects of drivers.

ABSTRACT: Drivers drowsiness is the major problem that causes road accidents. Unlike normal facial expression, drowsiness is defined to be a condition of exhaustion, where the expression of the face is different from usual. The important steps in detecting drowsiness are face detection and expression detection. Many algorithms are being developed to detect face and expressions. But these algorithms give poor performance due to the extrinsic parameters of the environment. Light and position of the camera are the major problems. In this paper, different architectures were used to analyse the performance of face and drowsiness detection. Also we have proposed new detection methods using deep learning techniques. To estimate the drivers' state we use facial regions corresponding to the entire face. The algorithms employed for face detection are i) Viola Jones ii) DLib iii) Yolo V3. For the Classification, The CNN (Convolutional Neural Network) architecture employed in the drowsiness detection is modified LeNet.

Keyword : Viola Jones, DLib, Yolo V3. For the Classification, The CNN (Convolutional Neural Network) architecture employed in the drowsiness detection is modified LeNet.

I. INTRODUCTION

Automobiles have become an essential mode of transportation for people. As per the 'statista' global vehicle statistics, selling rate of vehicles from 2017 to 2019 was 95 million units. In 2018, the selling rate was 1 billion. In 2020 the global selling rate until March was 60.5 million automobiles. With increase in the number of vehicles, the occurrence of traffic and accidents is also increases gradually. Traffic collisions are a major source of deaths every year. The National Crime Record Bureau (NCRB) reports 496,762 road-related traffic collisions in all states. According to an estimate given by the World Health Organization (WHO), around 1.35 million people worldwide have died due to road traffic injuries. These accidents occur due to fatigue driving approximately 20% -

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end accidents did not show clear 24 hour patterns. Retaining alcohol-related accidents approximately doubled the nighttime peak for total accidents. During the winter, the peak of total accidents occurred at 03:00h (OR=3.8, Ci=3.5- 4.0), five hours before sunrise, whereas the summer peak occurred

The proposed system is based on non-contact method, since it is low cost as compared to contact method. The main goal of this work is to determine whether a driver is drowsy. The algorithmic pipeline analyses each frame image of the video stream and detects the drivers' condition – whether feeling drowsy or not. The proposed system is based on non-contact method, since it is low cost as compared to contact method. After detection, the next step is giving an alert alarm to the driver so that he can take necessary action. Here deep learning technique is used with the help of Convolutional Neural Network (CNN).

II. LITERATURE SURVEY

Driver Fatigue and Road Safety -Implication In An Indian Context

Author:Rahul Dagli

Methodology:Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. Hence Road safety is of utmost importance. Fatigue among drivers is a major cause of road accidents, Fatigue is defined as a gradual and cumulative process associated with 'a loss of efficiency, and a disinclination for any kind of effort'. Fatigue increases as time-on-task progresses. Grandjean (1979; p. 175). It is estimated that nearly 20% of all accidents is caused by fatigue as per The Royal society for prevention of accidents (RoSPA). This paper shall focus on fatigue its causes, effects, current laws and regulation against fatigue and driving time, and also analyze statistical data available of road accidents caused due to fatigue, solutions that can be implemented, solutions for reducing fatigue, suggestions for India along with the impact it will have based on the statistical data..

Night driving, season, and the risk of highway accidents Author:T Akerstedt, G Kecklund, L G Horte;

Methodology: Official accident and traffic density statistics on Swedish highways were used to compute the relative risk (Odds Ratio - OR) of being injured or killed in a traffic accident at different times of day. After removing accidents due to alcohol 10344 accidents remained for computations, and the period 10:00h-11:00h was used as the reference point. The highest total risk was seen at 0400h (OR=5.7, Confidence interval = 5.6-5.8), with an OR of 11.4 (Ci=10.3-12.5) for fatal accidents at the same point. The same pattern was exhibited by single vehicle, head-on, and "other" (e.g., turning off the road) accidents, whereas overtaking and rear-

at 04:00h (OR=11.6, Ci=11.3-11.9), shortly after the early summer sunrise and with consistently higher nighttime risk than for winter driving. It was concluded that early morning driving is several times more dangerous than driving during the forenoon. Apart from alcohol the effect seems related to sleepiness, but not to darkness.

whole system. They are used by software engineers as the starting point for the system design.

