



# Empirical Study on Finger Photoplethysmogram to avoid Arrhythmia Road Accidents

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**Abstract:** Road accidents are a human misfortune. They involve high human distress and financial costs in terms of at the wrong time casualty, wound and hammering of potential revenue. Many initiatives are taken to implement road safety. Recent report in India against road accident, there were closely 5 lakh road accidents, which resulted in more than 1.3 lakh persons are put up with arrhythmias with anger. These numbers translate into one road accident are caused by over speed and unconditional health of drivers. The present study provides the magnitude the prevention method to arrhythmias with anger road accident. The analysis on arrhythmias with anger will help to create a decision making system which preventing from arrhythmias road accident.

**KEYWORDS:** Road Safety, Accident Prevention, Accident Classification.

## I. INTRODUCTION

Now a day's road accident is a major crisis in all over the world. Road traffic fatalities are forecast to increase over the next ten years from a current level of more than 1.3 million to more than 1.9 million by 2020. The Commission for Global Road Safety believes that the urgent priority is to halt this appalling and avoidable rise in road injury and then begin to achieve year on year reductions. The world could prevent 5 million deaths and 50 million serious injuries by 2020 by dramatically scaling up investment in road safety, at global, regional and national levels. Each year nearly 1.3 million people die as a result of a road traffic collision, more than 3000 deaths each day and more than half of these people are not travelling in a car [1]. Road Accident Scenario in India mobile phones and personalized vehicles are increasing with the same growth rate. For instance while the population of India increased by 17.64 percent over the past ten years, the number of licensed vehicles increased by 132 percent over the same period. According to official statistics, 430,654 people were killed in road traffic crashes in India in 2010 (NCRB 2010) [2]. The situation in India has worsened in recent years. Traffic fatalities increased by about 5.5% per year from 2009 to 2010 [3]. Due to arrhythmias with anger road accidents are very common among the youngsters in India. It causes the crisis among all living beings.

## II. PHYSIOLOGICAL BASIS OF ARRHYTHMIA DURING DRIVING

Postulated mechanisms that may lead to an increased frequency of arrhythmias during driving are two-fold. First, it has been demonstrated that driving can trigger psychological stress in the form of anger and anxiety. In turn this can lead to elevated levels of catecholamines resulting in perturbations of the autonomic nervous system and stimulation of the sympathetic nervous system leading to an increased propensity to arrhythmias. Elevated levels of urinary catecholamines and cortisol have been demonstrated in long-distance coach drivers during periods of driving compared with measurements taken on days off work [4]. In a study by Taggart et al. examining the effects of driving on the normal and abnormal heart, driving was associated with an increased heart rate and precipitation of angina in patients with known coronary disease. Although following a city drive, there was no significant increase in catecholamine levels, this was only measured in three patients and at the end of the drive. Neither elevated nor adrenaline levels were seen in racing car drivers. Salivary amylase levels have been shown to be increased during sympathetic activation and can act as an index of plasma nor adrenaline concentrations during stressful situations; one which can be measured non-intrusively and by causing minimal stress by obtaining samples. Salivary amylase

levels have been shown to increase significantly during a simulated driving exercise [6]. Such simulated driving exercises have also demonstrated physiological cardiovascular changes (elevated heart rate, blood pressure, and total peripheral resistance) associated with anger precipitated by traffic jams during the simulated journey [7]. These features also are reflective of enhanced sympathetic activity.

### III. PHOTOPLETHYSMOGRAPHY (PPG) SIGNAL

It ensures detection of blood volume pulsations by time-resolved analysis of the tissue back-scattered or absorbed optical radiation [8]. PPG technique has good potential for express diagnostics and early

screening of cardio-vascular pathologies, as well as for self-monitoring of the vascular condition [9, 10]. It is very important for a patient suffering from the cardiac disease to perform accurate and quick assessment of his/her cardiovascular condition, so development of new techniques for continuous monitoring of the PPG signals seem to be clinically significant. Studies on wireless PPG systems based on Bluetooth technology have been initiated recently [11]. Tests of the first experimental prototypes confirmed viability of this approach, and PPG distant sensing at distances up to 10 m has been demonstrated using PC or specially designed detecting unit as the bio-signal receiver.

