



## A Study on road accidents and detection of driver's distraction

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### ABSTRACT

The number and quantity of vehicles on roads have enlarged due to technological and cost-effective progress in recent years. As a result of this increase, Avoiding the traffic and accidents have become one of the most important parts of our daily lives as people spend more time in traffic thereby forcing drivers and other road users to face a higher risk of the traffic accident. Road accidents are an outcome of the interplay of various factors, some of which is a length of the road network, vehicle population, human population and enforcement of road safety regulations.

The number one cause of car accidents is not a criminal that drove drunken, speed or ran a red light. Distracted drivers are the top cause of car accidents in most of the countries. A distracted driver diverts his or her attention from the road, usually to talk on a cell phone, send a text message or eat food. This study has discussed the statistics of road accidents and the top ten states in India's accidental death rates, common behavior of drivers which causes the accidents and distraction types. This paper proposed a methodology of detecting the distraction of drivers by calculating the heartbeat rate of the drivers when he or she is distracted.

### INTRODUCTION:

Every year road accidents claim the lives of 1.3 million people worldwide. Every hour, 40 people under the age of 25 die in road accidents around the globe. Between 20 and 50 million more people suffer

non-fatal injuries, with many incurring a disability as a result of their injury. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries, and for family members who need to take time off work or school to care for the injured. Automobile-related deaths in developing countries, with young people in the age groups from 5 to 24 years old possessing the highest risks

Over 1, 37,000 people were killed in road accidents in 2013 alone, that is more than the number of people killed in all our wars put together. 16 children die on Indian roads daily. 5 lives end on Delhi's roads every day. There is one death every four minutes due to a road accident in India. One serious road accident in the country occurs every minute and 16 dies on Indian roads every hour. India witnessed 17 deaths and 55 road accidents every hour in 2016, one of the highest in the world, according to the latest report released by the Union road transport and highways ministry.

The report compiled by the ministry's Transport Research Wing said road accidents killed 150,785 people across India in 2016 — a 3.3% jump from 2015 when 146,000 larks road fatalities were reported — indicating Indian roads continue to be one of the deadliest in the world. The number of road accidents, however, declined from 501,000 lakh in 2015 to 480,652 lakh in 2016.

India recorded at least 4, 80,652 accidents in 2016, leading to 1,50,785 deaths. The number suggests that at least 413 people died every day in 1,317 road accidents. Further breaking down the statistics, the data reveals that at least 17 deaths occurred in road accidents in 55 accidents every hour in the given time period. Comparing the new recordings with data from previous year shows that in spite of recording fewer accidents in 2016, more deaths have occurred this year as in 2015. In 2015, 1,46,133 people had died in 5,01,423 accidents. The accident severity, which is measured as the number of persons killed per 100 accidents, was recorded at 29.1 in 2015 which is lower than 31.4 in 2016.

### ROAD ACCIDENT:

A Road accident refers to an accident involving at least one road open to public circulation and in which at least one person is injured or killed. Intentional acts (murder, suicide) and natural disasters are excluded. Road accident is the most unwanted thing to happen to a road user, though they happen fairly often. The most regrettable thing is that we don't learn from our mistakes on road. Most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. The main cause of accidents and crashes are due to human errors.

Traffic accident is major cause of death and injuries worldwide but while they are declining in many parts of the developed world, fatalities are still on the rise in many developing countries including India. In our Tamilnadu state more than half of the road accident

victims are in the group of 20 to 55, the key wage earning and child raising age group.

The common behavior of humans which results in accident.

1. Over Speeding
2. Drunken Driving
3. Distractions to Drive
4. Red Light Jumping
5. Avoiding Safety Gears like Seat belts and Helmets
6. Non-adherence to lane driving and overtaking in a wrong manner

Top Ten States	Cases		Injuries		Fatalities	
	ADSI	TRW	ADSI	TRW	ADSI	TRW
Uttar Pradesh	28095	32385	17384	23205	18407	17666
Tamil Nadu	69059	69059	79746	79746	15642	15642
Maharashtra	42250	63805	39301	39606	13685	13212
Karnataka	44011	44011	56971	56971	10857	10856
Rajasthan	24072	24072	26153	26153	10510	10510
Madhya Pradesh	40859	54947	40878	55815	9758	9314
Andhra Pradesh	22839	24258	29439	29439	8297	8297
Gujarat	23362	23183	21505	21448	8245	8119
Telangana	21252	21252	22948	22948	7110	7110
West Bengal	17706	13208	15504	11794	6705	6234
Total (All India)	464674	501423	482389	500279	148707	146133

