



## ICNSCET19- International Conference on New Scientific Creations in Engineering and Technology

### WILDLIFE COLLISION AVOIDER

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**Abstract**— One of the main problems facing all developed countries is death and injuries from road accidents. When an animal accident occurs on the road, the main problem is a traffic accident. This article provides a simple and inexpensive way to automatically detect animals on motorways to prevent collisions with vehicles using computer vision technology. There is also a method for determining the distance between the vehicle mounted on the vehicle and the actual device. Using the proposed system, more than 2,200 positive and negative images were recorded and tested at different vehicle speeds. After a 2 second rule, the proposed method can warn the driver when the vehicle speed is 35 km / h and the animal is recognized correctly. The overall accuracy of the proposed method is almost 82.5%.

**Keywords**— wildlife; accident; vehicle speed; detection; images.

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#### I. INTRODUCTION

Today's automobile style primarily depends on safety measures, security tools and comfort mechanism.

The safety of an automobile is the highest priority according to a recent report The report commissioned by World Health Organization in its Global Status Study on Road Safety 2013, revealed that the leading cause of death for young people (15-29 age) globally is due to road traffic collisions. Even though various countries have initiated and taken steps to reduce road traffic collisions and accidents, the total number of crashes and traffic accidents remain as high as 1.24 million per year. Road traffic accidents and injuries are expected to rise by almost 65% by the end of 2020. Due to road accidents, every year 1 out of 20,000 persons lose their life and 12 out of 70,000 individuals face serious injuries in India. India is also known for the maximum number of road accidents in the world. According to the data given by National Crime Records Bureau (NCRB), India, there was almost 118,239 people who lost their life due to road accidents in the year 2008.

Road accidents are increasing due to the increase in a number of vehicles day by day and also the due to the absence of any intelligent highway safety and alert system. According to data given in a study , the number of people who lost their lives in India due to road accidents was almost 0.11 million deaths in 2006, which was approximately 10% of the total road accident deaths in the world.

According to the accident research study conducted by JP Research India Pvt. Ltd. for the Ahmedabad-Gandhinagar region (cities of India), for the duration February 2014 to January

2015, total 206 road traffic accidents were recorded and these were influenced by three main factors i.e. human, vehicle, infrastructure or a mixture of them. The number in figure 1 is a percentage of the total number of accidents surveyed. According to the record, human factor influence on road traffic accidents was 92%, vehicle 9% and infrastructure 45%. Out of total 45% (91 accidents) infrastructure influenced traffic accidents, 6% (12 accidents) were due to animals on the road whereas out of total 92% (171) human factor influenced traffic accidents, 14% (24) were due to driver inattention and absence of any timely alert system for preventing the collision.

Similar sorts of surveys were conducted for the Mumbai-Pune throughway, and Coimbatore by JP Research India Pvt. Ltd. and the conclusions hinted at a big share of road accidents ensuing thanks to associate degree object (animal) on the road, driver inattention, and absence of an intelligent highway safety alert system.

## II. EVIDENCE OF WILDLIFE COLLISION

We gift a system of animal dying facts throughout Europe (AVC). the principle thing of this system is the geographic database related to the net application. AVC information is furnished by way of the police thru avenue site visitors accidents (JSDI) and voluntary delivery systems thru the net or the cellular interface. records is processed using computerized scripts that come across facts mistakes and perform spatial evaluation. As a end result, hunters get a fashionable picture in their territory. presently, there are over forty,000 entries on this database. it has been 50% due to the fact its launch inside two years. most of the information (90%) comes from JSDI. This view is called 44% of JSDI entries. Most of the showed species have been deer (75%) and boar (15%). 32.five% (56.4%) of those conflicts occur one hour (2 hours) earlier than or after sundown or dawn. In wild boars, the fee become less major (19.4% and 37.7%). approximately 1,800 AVC get right of entry to points have been found at the map, that's zero.5% of the Czech street community.

## III. TECHNOLOGY USED

Animals has specific heat signature and size variation. Sensor are used to identify those animal specific heat signature. Thermal camera is used to identify the heat signature. The sensor head emits an ultrasonic wave and receives the wave mirrored back from the target.