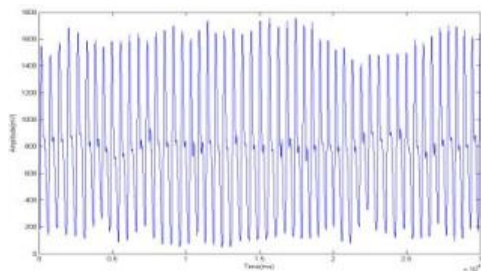


Figure 1: Acquired PPG Signal

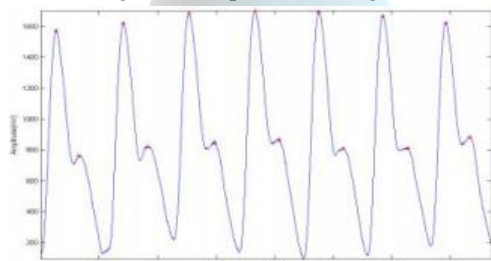


Figure 2: Peak detection for acquired PPG signal

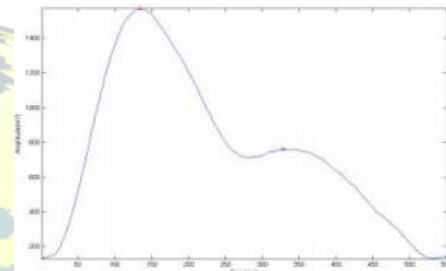


Figure 3: Peak detection (The detected peaks are denoted by red dots)

