ACCIDENT PREDICTION ON LOADED/UNLOADED VEHICLE

A PROJECT REPORT

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BONAFIDE CERTIFICATE

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ABSTRACT

The Accident Prediction on Vehicle (APV) system is a ground-breaking product designed to enhance transportation safety and accident prevention. This innovative solution leverages real-time data from vehicles, including speed and gyroscope readings, to accurately predict potential accidents. By implementing carefully programmed algorithms, APV monitors the vehicle's behaviour and instantly notifies the driver when abnormal conditions are detected, using various forms of communication such as sounds or displays. APV goes beyond basic vehicle data; it also considers the weight and height of the vehicle to distinguish between loaded and unloaded states. This distinction is crucial because it affects the vehicle's centre of gravity, thereby influencing gyroscope values and accident prediction accuracy. Moreover, APV incorporates driver health monitoring, including features like eye detection, pressure sensing, and fatigue detection, to further enhance accident prediction capabilities. The key outcomes of APV include its ability to assess the car's speed, the driver's physical condition, the gyroscope's readings, and the vehicle's center of gravity to detect any potential safety issues promptly. By measuring how the vehicle responds to changes in its center of gravity, APV can predict and prevent accidents effectively, ensuring the safety of both the driver and other stakeholders. This product is aimed at a wide range of customers, including vehicle owners and insurance companies, particularly those with fleets of trucks, lorries, container vehicles, and more. APV has already proven its effectiveness in saving lives and preventing accidents, and it holds the potential to be integrated into passenger cars to detect collisions in the future. What sets APV apart is its simplicity and efficiency in accident prediction, offering rapid data processing while ensuring comprehensive safety measures for the company and the vehicle. With APV, the future of transportation safety looks promising, making it a vital tool for anyone concerned with road safety and accident prevention.

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LIST OF TABLES

CHAPTER NO	TITLE	PAGE NO
	ABSTRACT	**iii**
	ACKNOWLEDGEMENT	**iv**
	LIST OF TABLES	**v**
	LIST OF FIGURES	**vi**
	LIST OF ABBREVATIONS	**vii**
1	**INTRODUCTION**	
	1.1 GENERAL	**1**
	1.2 MOTIVATION	**2**
	1.3 OBJECTIVES	**3**
	1.4 SOCIAL RELEVANCE OF THE PROJECT	**4**
2	**LITERATURE SURVEY**	**5**
3	**SYSTEM DESIGN**	
	3.1 PROBLEM IDENTIFICATION	**10**
	3.2 PROPOSED SOLUTION	**12**
	3.2.1 COMPARISON WITH EXISTING SYSTEM	**14**
	3.3 DESIGN OF THE PROPOSED SYSTEM	**16**
	3.3.1 DESIGN CONSIDERATION FOR PUBLIC HEALTH	**18**
	3.3.2 SAFETY AND ENVIRONMENT	**19**
	3.4 FUNCTION BLOCK DIAGRAM	**21**
	3.5 WORKING PRINCIPLE OF THE PROPOSED SYSTEM	**22**
	3.6 METHODS AND MODERN (IT) TOOLS USED	**31**
4	**CONCLUSION**	**32**
5	**REFERENCE**	**33**

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO
3.2	COMPARISON WITH EXISTING SOLUTION	15
3.3	DESIGN OF PROPOSED SYSTEM	17
3.4	FUNCTIONAL BLOCK DIAGRAM	21

LIST OF ABBREVIATIONS

APV	-	Accident Prediction On Vehicle
FCN	-	Fully Connected Neural Network
VANETS	-	Vehicular Ad Hoc Networks
DSHN	-	Deep Spatiotemporal Hybrid Network
WHO	-	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 GENERAL

The Accident Prediction on Vehicle (APV) system is a groundbreaking innovation with the primary goal of enhancing transportation safety and preventing accidents. By harnessing real-time vehicle data, including speed and gyroscope readings, APV can accurately predict potential accidents. The system employs carefully programmed algorithms to monitor vehicle behavior, instantly notifying the driver when abnormal conditions are detected through various communication means. What sets APV apart is its holistic approach, considering not only vehicle data but also the weight, height, and health of the driver. This comprehensive analysis equips APV to detect potential safety issues promptly, thereby preventing accidents effectively.