Zigbee specification is meant to be less complicated and fewer high-ticket than different wireless personal space networks (WPANs), such as Bluetooth or more general wireless networking such as Wi-Fi. Applications embody wireless lightweight switches, home energy monitors, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer. Its low power consumption limits transmission distances to 10–100meters line-of-sight, depending on power output and environmental characteristics. Zigbee devices will transmit knowledge over long distances by passing knowledge through a mesh network of intermediate devices to succeed in additional distant ones. Zigbee is usually utilized in low rate applications that need long battery life and secure networking (Zigbee networks square measure secured by 128 bit radially symmetrical secret writing keys.) Zigbee has a defined rate of 250 Kbit/s, best suited for intermittent data transmissions from a sensor or input device. Zigbee was formed in 1998, standardized in 2003, and revised in 2006.The name refers to the waggle dance of honey bees when their come back to the beehive.

Node MCU is associate degree open supply IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the code instead of the event kits.

The firmware uses the Lau scripting language. It is supported the Lau project, and designed on the Espressif Non-OS SDK for ESP8266. It uses many open source projects. DHT temperature and humidity sensors. These sensors square measure terribly basic and slow, however square measure nice for hobbyists who need to try to some basic knowledge work. The DHT sensors square measure fabricated from 2 elements, a capacitive humidity sensor and a thermostat. There is conjointly an awfully basic chip within that wills some analog to digital conversion and spits out a digital signal with the temperature and wetness. The digital signal is fairly simple to browse victimization any microcontroller. A flame device module that consists of a flame device (IR receiver), resistor, capacitor, potentiometer, and comparator LM393 in an integrated circuit. Connecting your Flame Detector to an Arduino. Verify Operation of the Flame Detector Module and change Sensitivity.

A smoke detector is a device that senses smoke, generally as associate degree indicator of fireside. Commercial security devices issue a proof to a fireplace alarm panel as a part of a fireplace warning device, while household smoke detectors, also known as smoke alarms, generally issue an area perceptible or visual alarm from the detector itself. Smoke detectors square measure housed in plastic enclosures, typically shaped like a disk about 150 millimeters (6 in) in diameter and 25 millimeters (1 in) thick, but shape and size vary. Smoke will be detected either optically (photoelectric) or by physical method (ionization); detectors could use either, or both, methods. Sensitive alarms will be wont to discover, and therefore deter, smoking in areas wherever it's illegal. Smoke detectors in massive industrial, industrial, and residential buildings square measure sometimes hopped-up by a central hearth warning device, that is hopped-up by the building power with battery backup.

Domestic smoke detectors vary from individual powered units, to several interlinked mains-powered units with battery backup; with these interlinked units, if any unit detects smoke, all trigger even if household power has gone out. The risk of dying during a home hearth is cut in homes with operating smoke alarms. The USA National Health Protection Association reports zero.53 deaths per 100 fires in homes with working smoke alarms compared to 1.18 deaths in homes without (2009–2013) Some homes do not have any smoke alarms; some alarms do not have working batteries; sometimes the alarm fails to detect the fire.

The Arduino Mega 2560 may be a microcontroller board supported the ATmega2560. It has fifty-four digital input/output pins (of that fifteen will be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB association, a power jack, an ICSP header, and a reset button. It contains everything required to support the microcontroller; merely connect it to a laptop with a USB cable or power it with a AC-to-DC adapter or battery to urge started. The Mega 2560 board is compatible with most shields designed for the Uno and also the former boards Duemilanove or Decimal perform special analyses.

The application automatically computes AVC hotspots every midnight and crash densities along road sections. Hunter space directors consequently have an summary of their areas. More than 40000 records are currently included in this database. 50% of them were side over the last 2 years once it had been launched. The majority of data (90%) came from JSDI. The species is understood for four hundred and forty yards of JSDI records. The majority of the known species were Capreolus (75%), followed by wild boar (15%). Roe deer crashes occur most often in could among a pair of once sunset. 32.5% (56.4%) of those crashes occur among one h (2 h) before or once sunset or sunrise. For wild boar, the values are less distinctive (19.4% and 37.7%). Approximately 1800 AVC hotspots, that cowl zero.5% of the Czech road network, were detected and visualized on a map.