Hardware:

III. PROPOSED

There are several different algorithms and methods for eye tracking, and monitoring. Most of them in some way relate to features of the eye (typically reflections from the eye) within a video image of the driver. The original aim of this project was to use the retinal reflection as a means to finding the eyes on the face, and then using the absence of this reflection as a way of detecting when the eyes are closed. Applying this algorithm on consecutive video frames may aid in the calculation of eye closure period. Eye closure period for drowsy drivers are longer than normal blinking. It is also very little longer time could result in severe crash. So we will warn the driver as soon as closed eye is detected.

SYSTEM REQUIREMENTS

SOFTWARE SPECIFICATION

The software requirements document is the specification of the system. It should include both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the teams and tracking the team's progress throughout the development activity.

Software :

- ◆ Python IDLE
- ◆ Anaconda Navigator
- ◆ Pandas
- ◆ Numpy
- ◆ Tensorflow
- ◆ Matplot

HARDWARE SPECIFICATION

The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the

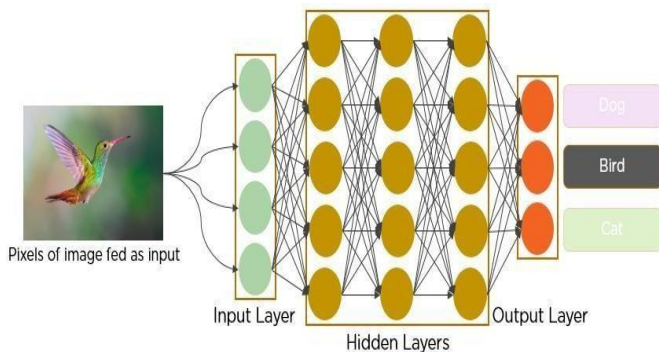
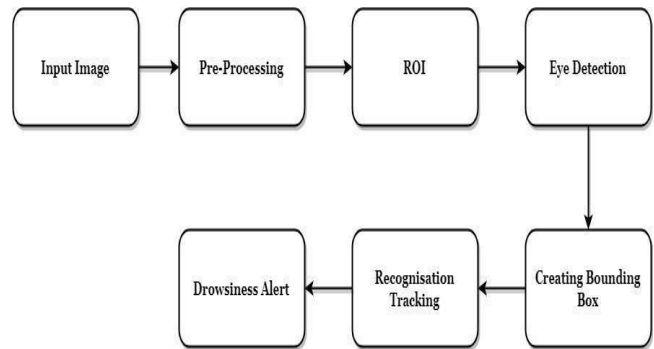
- ◆ Main Processor- 2GHz
- ◆ Ram- 512 MB (min)
- ◆ Hard Disk- 80 GB

SYSTEM ARCHITECTURE

Figure 3.1 System Design .

SYSTEM IMPLEMENTATION

In the past few decades, Deep Learning has proved to be a very powerful tool because of its ability to handle large amounts of data. The interest to use hidden layers has surpassed traditional techniques, especially in pattern recognition. One of the most popular deep neural networks is Convolutional Neural Networks.