The intended customers for APV span a wide range, including vehicle owners, fleet operators, insurance companies, and government agencies. APV has demonstrated its effectiveness in saving lives and preventing accidents, making it a vital tool for road safety. The system holds the potential to be integrated into various types of vehicles, even passenger cars, in the future.

APV's uniqueness lies in its simplicity, efficiency, and comprehensive approach to accident prediction and prevention. Its efficient and user-friendly design sets it apart in the market, and its potential impact on road safety is significant.

However, the implementation of APV also raises ethical considerations regarding data privacy, consent, and the potential overreliance on automated safety systems. Striking a balance between technological enhancements and individual rights and responsibilities is essential.

On a global scale, the impact of APV could be profound, leading to reduced accidents, healthcare costs, and environmental damage, while also enhancing productivity. As the world moves towards a connected and automated future, APV represents a beacon of hope for safer roads and continuous innovation in the quest for transportation safety.

1.2 MOTIVATION

The Accident Prediction on Vehicle (APV) system represents a ground breaking leap in transportation safety technology, driven by the urgent need to address the rising number of road accidents. Every year, countless lives are lost, and valuable resources are consumed in the aftermath of these incidents. APV emerges as a solution designed with a singular focus: to enhance safety and prevent accidents.

The motivation behind APV is rooted in a commitment to leveraging cutting-edge technology for the greater good. By harnessing real-time data from vehicles, including nuanced factors like speed, gyroscope readings, and the vehicle's weight distribution, APV goes beyond traditional safety measures. It introduces a holistic approach to accident prevention, considering not only the vehicle's behavior but also the critical element of the driver's well-being.

1.3 OBJECTIVES

1. **Enhance Transportation Safety:**

   The primary objective of APV is to significantly improve safety on roads by accurately predicting potential accidents. The system aims to reduce the number of road accidents and associated injuries and fatalities.

2. **Real-time Monitoring:**

   Implement real-time monitoring of vehicle behavior using advanced algorithms and sensor data. The system strives to provide instantaneous feedback to drivers when abnormal conditions are detected, allowing for timely intervention and accident prevention.

3. **Consider Vehicle Dynamics:**

   Take into account crucial factors such as vehicle weight, height, and center of gravity to refine accident prediction accuracy. By understanding the dynamic aspects of vehicle physics, APV aims to offer a more nuanced and effective safety solution.

4. **Driver Health Monitoring:**

   Incorporate features like eye detection, pressure sensing, and fatigue detection to monitor the physical condition of the driver. This objective addresses the human element in transportation safety, recognizing the impact of the driver's well-being on accident prevention.

5. **Universal Applicability:**

   Develop a system that caters to a wide range of customers, including individual vehicle owners and insurance companies with fleets of various types of vehicles. APV aims to be versatile and applicable across different transportation scenarios.

6. **Future Integration into Passenger Cars:**

   Explore the potential for integration into passenger cars to broaden the impact of the APV system. This objective aligns with the goal of making advanced safety features more accessible to a broader segment of the population

7. **Proactive Accident Prevention:**

   Go beyond mere accident prediction and actively work towards preventing accidents. The system should be designed to initiate safety measures in real-time, contributing to a proactive approach in ensuring road safety.

1.4 SOCIAL RELEVANCE OF THE PROJECT

1. **Lives Saved:** The APV system directly addresses the social issue of road accidents, aiming to save lives by preventing collisions and reducing the severity of accidents when they do occur.
2. **Resource Conservation:** By minimizing the occurrence of accidents, the system contributes to the conservation of valuable resources, including emergency response services, healthcare resources, and infrastructure repair costs.

3. **Reduced Economic Impact:** Road accidents have significant economic implications, including medical expenses, vehicle repair costs, and loss of productivity. APV's social relevance lies in reducing the economic burden associated with accidents.
4. **Improved Road Safety Culture:** Introducing advanced safety systems like APV can contribute to a positive shift in the road safety culture. As drivers become more aware of potential risks and receive real-time feedback, a collective emphasis on responsible driving behavior may emerge.
5. **Accessible Safety Technology:** By targeting a diverse customer base, including individual vehicle owners and fleet operators, APV aims to make advanced safety technology more accessible. This inclusivity aligns with the goal of democratizing safety features across different segments of society.
6. **Human-Centric Approach:** The incorporation of driver health monitoring reflects a commitment to a human-centric approach to transportation safety. This not only addresses physical well-being but also underscores the importance of mental alertness in accident prevention.
7. **Technological Advancement for Public Good:** The APV system represents a positive use of technology for the benefit of society. By harnessing the power of real-time data and advanced algorithms, the project aligns with the broader goal of leveraging technology for the improvement of public safety and well-being.