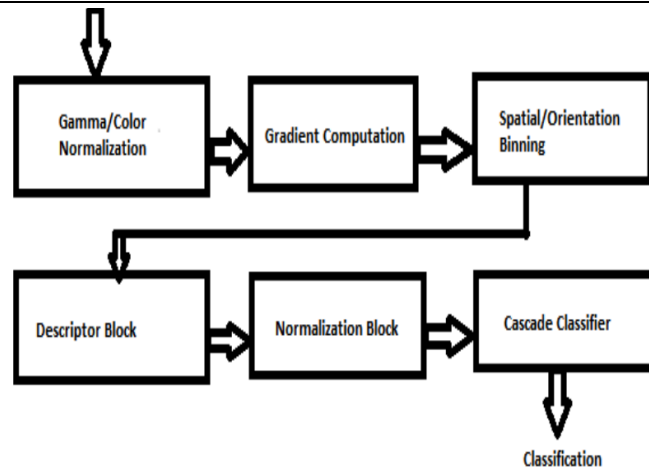


Figure 1. block diagram

The Raspberry Pi may be a series of little single-board computers developed within the UK by the Raspberry Pi Foundation to market teaching of basic applied science in faculties and in developing countries. The original model became much more common than anticipated; merchandising outside its target marketplace for uses like artificial intelligence. It doesn't embody peripherals (such as keyboards and mice) and cases. However, some accessories are enclosed in many official and unofficial bundles. Raspberry Pi three Model B+ was launched with a quicker one.4 gigacycle per second processor and a three-times quicker gigabit local area network (throughput restricted to ca.300 Mbit/s by the interior USB a pair of.0 connection) or a pair of.4 / 5 GHz dual-band Wi-Fi (100 Mbit/s).[1] Other features are Power over Ethernet (PoE), USB boot and network boot(an SD card is not required).

#### IV. PROCEDURE

In this step, the image is split into  $8 \times 8$  cells and a bar graph of gradients is calculated for every  $8 \times 8$  cells. We will study the histograms during a moment, however before we have a tendency to go there allow us to 1stperceive why we've divided the image into  $8 \times 8$  cells. One of the vital reasons to use a feature descriptor to explain a patch of a picture is that it provides a compact illustration. An  $8 \times 8$  image patch contains  $8 \times 8 \times 3 = 192$  constituent values.

The gradient of this patch contains 2 values (magnitude and direction) per pixel which adds up to  $8 \times 8 \times 2 = 128$  numbers. By the top of this section we {are going to} see however these 128 numbers are delineated employing a nine-bin bar graph which may be hold on as associate array of 9 numbers. Not solely is that the illustration additional compact, calculating a histogram over a patch makes this representation more robust to noise. Individual gradients may have noise, but a histogram over  $8 \times 8$  patch makes the representation much less sensitive to noise. But why  $8 \times 8$  patch? Why not  $32 \times 32$ ? It is a style alternative knowing by the dimensions of options we have a tendency to is searching for. HOG was used for pedestrian detection initially. $8 \times 8$  cells during a exposure of a pedestrian scaled to  $64 \times 128$  are sufficiently big to capture attention-grabbing options (e.g. The face, the highest of the top etc.). The bar graph is basically a vector ( or associate array ) of nine bins ( numbers ) such as angles zero, 20, 40, 60 ... 160.Let us look into one  $8 \times 8$  patch within the image and see however the gradients look.

If you're a beginner in laptop vision, the image within the center is incredibly informative. It shows the patch of the image overlaid with arrows showing the gradient — the arrow shows the direction of gradient and its length shows the magnitude.

Notice however the direction of arrows points to the direction of amendment in intensity and also the magnitude shows however massive the distinction is. On the proper, we see the raw numbers representing the gradients in the  $8 \times 8$  cells with one minor difference — the angles are between 0 and 180 degrees instead of 0 to 360 degrees. These are known as “unsigned” gradients as a result of a gradient and it’s negative are delineated by a similar number. In alternative words, a gradient arrow and the one 180 degrees opposite to it are considered the same. But, why not use the 0-360degrees? Empirically it's been shown that unsigned gradients work higher than signed gradients for pedestrian detection. Some implementations of HOG can permit you to specify if you wish to use signed gradients. The next step is to make a bar chart of gradients in these  $8 \times 8$  cells. The bar chart contains nine bins resembling angles zero, 20, 40 ... 160.

