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Road Rage Detection System

Suyash Shashikant Deshmukh

Ashish Saji

Keraleeya Samajam's Model College, Dombivli East, Mumbai, Maharashtra, India

***Abstract*— It is crucial to highlight that aggressive driving and road rage is not the same, however, aggressive driving leads to road rage. According to the NHTSA (National Road Traffic Safety Administration), aggressive driving is once "an individual commits a mixture of moving traffic offenses therefore on threaten different people or property." violence takes things one step additional into additional aggressive and maybe unsafe. Road rage is a sort of angry aggressive attitude performed by drivers to impose dominance. The power exerted can be in any method such as using harsh terminology, threatening physically, attempting to begin a physical fight in the middle of the road, and repeatedly honking. The fundamental objective of this project is to build a system that can detect such conflicts and offer a timely response to avert probable harm to the involved parties. The introduction of such a system will not only reduce the damage to the concerned parties but will also make the drivers careful before committing similar acts next time.**

***Keywords*— Road rage, driving, offense, aggressive**

INTRODUCTION

Road rage has become a cultural norm in Asian nation as most drivers feel the requirement to vent out their anger whereas driving on the roads. Driving on busy Indian roads will result in frustration and anxiety that typically translate into road rage. The rate of road accidents in Asian country is one amongst the very best within the world. With a lot of and a lot of children obtaining behind the wheel, most accidents are caused thanks to a blemished driving pattern. Sensation seeking, driving anger, vengeance, boredom, and stress ar a number of the prime factors why individuals communicate unsafe driving and find into things which will be simply avoided. loads of times, associate degree instructive response of 1 driver to a different commuter might end in a force. Road rage refers to violent accidents resulting from stress and various psychological factors while driving on roads or areas with heavy traffic. Road rage will cause incidents wherever a driver purposely injures or kills the other driver, pedestrian, or a traveller or threatens to try and do constant. violence usually begins with heated arguments with another commuter, passenger, or a pedestrian and would possibly even increase to physical violence. Therefore, there is need of system that can reduce the damage to the concerned parties but will also make the drivers careful before committing similar acts next time.

Road rage detection system is the use of automatic video analytics to enhance effectiveness of surveillance system. This system introduces intelligent analysis of single person activity to enhance the road safety and also enriches this system through an automatic identification of abnormal behaviour of the person. The increasing number of incidents like aggressive driving, violent behavior or furious actions demonstrated by drivers, physical fight on road has raised questions on road safety. Detecting such multiple activities in real time video can be very difficult by manually. Therefore, there is need of such system that can intelligently monitor, captures data in real time, transmits, process and understand the information related to those monitored. The system will process video flow images to automatically detect objects like peoples, vehicles, suspicious equipment for security purposes and makes the events available for generating real time alerts. This video data can be used as a forensic tool for after crime inspection. As video cameras are available at good price in market it will provide wide range of applications such as traffic monitoring and human activity understanding. Hence our system will enrich road safety by detecting conflicts on road and offer a timely response to the conflict to avert probable harm.

RELATED WORK

A few of the previous researches made on the same area will supply creative thoughts of planning and developing the project. This chapter can elaborate the recent analysis on the new technology. It underlines the relevance of road rage detection systems in numerous applications. Research and discoveries have been undertaken in order to build and develop road rage detection systems that will meet the aim and objective in this project.

1) *Accident Detection System using Image Processing and MDR, 2007*:

Conducted by Yong-Kul Ki for Korea university has proven a potential solution for an image processing system for automatically detection, recording, and reporting traffic incidents at an intersection. And conceived and created the metadata registry for the system to boost the interoperability. They built and put the ARRS, which is a vision-based accident detection system, at two crossings in Seoul, Korea. In this investigation, they effectively detected 4 traffic accident and recorded by the AARSs during the test period. In this study author mentioned that this accident detection and video-verification method will be able to deliver real-time crash warnings to the operators and drivers but the video clips are invaluable for intersection safety studies.