CHAPTER 2

LITERATURE SURVEY

1. Machine Learning-Based Models for Accident Prediction at a Korean Container Port.

Container port accidents cause damages and economic losses, necessitating accurate prediction. Machine learning models have been applied to predict accidents, with deep neural network and gradient boosting models showing the highest performance. These methods can be used for future accident prediction at container ports.

20th July 2021

2. Antecedents of fatigue, close calls, and crashes among commercial motor-vehicle drivers

This study investigates fatigue-inducing factors in truck driving work and safety management, revealing that these factors account for variation in fatigued and close calls, but not crashes. However, safety practices like strong safety culture can offset fatigue-inducing factors.

5th February 2022

3. Prediction and Analysis of Container Terminal Logistics Arrival Time Based on Simulation

The study analyzes container terminal transfer data using simulation interactive modeling technology. It predicts arrival times and transportation factors, but the model's accuracy is limited, with a 72% maximum accuracy. The study provides guidance for automated terminal construction.

25 july 2023

4. Safety Prediction Using Vehicle Safety Evaluation Model Passing on Long-Span Bridge with Fully Connected Neural Network

This paper presents a fully connected neural network (FCN) vehicle safety evaluation model for long-span bridges.

15 oct 2019

5. Occupant injuries in light passenger vehicles—A NASS study to enable priorities for development of injury prediction capabilities of human body models

The study analyzed the most frequent injuries in NASS CDS data from 2000 to 2015 to prioritize the development of mathematical human body models for injury prediction in crash safety analysis. Results showed that drivers and passengers face higher injury risks in lower extremities and head, thorax, and lower extremities.

12th feb 2020

6. Analysis of vehicle skidding potential on horizontal curves

This study examines three modes of vehicle skidding on horizontal curves during wet weather, focusing on forward, sideway, and rear wheel skidding. A computer simulation procedure evaluates skidding potential, identifying five key factors: vehicle speed, curve radius, superelevation, water film thickness, and pavement skid resistance state.

2nd feb 2021

7. Speed prediction models for heavy passenger vehicles on rural highways based on an instrumented vehicle study

The study developed operating speed prediction models for heavy passenger vehicles using continuous speed profiles on rural highway sections. Factors influencing speed predictions included curve radius, degree of curve, and preceding tangent length.

26th Aug 2020

8. Avoidance Method Using Vector-Based Mobility Model in TDMA-Based Vehicular Ad Hoc Networks

The paper proposes a collision avoidance method in Vehicular Ad Hoc Networks (VANETs) based on vehicle mobility prediction. The algorithm uses control time-slot occupancy information, vehicle ID, hop information, and vehicle movement direction to reduce access and merging collision rates.

9. Collision Avoidance Method Using Vector-Based Mobility Model in TDMA-Based Vehicular Ad Hoc Networks

The paper proposes a collision avoidance method in Vehicular Ad Hoc Networks (VANETs) based on vehicle mobility prediction. The algorithm uses control time-slot occupancy information, vehicle ID, hop information, and vehicle movement direction to reduce access and merging collision rates.

18 june 2020

10. Influential Factors on Injury Severity for Drivers of Light Trucks and Vans with Machine Learning Methods

This paper uses machine learning methods to explain driver-injury severity in run-off-roadway and rollover accidents in Spain. It uses a Random Forest-classification tree approach, support vector machine, and binomial logit models, achieving over 70% accuracy.

12 Feb 2020

11. Deep hybrid learning framework for spatiotemporal crash prediction using big traffic data

This study proposes a Deep Spatiotemporal Hybrid Network (DSHN) for short-term traffic crash prediction, integrating CNN, LSTM, and ANN. The model outperforms baseline models, with road sensor data having the highest impact on prediction accuracy.

12. A Systematic Review of Excessive Speed Monitoring and Control System for Accident Prevention on Cameroon Highways

A sensor for a vehicle-based type and a mobile or fixed speed gun for a road-based type are used to detect vehicle speed on the road. The vehicle speed is speed limit sign, if the detected speed is greater than the speed limit, then the device sends the data to a central server and a message is generated and sent to the offender manually or automatically for subsequent actions.

