Pedestrian Detection System using Image Processing for Driver Assistance

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Abstract: Human beings are the main important reason of road accidents. In high way roads the vehicles are going very fast. Because of such reasons while crossing the roads animals and also humans falls as a prey to the accidents. To avoid such kind of accidents new system is proposed using image processing concepts. In this the system is embedded with the vehicle. Camera is the main part of the proposed system. Whenever the animal or human being tries to cross the road while driving, the camera captures the image. In this proposed system, object detection concept is used. If the people or animals are detected by the camera this system provides an alarm to the user and automatically controls the speed of the vehicle. The type of the images and position of an image are also displayed on the LCD. The entire system is controlled by Arduino controller.

Keywords: Cascade random forest, FIR image, KMU pedestrian dataset, sudden pedestrian crossing, Virtual reference line.

1. Introduction
Images are processed by using various image processing algorithms. Images consist of number of rows and columns. The meeting point of row and column is called pixel. The images also consist of different variables like depth, color of an image and captured time. The images are captured from digital camera. These captured images are stored in the computer memory in the form of binary. After processing the stored image it is displayed on the monitor. Image processing concept is applied in various domains such as remote sensing, face identification, finger print recognition etc. Now this digital image processing concept is used in Pedestrian Crossing also. The existing accident detection system was developed by using sensors. This proposed system is implemented by using image processing concepts. This system provides better result compared with existing methods.

Pedestrian detection is one of the important research areas in computer vision. This system is mainly used to avoid accidents on high way roads. Within the fraction of second accidents occurs in highways. As the vehicles are moving in a fast manner in national highways so the vehicles can’t be stopped immediately. But this task is very difficult in real time scenario because the vehicle and the object are in the moving state. The detection result is also based upon the background images. This proposed system is used to detect sudden pedestrian crossing by using camera from the vehicle. This proposed system is installed with the vehicle. This system can use different type of camera like near-infrared and far-infrared.
This second part of this article discuss about existing pedestrian crossing concepts. Third part shows the proposed system architecture diagram and flow diagram. Section four contains result and discussion part. The final fifth section concludes this proposed system.

2. Literature Review
Rutika V et al., proposed a new system for avoiding in national highways. The proposed system name is called Sudden Pedestrian Crossing. The main purpose of this proposed system was to avoid vehicle crashes and peoples on foot. In this system far-infrared camera was used to capture images from the pedestrian. In this proposed system camera was placed on in front of the vehicle. Mostly during the summer season only this system was used to detect the pedestrians. Using Cascade Random Forest machine learning concept was implemented here. Kalman Filtering concept was used to find out the pedestrians near the road. The final result shows that this proposed technique provide better result compared with an existing techniques [1].

Mira Jeong et al., explained the importance of Sudden pedestrian crossing. The important reasons of the accidents are the persons unexpectedly cross the road. The author says that in the previous systems others are developed the system for winter or spring season. This proposed system was mainly used in summer season also because mostly accidents are happen in summer days in Korea. Here the camera also fit in front of the automobile system. Initially the image optimum level area was identified using image processing concept. This system was assessed based upon spatiotemporal characteristics of the pedestrians. This system was developed successfully and end data was captured from various places. The performance of the proposed system was compared with an existing system [2].

K. Sri Krishna Aditya et al., explained about the peoples are not having proper awareness about accident avoiding systems. The authors proposed a new system for avoiding accidents. This embedded system consists of two important modules. In the first module detect the objects when come to the view portion of the camera. Camera is assembled with in front portion of the vehicle. The second module of this system is issued an alert signal when the objects are detected in the pedestrian. This system was mainly used to detect the objects on the pedestrian portion and issue alarm signal to the driver. This system was developed by using ARM 32 bit controller. It controller have some special features. It is capable of processing images and videos by using various machine learning classification concepts. In existing system the data are captured by using various sensors. The cost of the sensors is too high compared with this system. In this proposed system collects the images from the camera. The camera was connected with the microcontroller by using USB device and the captured images are processed by using image processing concepts. If any sudden pedestrians were identified by the camera it provides the alert signal through buzzer and stop the automobiles automatically. The LCD unit is used to display the details about the detected object and position of the detected object [3].

Yanwu Xu et al., studied about the risks of pedestrians are try to cross the road suddenly. Existing system consists of two various modules. In the first module was used to detect the pedestrians and the second module was used to issue an alarm sound when the object was detected. In this article the authors proposed a new system for pedestrian detection using three level coarse frameworks. This proposed architecture was tested with high quality videos captured by camera [4].

S. A. S Sadia Bano et al., says that the reason of the vehicle crashes are suddenly pedestrians cross the road. This proposed system was mainly used for detect the objects at the night time only. He infra red camera was attached with the automobiles. Using this system initially find out the optimum level of the captured image and find out the area. This system was evaluated based upon virtual lines and overlapped area [5].