### Road crash cases in top 5 Indian States between years 2013 and 2016

States	2013	2014	2015	2016
Tamilnadu	66538	67250	69059	71025
Karnataka	39591	43694	44011	45921
Maharashtra	43863	44382	42250	40998
Uttar Pradesh	25975	26064	28095	30542
Rajasthan	23586	24639	24072	23958

### Accident Details in Tamil Nadu for Certain Years State : Tamil Nadu

YEAR	FATAL		Grievous Injury		Minor Injury		Non-Injury	Total Accidents	Total Number of Persons involved
	N.A	N.P.k	N.A	N.P.I	N.A	N.P.I	N.A		
2010	14241	15409	4613	6844	42320	68601	3822	64996	90854
2011	14359	15422	4619	6573	42766	67672	4129	65873	89667
2012	15072	16175	4851	6972	44604	71376	3230	67757	94523
2013	14504	15563	4715	6513	44158	69168	2861	66238	91244
2014	14165	15190	5375	7381	45100	70344	2610	67250	92915
2015	14524	15642	7388	9400	44880	70301	2267	67250	95343
2016	16092	17218	6262	8421	46908	73742	2169	71431	99381
N.A - Number of Accidents    N.P.K - Number of persons killed    N.P.I - Number of persons Injured									

**Types of Accident:**

The following are the five most common Types of Car accidents and advice on how to best avoid them.

1. Rear-end Collision
2. Single vehicle crashes
3. T-bone or cross-Traffic accident
4. Clipping other cars when merging.
5. Low-speed accidents.

According to the national floor safety Institution (NFSI), slip and fall accident are the leading cause of workers compensation claims. Some of the most common types of injuries suffered in slip and fall accidents include fractured, Sprains knee injuries and hand or wrist injuries.

**DISTRACTIONS:**

Driver distraction is an important risk factor for road traffic injuries. There are different types of driver's distraction, usually divided into those where the source of distraction is **internal** to the vehicle such as tuning a radio or using a mobile phone and those **external** to the vehicle such as looking at billboards or watching peoples on the side of the road.

**1. Visual:**

Looking away from the road for a non-during related task.

**2. Cognitive:**

Reflecting on a subject of conversation as a result of following on the Phone-rather than analysis the road situation.

**3. Physical:**

When the driver holds or with both hands or dialing or a mobile phone or operates a device rather than sleeping with both hands or dialing on a mobile or learning over tune a radio that may lead to rotating the steering wheel.

**4. Auditory:**

Responding to a ringing mobile or if a devices is turned is so loud that it mark other sounds such as ambulance sirens

**Objectives of the proposed system**

1. To detect the distraction of drivers and to avoid road crashes.

2. Using Face Detector Sensor and Heart Beat Reader to measure the deviations of Drivers

**Methodologies:**

In order to design safe vehicles, it is important to be able to evaluate in-vehicle systems to determine how distracting they are for people to use while driving. The Peripheral Detection Task (PDT) is a method for measuring the amount of driver mental workload and visual distraction in road vehicles. It is a secondary task measure where drivers must respond to random Targets presented in their peripheral view. As drivers become distracted they respond slower and miss more of the PDT targets. This study aimed to test if the PDT is useful for measuring driver mental workload and visual distraction from in-vehicle information systems in the real road traffic environment.

**HOW TO CONTROL: Heart Beat Rate**

When the heart beats, a pressure wave moves out along the arteries at a few meters per seconds (appreciably faster than the blood actually flows). This pressure wave can be felt at the wrist, but it also causes an increase in the blood volume in the tissues, which can be detected.

The following Table shows the average heartbeat rate range versus the age of the person.

AGE	RANGE	AVERAGE RATE
0 – 1 Month	100 – 180	140
2 – 3 Month	110 – 180	145
4 – 12 Month	80 – 180	130
1- 3 years	80 – 160	120
4-5 years	80 – 120	100
6-8 years	70 – 115	92.5
9 – 11 Years	60 – 110	85
12 - 16 years	60 – 110	85
> 16 Years	60 – 100	80

**Average heartbeat rate range versus the age of a person**

Normal Heart Beat rate differs. There is no single number constantly. Heartbeat rate differs based on age, sex, weight, physical condition and other factors.