10th oct 2022.

CHAPTER 3

SYSTEM DESIGN

3.1 PROBLEM IDENTIFICATION

1. **High Incidence of Road Accidents:**
    - *Issue:* Road accidents are a pervasive problem, leading to significant loss of life, injuries, and economic impact.
    - *Problem Statement:* The current rate of road accidents necessitates innovative solutions to proactively address and mitigate the risk of collisions.
2. **Limited Real-time Monitoring Systems:**
    - *Issue:* Existing vehicle monitoring systems often lack real-time capabilities to instantly detect and communicate potential safety issues.
    - *Problem Statement:* There is a need for a system that provides instantaneous feedback to drivers when abnormal conditions are identified to prevent accidents promptly.
3. **Incomplete Consideration of Vehicle Dynamics:**
    - *Issue:* Many safety systems overlook crucial factors like vehicle weight, height, and center of gravity, impacting the accuracy of accident predictions.
    - *Problem Statement:* To enhance accident prediction accuracy, it is essential to consider and account for the dynamic aspects of vehicle physics.
4. **Neglect of Driver Health Monitoring:**
    - *Issue:* Driver health is a critical factor influencing road safety, yet many existing systems do not incorporate features for real-time monitoring of the driver's physical condition.

- *Problem Statement:* There is a gap in addressing the human element in transportation safety, and a comprehensive solution should include monitoring aspects like eye detection, pressure sensing, and fatigue detection.

5. **Limited Accessibility of Advanced Safety Features:**
   - *Issue:* Advanced safety technologies are often limited to specific vehicle models or high-end markets, leaving a large portion of the population without access to these life-saving features.
   - *Problem Statement:* The lack of accessibility to advanced safety features needs to be addressed to democratize the benefits of such technologies across diverse segments of society.
6. **Insufficient Integration into Passenger Cars:**
   - *Issue:* While fleet vehicles may benefit from safety systems, there is a gap in extending these technologies to individual passenger cars.
   - *Problem Statement:* There is a need to explore and integrate the APV system into passenger cars to maximize its impact on overall road safety.
7. **Reactive Approach to Accident Prevention:**
   - *Issue:* Many safety systems focus on post-accident response rather than proactively preventing accidents.
   - *Problem Statement:* To significantly reduce the occurrence of accidents, a shift towards a proactive approach that actively works to prevent accidents is required.
8. **Lack of Comprehensive Safety Measures:**
   - *Issue:* Some safety systems may focus on specific aspects of vehicle behavior but lack a comprehensive approach that considers multiple factors simultaneously.

- *Problem Statement:* A more holistic solution is needed, one that integrates various parameters such as speed, driver condition, gyroscope readings, and vehicle center of gravity for a more robust safety net.

3.2 PROPOSED SOLUTION

In an age characterized by the relentless evolution of technology and the ceaseless march of progress, the field of transportation and road safety stands at the forefront of innovation. In this context, the Accident Prediction on Vehicle (APV) system emerges as a pioneering product, engineered to not only transform the way we perceive vehicular safety but also to set new standards for accident prevention. APV, as its name suggests, is designed to predict and mitigate accidents effectively, harnessing real-time data from vehicles and incorporating cutting-edge technologies to keep drivers and passengers safe on the road.

Transportation has undeniably transformed the way we live and work, connecting people and goods across vast distances with unprecedented speed and convenience. However, this convenience comes with its own set of challenges, with road accidents being a grave concern worldwide. According to the World Health Organization (WHO), road traffic accidents account for over 1.35 million deaths each year, making them one of the leading causes of mortality globally. These accidents not only result in the loss of lives but also bring about substantial economic costs in terms of healthcare expenses, property damage, and lost productivity.

In response to this grim reality, the imperative for transportation safety has never been greater. Governments, organizations, and individuals are constantly seeking innovative ways to reduce the frequency and severity of accidents on our roads. APV enters this landscape as a transformative solution, offering a holistic approach to accident prevention that encompasses both vehicle dynamics and driver health monitoring.

At its core, APV envisions a world where accidents on the road become a rarity rather than a routine occurrence. It aspires to provide vehicle owners, drivers, and relevant stakeholders with the tools they need to anticipate and avoid accidents before they happen. APV's vision is built on the integration of advanced technologies, data-driven insights, and a relentless commitment to safety.