2) *Chicago – ACLU of Illinois, 2011*:

In February 2011, the Illinois ACLU released a wide-ranging report on Chicago's video surveillance camera network. The ACLU's Schwartz estimated that the city has access to between 10,000 and 20,000 public and private cameras, though the exact number is unknown. Like the NYCLU report and the ACLU California report, this report did not scientifically examine the effectiveness of the surveillance camera system as a tool to fight crime but rather analysed the system with respect to civil liberties. The study revealed the following inherent risks of such a surveillance system, as demonstrated by various surveillance camera systems: the lack of the regulation of many camera features, privacy and First Amendment issues, inappropriate release of videos by employees, and racial disparities in targeting. The study looked at the exorbitant costs of cameras in detecting such systems, they are not particularly effective in solving crimes and question their effectiveness in deterrence.

3) *Vision-Based Road Rage Detection Framework in Automotive Safety Applications*:

This is the primary have a look at on this studies location which addresses the trouble of figuring out the driver's behaviour whilst the orientation of the face and the lighting fixtures situations of the passenger compartment vary. Another essential thing is that the algorithm steps are primarily based totally om DL architectures that don't require using GPUs and therefore the algorithm pipeline may be without difficulty included into the maximum famous microcontrollers withinside the ADAS context. It is likewise really well worth highlighting a few barriers of the cutting-edge pipeline. First, from the experimental putting it's far obtrusive how the lighting fixtures situations of the passenger compartment can create issues with admire to the FER task.

4) *Research on Urban Traffic Incident Detection Based on Vehicle Cameras*:

This have a look at develops an actual-time visitors occasion detector primarily based totally at the progressed YOLOv5 algorithm, and it advocate to installation the progressed light-weight version at the automobile facet to catch up on the detection blindness of roadside detection gadgets because of pavement density. Experiments display that this approach is capable of discover crowd gathering, automobile gathering, visitor's accidents, fires and different occasions in actual time. This progressed YOLOv5s version has the very best F-1 and map rankings in comparison with different traditional models, achieving 84% and 84.2% and the parameter quantity is likewise in a decrease range.

According to previous research paper, it is clear that the previously implemented system has been focused on specific function such as traffic monitoring, accident detection. Also, some of the systems have been over expensive to implement. Although these systems had reduced crime to some degree there is concern over people's privacy and improper release of captured footage by authorities. In today's over crowded road there is need of system that can perform multiple task such as detecting aggressive behaviour of the driver or informing traffic department about harsh driving, detecting suspicious weapons, informing police if there is physical fight happening on road. The proposed system will automatically send live footage if any abnormal activity detected. There is no need of monitoring manually. By analysing previous systems, it is clear that there is no system has been proposed that can detect multiple types of road rage activity.

SYSTEM DESIGN

The road rage detection system makes use of 3-tier structure that incorporates of consumer aspect, utility server and a database server. The utility server includes the server tool that's ready with a GSM modem. The consumer-aspect tool desires best the browser. It will connect with server through Ip deal with and port number. The server-aspect tool in particular consists of modules one is http server and some other is photograph processing. Two gadgets talk with every different with http protocol. Hence http server is required. It will construct in server-aspect tool itself. The predominant functioning of that is to address the imminent requests, take a look at for validation and generate the response. The image processing module is to come across intrusion.

IBM Smart Surveillance Engine (SSE):

The IBM Smart Surveillance Engine (SSE) is a software-primarily based video-primarily based totally occasion detection era that provides "intelligent" video surveillance capabilities. The SSE was developed with the intention of making currently deployed surveillance systems "intelligent".

SSE is based on the following key video analytics technologies:

1) *Object Detection:* This group of technologies can detect moving objects in a video stream generated by a static camera. The detection techniques are tolerant of changes in natural lighting, reasonable weather changes, distracting motion (such as trees blowing in the wind), and camera shake.