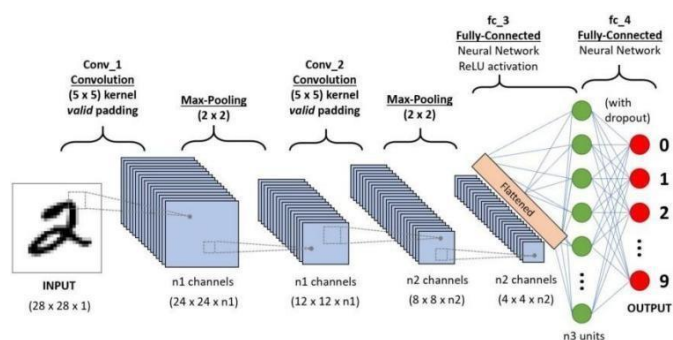
Since the 1950s, the early days of AI, researchers have struggled to make a system that can understand visual data. In the following years, this field came to be known as Computer Vision. In 2012, computer vision took a quantum leap when a group of researchers from the University of Toronto developed an AI model that surpassed the best image recognition algorithms and that too by a large margin. The AI system, which became known as AlexNet (named after its main creator, Alex Krizhevsky), won the 2012 ImageNet computer vision contest with an amazing 85 percent accuracy. The runner-up scored a modest 74 percent on the test. At the heart of AlexNet was Convolutional Neural Networks a special type of neural network that roughly imitates human vision. Over the years

CNNs have become a very important part of many Computer Vision applications and hence a part of any computer vision course online. So let's take a look at the workings of CNNs.

BACKGROUND OF CNNs

CNN's were first developed and used around the 1980s. The most that a CNN could do at that time was recognize handwritten digits. It was mostly used in the postal sectors to read zip codes, pin codes, etc. The important thing to remember about any deep learning model is that it requires a large amount of data to train and also requires a lot of computing resources. This was a major drawback for CNNs at that period and hence CNNs were only limited to the postal sectors and it failed to enter the world of machine learning.

pictures in this methodology. The key advantage of this filter is, as compared with other filters, it achieves excellent noise reduction with less blurring. The gray conversion will be the next step after filtering. This is the process by which pixels with RGB level are converted to gray. Therefore, it is



In 2012 Alex Krizhevsky realized that it was time to bring back the branch of deep learning that uses multi-layered neural networks. The availability of large sets of data, to be more specific ImageNet datasets with millions of labeled images and an abundance of computing resources enabled researchers to revive CNNs.

MODULES & ORANIZATION

PRE-PROCESSING

Pre-processing an image increases the precision of an optical inspection significantly. Pre-processing is the first step towards improving image quality. The filtering technique is used to start the image processing stage. Image filtering is useful to smoothen, sharpen and remove noise for many purposes. Filtering eliminates noise or other small image fluctuations. Such noises then have to be denoted. Gabor filter is used for noise removal and for the deficiency of the

appropriate to convert the gray picture. The main aim of this conversion is to remove the information on the colour and saturation by retaining the light.

FACE DETECTION

In order to exploit uniqueness of faces in emotion recognition, the first step is to detect and localize those faces in the images. This is the task achieved by face detection systems. As face detection is one of popular research areas, many algorithms have been proposed for it. Most of them are based on the same idea considering the face detection as a binary classification task. That is, given a part of image, the task is to decide whether it is a face or not. This is achieved by first transforming the given region into features and then using classifier trained on example images to decide if these features represent a human face. As faces can appear in various locations and can also show themselves in various sizes, often, a window-sliding technique is also employed. The idea is to have the classifier classifying the portions of an image, at all location and scales, as face or non-face.

DROWSINESS DETECTION

Drowsiness detection is the classification process in the system. Many machine learning approaches are already developed for classification. But these approaches will not satisfy the goal. As the dataset collected through NIR camera in the vehicle environment, Image has only a low light illumination.

Deep learning approaches will give good results. Many Pre trained deep networks are available for drowsiness detection.

Two types of classification methods can be used.

i) Analyse eye and mouth region of interests to determine whether the eyes or mouth are opened or closed.

ii) Analyse the entire region of interest of the face.

Drowsiness can be classified according to the emotion of the person. Here we create a new training algorithm with modified LeNet for two classes. LeNet is the earliest architecture in Convolutional Neural Network. In this work,

a modified approach of LeNet is used because of its simplicity and performance. The modification is included to improve the efficiency of the system by learning the raw face images. CNNs are essential tools for deep learning and are especially suited for analysing image data. Architecture of CNN is mentioned.