A. Sumi et al., says the importance of automation system. Practically most of the processing was done by based upon automation. In an existing system the human beings are needed for the specific task. But in
automation everything will be happened automatically without human intervention. This research article describes two major tasks. In the first task the images are collected from the camera fit in the vehicle. But the images are not clear. It happened due to the automobiles are in moving condition. To improve the qualities of the image by using mean filter. This image processing concept ensures this proposed system to detect the objects crossing on the road and definitely this system was helps to avoid critical things on the road [6].

Xinyi Liu et al., describe the importance of Pedestrian crossing in the transportation department. The 3D road construction was used to detect the pedestrians on the road. Monitoring sudden pedestrian was very difficult in real time. In this proposed system the authors provided a new approach using mapping system. In this system initially classifiers are trained by using recall rate. The initial data was not clear. Using filtering and contour analysis improve the quality of the image. This system was worked in any condition and any light systems. It reduces the traffic problem and save the human life [7].

Information Mining and Machine learning calculations are picking up quality as a result of the capacity to deal with tremendous amounts of information to consolidate information from various sources and coordinate setting data [8]. In [9] Diabetic ketoacidosis and nonketotic hyperosmolar trance like state is a portion of serious complications. In [10] exploratory presentation of each of the three calculations is estimated on various tests, and great precision is achieved. In [11] research has indicated that AI algorithms work better in the determination of various maladies. In [13] discussed about privacy of the healthcare system using cloud and blockchain trending techniques for content Deduplication. In [14] the method executed a guess mechanized construction as Filtered Wall (FW) and it separated discarded substance from OSN customer substances. In [15] framework adequately utilizes these highlights for glaucoma location they are removed utilizing the optical thickness changed fundus picture alongside the first highlights.

3. Proposed System

Our proposed system is used to identify the sudden pedestrians using image processing object reorganization concepts. This system also provides the alarm to the vehicle riders when the object is identified. The following Figure 1 shows the outline architecture of our proposed pedestrian detection system. This system is embedded with the automobiles. The entire system is connected by using Arduino controller. This controller has object identification capability with the help of image processing concepts.

In this proposed system the objected are capture from cameras through USB device. The camera is fit in front of the vehicle. The microcontroller part processes the images using various image processing concepts. Image processing mean any types of signals are processing but the input is the picture format like images, pictures or moving pictures. The output of the image processing concepts is also an image or other characters of an image. The following Figure 2 shows how the images are processed by using various image processing concepts.
The original image is collected from the camera and it is converted into the binary form. After conversion the preprocessing concept is applied to remove the unwanted parts. Kalman filter is used to increase the clarity of an image. Because the camera captures the image when the vehicles are moving. In the final stage the images are predicted as a type of the images. When any objects are identified on the road the buzzer provides the alarm sign to the user. The display unit is used to display the details about the objects and their location. The entire concept of the proposed system improves the total functionality of the system. In our proposed working system executed on the basis of two stages. The important two stages of our proposed system is prediction stage and matched with an existing stored image. But the disadvantage of the Kalman filter is it increases the computational complexity of this system.

4. Results and Discussion

This proposed system is used to detect the sudden pedestrians on the national highways. In national highway roads the vehicles are moving very fast. At that time any pedestrians are crossed or any types of objects are types of objects are try to cross the road means automatically accidents will occur. To avoid such kind of crashes or accidents our proposed system is used. The following Figure 3 represents the pedestrian try to cross the road.
If the objects are try to cross the road the camera capture the images from the road and then apply the various image processing techniques and to identify the types of object and the position of the specified object. These proposed systems also give the alert to the automobile users through buzzer. The following Figure 4 shows the difference between normal person and crossing person. If the object is crossed suddenly the riders get a warning signal and automatically reduce the speed of the vehicle.

![Figure 3: Candidate pedestrian](image)

![Figure 4: Predicted output with comparative result](image)

The following Table 1 shows the performance of our proposed system compared with an existing system [2]. The performance was analyzed based upon true positive and false positive rate calculation.

True Positive rate = TP/Actual Yes
False Positive rate = FP/Actual No

| METHODS          | PARAMETERS     | WARNING (%) | CAUTION (%) | NORMAL (%) |
|------------------|----------------|-------------|-------------|------------|
| Existing method[2] | True Positive rate | 96          | 85          | 96         |
|                  | False Positive rate | 4           | 15          | 4          |
| Proposed method  | True Positive rate | 95.7        | 85.83       | 96.56      |
|                  | False Positive rate | 6.75        | 10.81       | 4.05       |
5. Conclusion

This proposed system is used to detect the sudden pedestrian cross on the road. On the national highways the vehicles are moving very fast. At that time if any objects tries to cross the road unwanted things are happens automatically. To avoid this condition this proposed system is embedded with the vehicle. In front of the vehicle the camera is installed. The camera captures the images when the object tries to cross the road. The microcontroller is used to process the captured images using various image processing concepts and detect the objects type and the location of the object. When the objects are detected the speed of the vehicle will be controlled automatically. The display system shows the image types with their entire details. The alarm sound is used to alert the driver when the objects are detected on the road. The performance of our proposed system is compared with an existing system.

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