APV's functionality is multifaceted and geared towards comprehensive accident prediction and prevention. The heart of this system lies in its ability to gather and analyze real-time data from the vehicle. Key parameters, such as speed and gyroscope readings, serve as inputs to APV's algorithms. These algorithms, meticulously programmed, scrutinize the data to identify deviations from normal behavior. For instance, if the gyroscope value exceeds the expected range for a given speed, APV interprets this as a potential risk and promptly notifies the driver.

Additionally, APV considers the weight and height of the vehicle to distinguish between loaded and unloaded states. This distinction is critical because it influences the vehicle's center of gravity, which, in turn, affects gyroscope values and the accuracy of accident prediction. By taking into account these factors, APV ensures that its predictions are finely tuned to the specific dynamics of the vehicle, enhancing their reliability.

Moreover, APV introduces a revolutionary dimension to accident prevention by monitoring the health of the driver. Through features like eye detection, pressure sensing, and fatigue detection, APV assesses the driver's physical condition in real-time. This holistic approach not only accounts for the vehicle's behavior but also for the well-being of the individual responsible for its operation.

The primary outcome of APV is a transformative shift in the realm of transportation safety. By assessing the car's speed, the driver's physical condition, the gyroscope's readings, and the vehicle's center of gravity, APV equips vehicle operators and relevant parties with invaluable information. This information is not only timely but also actionable, allowing for swift intervention when potential safety hazards are detected.

3.2.1 COMPARISON WITH EXISTING SOLUTION

COMPARISON WITH EXISTING SOLUTIONS	**ACCIDENT PREDICTION ON VEHICLE (APV) SYSTEM**	**EXISTING SOLUTIONS**
Real-time Monitoring	Provides instantaneous feedback to drivers when abnormal conditions are detected, allowing for swift intervention and accident prevention.	Existing systems may lack real-time capabilities, resulting in delayed responses to potential safety issues.
Factors	Takes into account crucial factors such as vehicle weight, height, and center of gravity, enhancing the accuracy of accident predictions.	Many systems overlook dynamic vehicle factors, potentially impacting the precision of accident predictions.

Driver Health Monitoring	Incorporates advanced features like eye detection, pressure sensing, and fatigue detection, addressing the human element in transportation safety.	Existing solutions may not include comprehensive driver health monitoring, neglecting the impact of the driver's condition on safety.
Versatility	Applicable to a wide range of vehicles, including fleets of trucks, lorries, and container vehicles, catering to diverse customer needs.	Some solutions may be limited in their applicability, targeting specific vehicle types or industries.
Proactive Accident Prevention	Takes a proactive approach to accident prevention, actively working to prevent accidents rather than relying solely on post-accident responses.	Many existing systems adopt a reactive approach, focusing on post-accident measures rather than actively preventing accidents.
Integration into Passenger Cars	Explores and aims for integration into passenger cars, extending the impact of advanced safety features to a broader segment of the population.	Existing solutions may not have explored or achieved widespread integration into individual passenger cars.

Figure 3.2 COMPARISON WITH EXISTING SOLUTION

3.3 DESIGN OF PROPOSED SYSTEM

The journey of the Accident Prediction on Vehicle system began with a simple yet profound idea: to leverage technology to enhance road safety. The founders of APV recognized the pressing need for a comprehensive solution that could predict accidents with precision and proactively alert drivers to potential risks. This idea stemmed from a collective passion for reducing the toll of road accidents on human lives and the broader economy.

The development process involved collaboration between experts in various fields, including data science, vehicle dynamics, and human-machine interaction. Countless hours of research, testing, and refinement went into creating a system that could seamlessly integrate with vehicles of all types and sizes. The result is a product that not only meets the highest standards of safety but also offers practicality and ease of use.