The following figure illustrates the process. We square measure gazing magnitude and direction of the gradient of an equivalent  $8 \times 8$  patch as within the previous figure. A bin is chosen supported the direction, and also the vote (the worth that goes into the bin) is chosen supported the magnitude. Let’s initial specialize in the component encircled in blue. It has Associate in Nursing angle (direction) of eighty degrees and magnitude of two. So it adds 2 to the 5th bin. The gradient at the component encircled victimization red has Associate in Nursing angle of ten degrees and magnitude of four. Since 10 degrees is half way between 0 and 20, the vote by the pixel splits evenly into the two bins. There is another detail to remember of. If the angle is larger than one hundred sixty degrees, it's between one hundred sixty and a hundred and eighty, and we know the angle wraps around making 0 and 180equivalent. So within the example below, the component with angle 165 degrees contributes proportionately to the 0-degree bin and also the one hundred sixty-degree bin. In the previous step, we created a histogram based on the gradient of the image. Gradients of a picture square measure sensitive to overall lighting. If you create the image darker by dividing all component values by a pair of, the gradient magnitude will change by half, and therefore the histogram values will change by half. Ideally, we would like our descriptor to be freelance of lighting variations. In alternative words, we'd wish to “normalize” the bar chart in order that they aren't littered with lighting variations.

Before I make a case for however the bar chart is normalized, let’s see how a vector of length 3 is normalized. Let’s say we've Associate in Nursing RGB color vector [128, 64, 32]. The length of this vector is  $\sqrt{146.64}$  this is often conjointly referred to as the L2 norm of the vector. Dividing every component of this vector by 146.64 provides North American country a normalized vector [0.87, 0.43, 0.22]. Now take into account another vector during which the weather square measure doubly the worth of the primary vector a pair of  $x$  [128, 64, 32] = [256, 128, 64]. You can work it out yourself to ascertain that normalizing [256, 128, 64] will result in [0.87, 0.43, 0.22], which is the same as the normalized version of the original RGB vector. You can see that normalizing a vector removes the size. Now that we all know a way to normalize a vector, you will be tempted to suppose that whereas shrewd HOG you'll be able to merely normalize the  $9 \times 1$  bar chart an equivalent means we have a tendency to normalized the  $3 \times 1$  vector above. It is not a foul plan, but a better idea is to normalize over a bigger sized block of  $16 \times 16$ . A  $16 \times 16$  block has 4 histograms which can be concatenated to form a  $36 \times 1$  element vector and it can be normalized just the way a  $3 \times 1$  vector is normalized. The window is then moved by eight pixels (see animation) and a normalized  $36 \times 1$  vector is calculated over this window and also the method is recurrent.

we are using a combination of HOG and boosted cascade classifier for animal detection. All the image processing techniques are implemented in Open CV software. Once the animal gets detected within the video, the next step is to find the distance of the animal from the testing vehicle and then alert the driver so that he will apply the brakes or perform the

other necessary action that is displayed on prompt as a message. Depending on the distance of the animal from the camera mounted vehicle, three kinds of messages (indication) are given to the driver i.e. animal very near, if animal is very near to the vehicle, animal little far, if the animal is little far from the vehicle and very far, if the animal is very far and at a safe distance from the vehicle.

## V. CONCLUSION

An efficient automatic animal detection and a warning system can help drivers in reducing the number of collisions occurring between the animal and the vehicle on roads and highways. In this paper, we discussed the necessity of automatic animal detection system and our algorithm for animal detection based on HOG and cascade classifier. The algorithm can detect an animal in different conditions on highways. The proposed system achieves an accuracy of almost 82.5 % regarding animal (cow) detection. Estimation of approximate animal distance from the testing vehicle is also done. Though the proposed work has been focused on automatic animal detection in context to Indian highways, it will work in other countries also. The proposed method can easily be extended for detection of other animals too after proper training and testing. The proposed system can be used with other available, efficient pedestrian and vehicle detection systems and can be offered as a complete solution (package) for preventing collisions and loss of human life on highways.

## VI. LIMITATIONS AND FUTURE SCOPE

Though our proposed system can detect the animals (cow) on roads and highways as well as gives alert to the driver, it has some limitations too. The proposed system can detect animal up to a distance of 20 meters only when a vehicle is stationary. The system can prevent collision of the vehicle with the animal when driving at a speed in between 30 to 35 kmph. Beyond this speed, though animal gets detected time is not sufficient to prevent animal-vehicle collision. Some means or method of increasing the detecting distance of the animal from the camera mounted vehicle needs to be done so that driver gets sufficient time for applying brakes or take any other action for preventing the collision which may be solved using high-end resolution cameras or radar. No effort has been created to observe animals throughout the night, that is predicted to be exhausted our future scope of study and analysis

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