2) *Object Tracking:* This suite of technologies can track the shape and position of multiple objects as they move through a space monitored by a static camera. The techniques are designed to handle significant occlusions when objects interact with each other

3) *Object Classification*: These technologies use various properties of an object, including shape, size and motion to assign a class designation to objects. Typical tags are Person, Group and Vehicle

FLOW OF THE PROPOSED SYSTEM

Road rage detection system will provide a cost-effective alternative for public safety workers to monitor activities in almost any location, without adding more feet on the street. It can be deployed to deliver a range of benefits to communities while increasing the efficiency and effectiveness of public safety workers. The following diagram shows the flow of our system and therefore the processes involved:

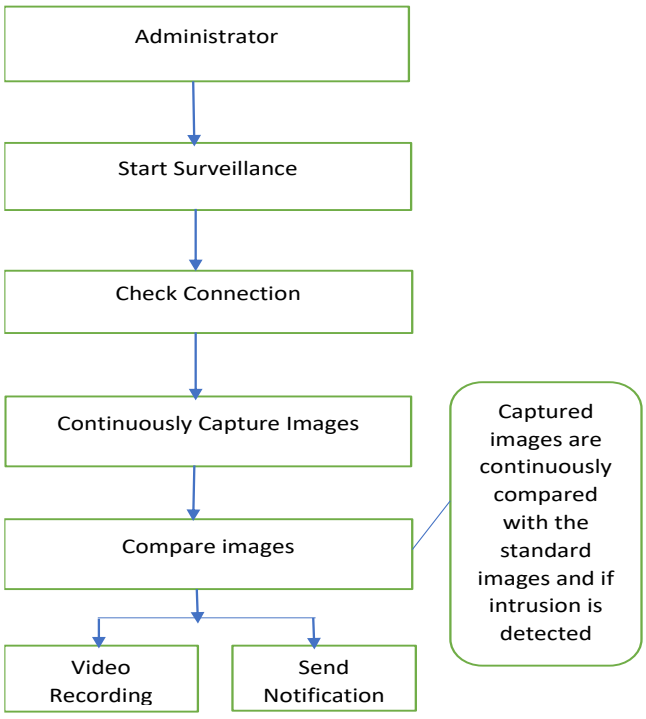


fig. 1 Flowchart of the Proposed System

On begin the appliance can initial check for if the device has camera. If camera is accessible, it'll acquire steady image that is employed as normal image. currently our application can incessantly take pic frames and compare current frame with previous one. this can facilitate it to sight any movement is there or not. As before long as there's detection of intrusion application can store captured frame to Coyote State card of device. at the same time a SMS or response can send to requested device. Response is nothing however the live video that's seen by server's camera.

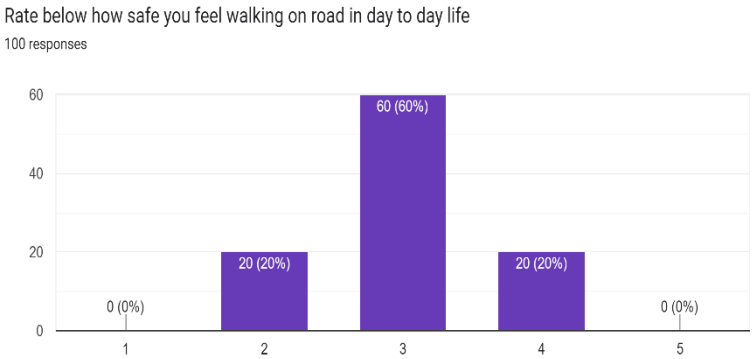
RESEARCH METHDOLOGY

HYBRID MODEL

A model may include both descriptive and analytical components. A descriptive model's logical relationships can be examined, and conclusions can be drawn to reason about the system. Nonetheless, logical analysis yields quite different conclusions than a quantitative chemical investigation of system properties.

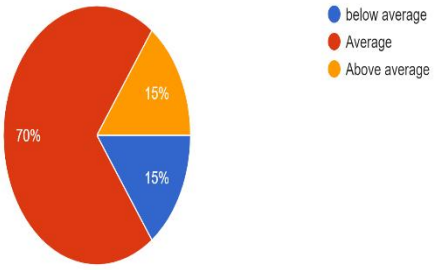
We first conducted a poll of people utilizing an online form creator and data collection service to acquire information regarding people's awareness.