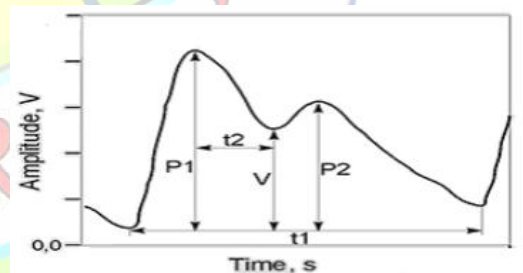


Figure 4 Typical PPG signal

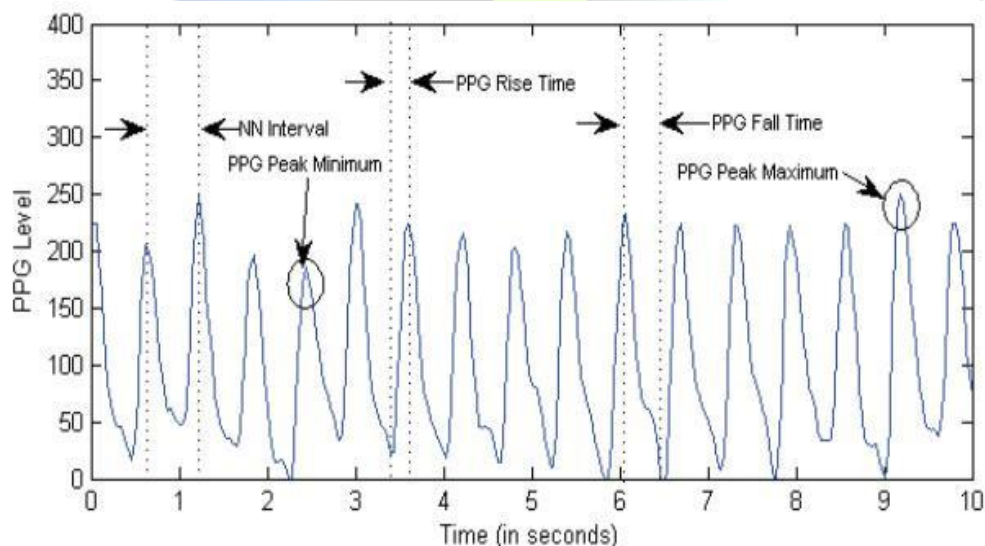


Figure 5: PPG Syntactic Features during Busy Driving



Figure 6: Instrument used for data collection: Pulse Oximeter



Figure 7: Instrument used for data collection: Microsoft BAND 2

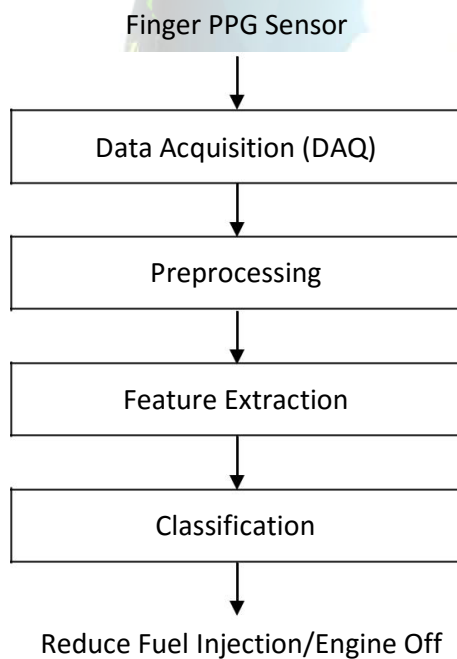


Figure 8: Common structure for PPG diagnostic system

Acquired PPG Signal has shown in Figure 1. Peak detection for acquired PPG signal to extracted features is shown in Figure 2 and Figure 3. In Figure 4 shown the The typical PPG signal was shown in Figure4. For

PPG Signal are acquired using wearable like Pulse Oximeter and Microsoft BAND 2 are shown in Figure 6 and Figure 7 which are commonly available in market for the PPG studies. [5] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for. The main design of this project is to track the heart attack of patients who are suffering from any attacks during driving and send them a medical need & thereby to stop the vehicle to ensure that the persons along them are safe from accident. Here, an eye blinking sensor is used to sense the blinking of the eye. spO2 sensor checks the pulse rate of the patient. Both are connected to micro controller.If eye blinking gets stopped then the signal is sent to the controller to make an alarm through the buffer. If spO2 sensor senses a variation in pulse or low oxygen content in blood, it may results in heart failure and therefore the controller stops the motor of the vehicle. Then Tarang F4 transmitter is used to send the vehicle number & the mobile number of the patient to a nearest medical station within 25 km for medical aid. The pulse rate monitored via LCD .The Tarang F4 receiver receives the signal and passes through controller and the number gets displayed in the LCD screen and an alarm is produced through a buzzer as soon the signal is received.

#### IV. PROPOSED APPROACH

We proposed to handle the noise in the PPG signals; so many de-nosing methods are available. In that Wavelet based de-nosing are outperformed in various test condition to reduce the noise in the signals. After the preprocessing the features of the received signals are fetched from the acquired PPG signals using the feature extraction methods the syntactic features extracted from PPG signals have been shown in Figure5 and from the extracted features we go for any discrimination methods and if it gives the positive sign then the system has to be trained or otherwise it will do again for the entire process until the positive sign has to be reached. The overall workflow of our artificial intelligent system to avoid the arrhythmias with anger road accidents is given in Figure. 8.

#### V. CONCLUSION

Design and development of a safety-critical driver assist system needs an intelligent inference framework for assessment of stress experienced by the drivers





under real-time driving scenarios with different conditions using PPG signals. Physiological signals were collected using a wearable signal acquisition unit. Body-worn wearable computer can enable us to activate and alarm to stop the vehicle or reduce the fuel injection to engine to turn off gradually or accordingly to handle the situations. Design of artificial intelligence PPG analysis would lead to a more economical and reliable compute-infrastructure for future wearable driver assist systems to avoid the arrhythmias with anger road accident. As a future work, we plan to work on the prediction of driver's arrhythmias with anger prediction using Smart band PPG data and construct the artificial intelligent system to avoid the arrhythmias with anger road accidents.

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