METHODS

Array scalars have exactly the same methods as arrays. The default behavior of these methods is to internally convert the scalar to an equivalent 0-dimensional array and to call the corresponding array method. In addition, math operations on array scalars are defined so that the same hardware flags are set and used to interpret the results as for `ufunc`, so that the error state used for `ufuncs` also carries over to the math on array scalars.

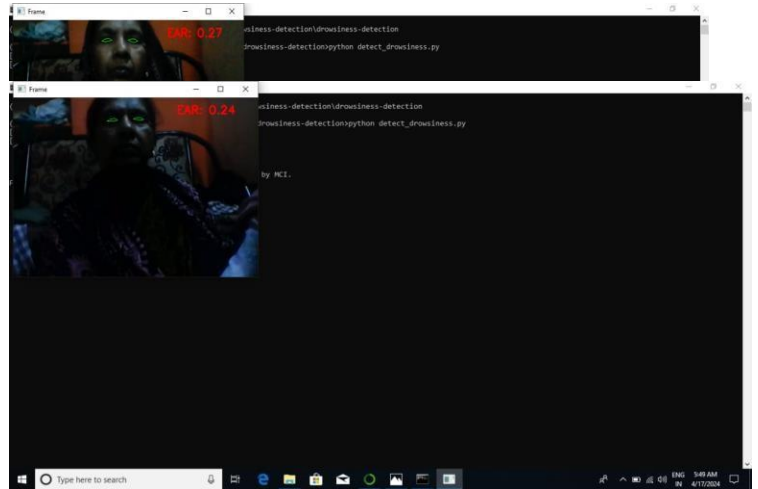
DATA TYPE OBJECTS (DTYPE)

A data type object (an instance of `numpy.dtype` class) describes how the bytes in the fixed-size block of memory corresponding to an array item should be interpreted. It describes the following aspects of the data: 1. Type of the data (integer, float, Python object, etc.) 2. Size of the data (how many bytes is in e.g. the integer) 3. Byte order of the data (little-endian or big-endian) 4. If the data type is structured, an aggregate of other data types, (e.g., describing an array item consisting of an integer and a float), (a) what are the names of the “fields” of the structure, by which they can be accessed, (b) what is the data-type of each field, and (c) which part of the memory block each field takes. 5. If the data type is a sub-array, what is its shape and data type. To describe the type of scalar data, there are several built-in scalar types in Numpy for various precision of integers, floating-point numbers, etc. An item extracted from an array, e.g., by indexing, will be a Python object whose type is the scalar type associated with the data type of the array. Note the scalar types are not data type objects, even though they can be used in place of one whenever a data type specification is needed in Numpy. Structured data types are formed by creating a data type whose fields contain other data types. Each field has a name by which it can be accessed. The parent data type should be of sufficient size to contain all its fields; the parent is nearly always based on the void type which allows an arbitrary item size. Structured data types may also contain nested structured sub-array data types in their fields. Finally, a data type can describe items that are themselves arrays of items of another data type. These sub-

arrays must, however, be of a fixed size. If an array is created using a data-type describing a sub-array, the dimensions of the sub-array are appended to the shape of the array when the array is created. Sub-arrays in a field of a structured type behave differently.

Figure 3.4 Detecting drowsy

Figure 3.5 drowsiness alert and speed decrease



IV. CONCLUSION

In this paper we demonstrated a way to determine if a driver is in a drowsy state, by using an NIR camera. Yolov3 was found to be better architecture for face detection than Viola Jones or dlib method. Modified LeNet is used for classification. Accuracy of the system is 97% for 20 frames per seconds. In some cases is the face is occluded, for example by hand.

For future we could extend the analysis by making it more robust to illumination changes in the video frames. A better camera could further improve the system performance. The algorithmic pipeline could be implemented on a single board computer for real time applications like advanced driver- assistance systems (ADAS). We could also include additional modalities like audio channel etc. along with the video frames and use a multi-modal machine-learning approach to improve performance..

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