CHAPTER 5

DESIGN

5.1 SYSTEM DESIGN

Design is the first development phase for every engineered product or system. System design is the process of evaluating alternate solutions, evaluating the choice following up the specification for the chosen alternative. System design work follows logical system analysis. The objective of the system is to improve the existing system or design a new system as the case may be and implement the system with improved facilities.

5.2 INPUT DESIGN

Input design is the part of the overall system design that requires very careful attention and is the most expensive phase. Objective during input design are as follows

Frames Capture:

The input data can be a frame, detected by raspberry pi from the video.

Blur Frame:

In Image processing, a Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function. It is a widely used effect in graphics software. Typically to reduce image noise and reduce detail Blur frame is necessary process for a frame enhancement and for getting good results Blurring is used for smoothing frames and reducing noice and details from the frame. With blurring, smooth transformation from one color to another and reduction of the edge contents are satisfied.In addition, threshold process for frame segmentation is used to create binary images from gray scale images. It is not interested in the details of the image but in the color of the object to track that by capturing the image.

Hough circle Transformation

Hough circle is used associated with Adaboost algorithm to detect speed limit signs. The Adaboost is a powerful machine learning algorithm. It has a cascaded structure which consists of several sub-processing stages, and a set of Haar-like features is given to every stage. If the sample blob fails to pass any sub-processing stage, it will be rejected as an uninterested region. The Adaboost algorithm is trained with a huge amount of positive and negative patterns captured in various environments and conditions to build up this cascade detector. A sample passed through the trained cascade is detected to be a candidate region of circular Hough transformation process. The amount of candidate regions is ideally small and hence the Hough transformation can be carried out in very little processing time. The performance of detection, due to these Adaboost – Hough system, is improved on both efficiency and accuracy aspects.

Speed limit sign recognition

This step is known as the last stage in most speed limit sign recognition systems. The blobs of interests are passed to the recognition module where the Optical Character Recognition (OCR) process is to take place. In speed limit sign recognition field, there are only ten digit characters (0 ~ 10) needing to care about. The common approaches are using a trained Artificial Neural Networks to classify the sample blobs [2, 3, 14, 16] or through Fuzzy template & local feature matching[4, 15]. Moreover, scan-line based digit recognition is also widely used in document acquisition and automated meter-reading [1, 27, 28]. This technique can also be used to recognize digits on the speed limit sign. The result of this process is treated as the reading of the speed limit sign. System informs driver this result via visual and / or acoustic signals. Thus, a process cycle of speed limit sign recognition is finished.

Speed limit sign detection

The main task of speed limit sign detection stage is identifying speed limit signs within those candidate regions got from colour segmentation stage. This stage consists of 3 processes, which are circular detection, content extraction\ segmentation and sign identification. Circular detection is the process which

checks whether a candidate region is a circle \ ellipse. Only circular candidate regions can go through to further processes and all non-circular regions are discarded.

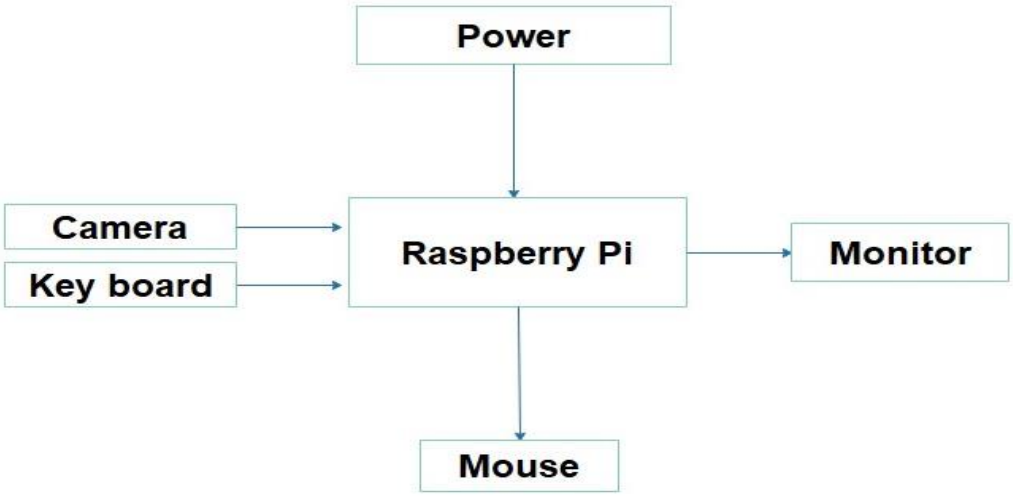
Image Acquisition

The first step is collection of images of traffic signs, data. The collection and storing of images are referred to as image acquisition. The real time traffic lights and road sign board images are used as data. Data's that are freely available from an online are not used. These images are collected at an average speed of 20 frames per second from high speed vehicles under different illumination conditions. Captured image in RGB form is converted to grey scale image. Grey scale images measures light intensity. Since each color image has several intensity levels detection process will be complex. Hence the input images are converted to grey scale format.

Image Preprocessing

Image preprocessing is an important part of the Traffic sign board detection system whose main idea is to remove low-frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images. The input image is divided into channels R, G, and B separately. In the proposed approach, filters are applied on each channel threshold to select those regions of the image where the values of the pixels fall in the range of our target object.

5.3 SYSTEM ARCHITECTURE



5.4 Output Design

We are going to introduce a system which will detect the traffic sign board and we can get the output in form of detection. After processing the images detected or video frames, the system will identify the sign board colour, shape and number. So that we can know the speed limit number easily.

Speed limit sign board detection consist of three major processing stages, which are Colour segmentation, Speed limit sign detection and Recognition ,number extraction. The system only searches for signs within red colour regions, because the speed limit sign in reality is always surrounded by red colour. The sign detection stage is the process that identifies speed limit signs from those candidate regions. It firstly identifies all circles and / or ellipses from these regions and then, for any circle and ellipse detected, the pixels within these circles will be binarized with black and write colours only. The pixel with RGB (Red, Green and Blue colour) value above the threshold will be marked with black colour. Otherwise, it will be marked with white colour. This will distinguish characters on (and /or contents of) the sign from the background because all speed limit readings are written in black colour on an ellipse in white. The sign detection is then applied on the binarized region to identify whether it is a speed limit sign by checking its visual features. Only those ellipses with similar visual features with speed limit signs survive as candidates of the recognition stage. A driving assistance system: real–time speed limit sign recognition system.

In the last processing stage of the system, the optical digit character recognition is applied to identify digit readings from those black blobs on candidate ellipses. The results of readings of recognition will be evaluated before output. When the final legal speed limit reading is generated, driver will be informed via both visual and acoustic signals.

Raspberry pi

Traffic Sign board Detected

4.5 FLOW CHART

TRAFFIC SIGN BOARD DETECTION