The following table shows the different situation or person's Heart Rate.

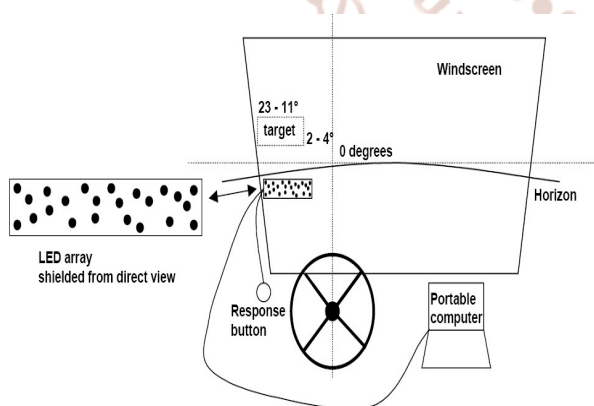


S.No	Category	Heart Rate in bpm (beats per minute)
1	Adults	60 - 100 bpm
2	Athlete's	40 bpm (good physic for them)
3	Jumping from airplane , watching a horror film	170 bpm
4	Drivers	181 bpm (maximum )
		153(average)
5	Rollercoaster ride	155 bpm
6	Proposing a girl friend	130bpm

### Heart rate of various situation or person

#### EQUIPMENT:

The PDT presents a small red target light on the windscreen in the driver's perifoveal field of view. The target is an LED reflection on the windscreen. The reflections appear as a heads-up display (HUD). The HUD target is located at a horizontal angle of approximately 11- 23 degrees to the left of the driver's forward view and at a vertical angle of approximately 2-4 Degrees above the horizon. The target appears within this area; one of 23 LEDs in the rack is illuminated. The targets appear with a random variation between 3-6 seconds. It lasts for one second and the response is possible from 200 milliseconds after onset until 2 seconds, otherwise it is considered a miss. Drivers respond to the targets by pressing a small button attached to their left index finger.



#### The Peripheral Detection Task Hardware

The **electrocardiograph** (ECG) signals were taken with an ambulatory monitoring device. The 0.1 Hz component of heart **rate variability** (HRV) was obtained using the analysis software Somnologica. The 0.1 Hz component of HRV was extracted since it

has been associated with the mental effort. Less variability or lower values of this measure indicate more mental effort. The **Rating Scale Mental Effort** (RSME) was used to rate subjective workload. This is a single scale that consists of a line that runs from 0-150 mm, where every 10-mm is marked. Along this line statements related to the invested effort are given **Procedure**.

The participants will be first given the test instructions and the PDT was explained. After this, the ECG equipment will be connected. This was followed by a 5-minute rest period to collect baseline data for the ECG. The participants will be instructed where to drive. The test vehicle will be given. The road trial started with a familiarization/practice drive. The next part will be on a motorway and the last part will be on a 2-lane undivided road with a number of traffic lights. Participants are instructed to perform the tasks at set points along the route. An unbalanced repeated measures design was used. The independent variables like road type/speed, motorway (110 km/h) and country road (90 km/h) and task, embedded or cognitive will be declared.

The embedded tasks will be determined

1. the tuned frequency on the radio and manually select a specific radio station (Task 1, Radio),
2. The cognitive task used was a backward counting task, for example, 568-7 (Task 2, Counting).
3. Turn on the CD-player and play a specific track on a specific CD, for example, track 3 on CD 1 (Task 3, CD).

The dependent measures will be heart rate variability, subjective mental effort, PDT reaction time and target hit rate. The HRV and PDT performance were recorded throughout the drive. The RSME was completed after each road section. PDT performance was summarized over 30-second intervals surrounding the tasks. The baseline performance was recorded over a 5-minute period so that a sufficient amount of data could be collected to calculate the power of the mental workload component of the HRV.

## CONCLUSION:

The papers provide the study on road accidents and their statistics are highlighted based on the different type of road accidents and various factors. This paper also studied about the distraction of drivers and how to control the distraction rate. Driver's heart rate is calculated and the alarm will alert when the distraction is detection on drivers. The proposed system helps to detect the distraction in which the road accidents can be controlled and can also be reduced when it is implemented.

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