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NIGHT VISION ASSIST FOR SAFE DRIVING

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Abstract— Drivers has to take care of safety measures while driving car. The driver's sight and his vision towards other colors during dark times need more attention. Besides his lack of attention during driving many external parameters usually cause problems to the drivers such as high fog, bad climate/weather, dim street lights usually the one with low intensity etc:-,These things grabs the attention from the engineers to develop night vision systems that helps the driver by improving the visibility on the path during dark times. In general, such a system is developed by using infrared cameras from which the information of objects presenting on the road can be extracted. Then, this system will inform drivers by means of visual, sound sensors or other signals about the obstacles and moving objects appearing in their path. Night Vision Assist focuses on detecting, illuminating and recognizing objects at night. Infrared cameras are adopted to tackle the problem of low visibility at night. Computer vision techniques, such as image enhancement, object detection and recognition etc., are used intensively to analyze videos captured by the infrared cameras. The system can be operated by the driver through a screen and audio notifications are used for informing the driver of the possible dangers if needed by using a microcontroller. We implemented the screen presence for the driver by the image acquisition and its processing using MATLAB.

Keywords— Infrared, CCD, image acquisition, MATLAB, infrared camera, CMOS, microcontroller.

INTRODUCTION

Everybody in this world emits electromagnetic radiation and in particular human body radiates IR signals. Of all the Electromagnetic signals that are existed the human eyes can detect signals whose frequency range is limited with in visible light region. When a light falls on the object the radiation emitted by the object depends on its body type, in all those radiated electromagnetic signals human eye can see signals only that are in visible range. It is well known to everybody that cats can see the things in dark also. Then what makes the things visible to cat eyes in the absence of light? It is IR radiation emitted by the body of the object. Cat eyes can detect even IR signals also. This attention has dragged us to develop night vision assistance for drivers.

DESCRIPTION OF THE SYSTEM

During the dark times the car drivers uses their headlights for vision. As the light from the head light hit the objects and gets back to our eyes. But the visibility range is very less for human eyes. If the number of obstacles is more in the path it is highly difficult and risk for the driver to drive.IR signals have more range than signals in the visible spectrum. So we can use a system where we could use a lens that receives the signals and we can process those signals in such a way that only visible and IR spectrum signals are processed on the screen. Particularly only IR if required. Present day cameras have IR filter in it, so we have to remove it from the circuit. At the head light position we should put together the IR emitter sources also.IR sources are required to detect object movement. Anybody can ask for the requirement of IR sources if the object itself emits IR signals. The IR signals radiated by them are basically less in power .So these IR sources together headlights work in such a way that the IR signals can detect the object movement at the far and near distances and the headlights are used for near action movements. These signals are getting hit by the objects and are received by the camera optical lens. After processing these signals we could use a interface to visualize the surroundings. Interface could be a TV / computer depending upon the requirement.

When the light from the lens fall on the image sensor the light intensity got converted into the number of electrons. These electrons got converted into the voltage and to zeros, ones using analog to digital convertor. These digital signals are processed by the electronic circuits inside the camera.CCD and CMOS are the two main technologies used in making image sensors widely now a day. This is general camera working. In order to make infrared camera we have to take a camera of our own choice and remove the infrared filter inside it as shown in below figures. So the sensor of camera is sensitive to both visible and infrared range signals. In case of only infrared signal input requirement we have to add a band pass filter that stops signals from the visible region band. This produces only the infrared signals on the screen. Here are some pictures of making the infrared camera from the camera of our own choice:

Figure.1 Webcam whose case has been removed.

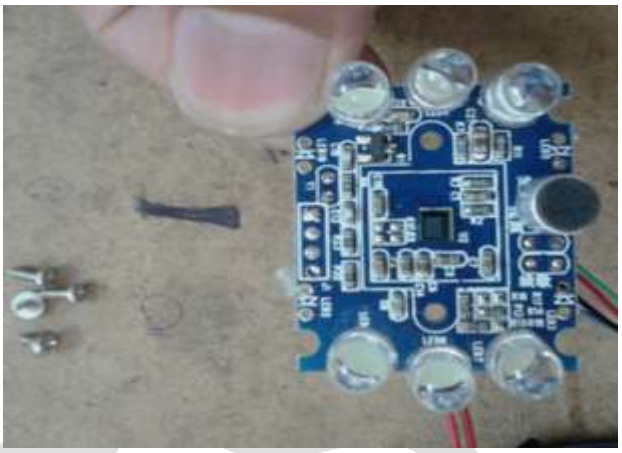

Figure.2 web camera including COMS sensor.

Figure.3 Lens assembly inside camera

Figure.4 Infrared filter from the web camera.