SURVEY RESULTS



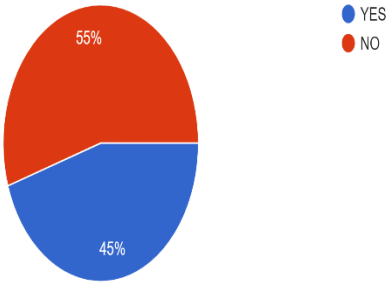
How would you rate your driving skills?

100 responses



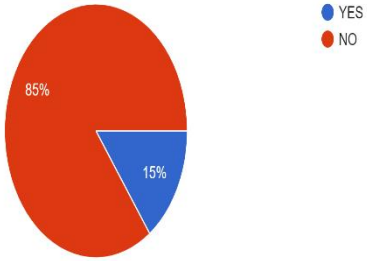
Have you ever been victim to another motorist's road rage?

100 responses



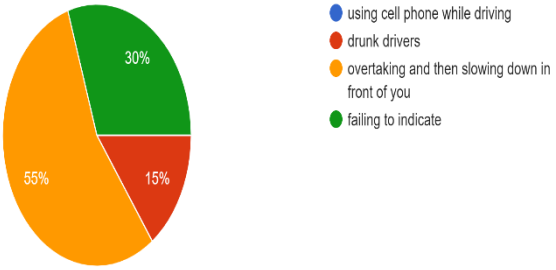
Do you consider speeding normal?

100 responses



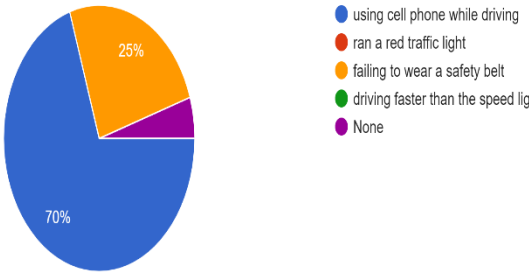
Which of the following scenarios are likely to trigger and emotional response from you?

100 responses



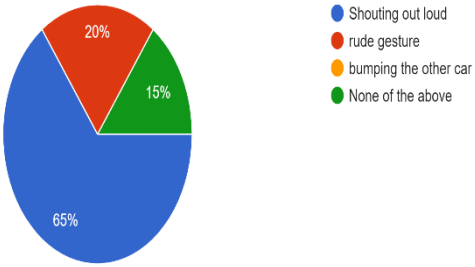
Which of the following traffic rules have you violated?

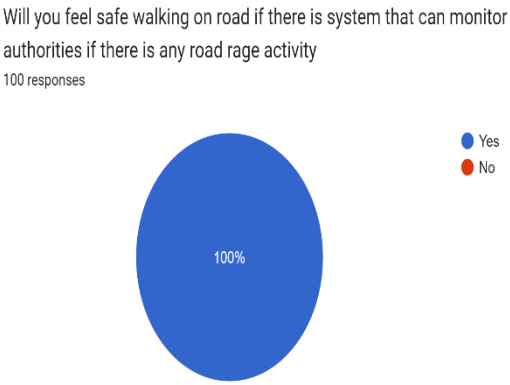
100 responses



In which of the following ways have you responded to another motorist's bad driving?

100 responses





HYPOTHESIS TESTING

Hypothesis testing is a sort of statistical reasoning that includes analyzing data from a sample to derive inferences about a population parameter or probability distribution. First, a hypothesis is created regarding the parameter or distribution. This is known as the null hypothesis, abbreviated as H0. After that, an alternative hypothesis (denoted Ha) is defined, which is the polar opposite of the null hypothesis. Using sample data, the hypothesis-testing technique determines whether or not H0 may be rejected. The statistical conclusion is that the alternative hypothesis Ha is true if H0 is rejected.