Now, we consider two images that are taken immediately one after other and we will take the difference of the 2 images. From this we can obtain the information regarding the objects that are moving as shown in figure. This difference images are Taken as consideration for grayscale image format. A threshold has to be considered and the grayscale image has to be Created..This can be created by comparing the level of intensities at each point. In case where if the threshold is greater than Intensity value one is generated and in other case zero is generated. These ones are white and zeros are black. These white

Spaces have to be converted into red color as shown in figure below. And that image has to be added to the original image, so that incase of object moving it shows its boundary by red color as shown in figure. The moving objects can be seen under red Colored boundary. Red color is chosen as it can grab human eye attention especially during night times. We can arrange beep sound using sound sensor when ever any object that is far away from the vehicle is moving as a sign of grabbing attention using Microcontrollers.

WORKING PROTOTYPE

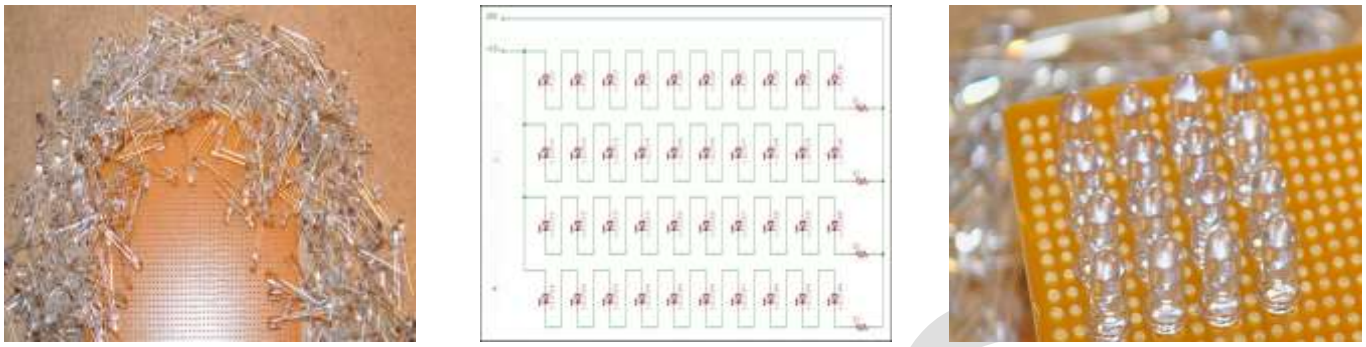

Figure.5 showing the INFRARED radiation source (IR LED's).

Figure.6 Picture 1

Figure.7 Picture 2

Picture 1 and 2 in the above figure 6 and 7 are the original pictures that are required to be processed.

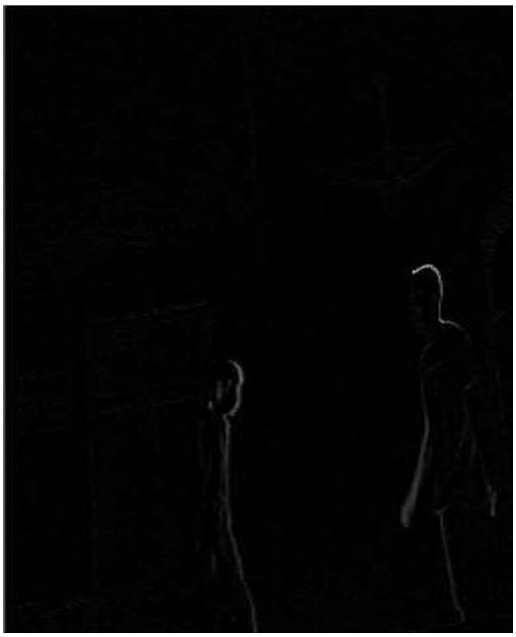

Figure.8

Figure.9

Fig 8 & 9 represent the difference of two consecutive frames in grayscale format

Figure.10

Figure.11

Figure. 10 & 11are the binary images representing the border of moving object in the frame

OUTPUT

After converting the white shading to red in the above pictures and adding them to the original pictures. We obtain

Figure.10

Figure.11

In the above figures the chairs are stationary so they appear same in both the pictures, but the persons are moving so they appeared with red colored boundary. Thus the moving objects from the near and far range can be seen on the screen.

CONCLUSION

Thus we can see the stationary and moving objects clearly that are present near and far from the car (i.e. to the driver) This system is developed to avoid the fatal incidents caused during the night travelling. This system can be upgraded by using more options to the microcontroller. By disabling the filter that stops both visible and infrared range signals driver can see both near and far objects in the Screen itself. This system will help the drivers who are suffering from long and short sightedness.

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