For this paper,

Null hypothesis (H0): Road Rage Detection System will enrich road safety.

Alternative hypothesis (Ha): Road Rage Detection System will not enrich road safety.

TEST (STATISTICS)

There are 3 tests available to determine if null hypothesis is to be rejected or not. They are:

1. Chi-squared test
2. T-student test (T-test)
3. Fisher's Z test.

For this paper, we will be using a 2 tailed T-student test.

A t-test is an inferential statistic that determine if there is a significant difference in the means of two groups that are related in some manner.

- *Level Of Significance:* The chance of rejecting the null hypothesis when it is true is the significance level (also known as alpha or α). A significance level of 0.05, for example, means there's a 5% probability of discovering a difference when there isn't one. Lower significance level indicate that more evidence is required to reject the null hypothesis.
- *Level of confidence:* The confidence level indicates that probability that the location of a statistical parameters (such as the arithmetic mean) measured in a sample survey is also true for the entire population.

Sr. No.	Data
1	60
2	70
3	85
4	70
5	55
6	55
7	65
8	100
Mean (x)	70
Standard Deviation (s)	15.58387444948

Level of Significance = 0.05 i.e., 5%

Level of Confidence = 95%

A t-score (t-value) is the number of standard deviations away from the t-mean. distribution.

The formula to find t-score is:

$t = (x- \mu) / (s/\sqrt{n})$

where x is the sample mean,

μ is the hypothesized mean,

s is the sample standard deviation,

and n is the sample size.

The p-value, also known as the probability value, indicates how probable your data is to have happened under the null hypothesis. Once we know the value of t, we can find the corresponding p-value. If the p-value is less than some alpha level (common choices are .01, .05, and .10) then we can reject the null hypothesis and conclude that smart devices are not secure and cannot be trusted with our privacy.

Calculating t-value:

Step 1: Determine what the null and alternative hypotheses are.

Null hypothesis (H0): Road Rage Detection System will enrich road safety.

Alternative hypothesis (Ha): Road Rage Detection System will not enrich road safety.

Step 2: Find the test statistic.

In this case, the hypothesized mean value is considered 0.

$t = (x-\mu) / (s/\sqrt{n}) = (70-0) / (15.58387444948/\sqrt{8})$

$= 12.70$

t-value = 12.70

Step 3: Calculate the test statistic's p-value.

The t-Distribution table with n-1 degrees of freedom is used to calculate the p-value. In this paper, the sample size is n=8, so n-8= 7.

By plugging the observed value in the calculator, it returns p-value. In this case the p-value returned is not less than 0.0001.

Since this p-value is not less than our chosen alpha level of 0.05, we cannot reject the null hypothesis. Thus, we have sufficient evidence to say that Road Rage Detection System will enrich road safety.

CONCLUSION

Road rage has become a cultural norm in India as most drivers feel the necessity to vent out their anger whereas driving on the roads. Driving on busy Indian roads will result in frustration and Angst that typically translate into force. A force refers to violent incidents arising out of stress and varied psychological factors whereas driving on roadways or high-traffic areas. force usually begins with heated arguments with another commuter, passenger, or a pedestrian and may even increase to physical violence. Therefore, there's would like of system which will scale back the injury to the involved parties however will build the drivers careful before committing similar acts next time. police work such multiple activities in real time video may be terribly troublesome by manually. Therefore, there's would like of such system which will showing intelligence monitor, captures information in real time, transmits, method and perceive the knowledge associated with those monitored. The force sight ion system can method video flow pictures to mechanically detect objects like peoples, vehicles, suspicious instrumentality for security functions and makes the events obtainable for generating real time alerts. Situational detection within the traffic system is of nice significance to traffic management and even urban management. This study develops a period of time traffic event detector. This analysis not solely brings convenience to town managers, however additionally brings safety and travel convenience to voters. thence our system can enrich road safety by police work conflicts on road and supply a timely response to the conflict to avert probable damage.

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