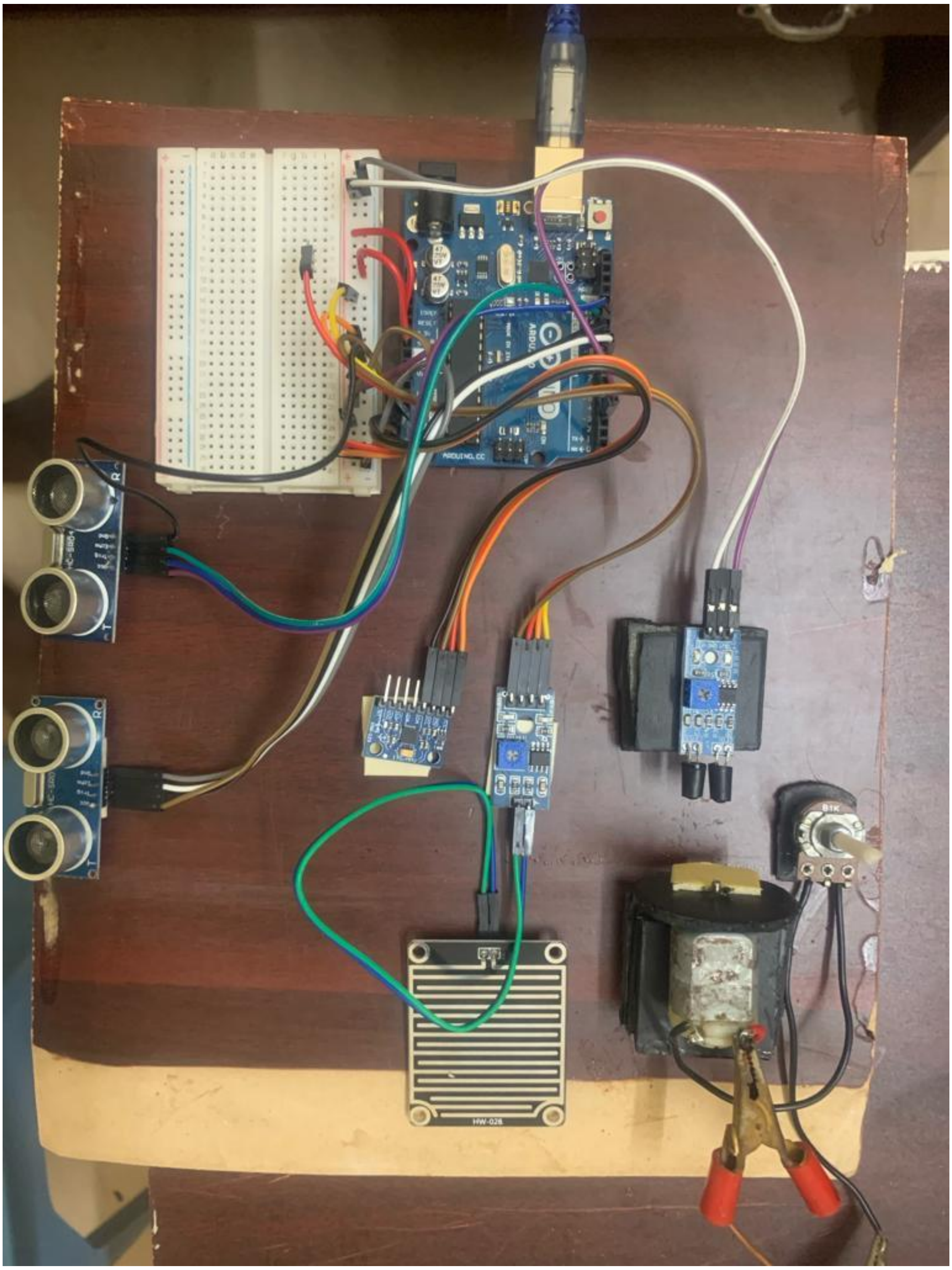

Figure 3.3 DESIGN OF PROPOSED SYSTEM

3.3.1 DESIGN CONSIDERATION FOR PUBLIC HEALTH

To understand the potential impact of APV, it's essential to consider its target customer segment. APV is designed to cater to a diverse range of customers, each with unique needs and concerns related to transportation safety. The primary customer groups for APV include:

1. Vehicle Owners: Individuals who own private cars, trucks, lorries, and other types of vehicles constitute a significant customer segment. These vehicle owners are often deeply invested in ensuring the safety of their family members and themselves while on the road. APV provides them with a valuable tool to enhance safety and reduce the risk of accidents.

2. Fleet Operators: Businesses that rely on fleets of vehicles, such as logistics companies, transportation services, and delivery companies, are another critical customer segment. For these organizations, the safety of their vehicles and drivers is paramount. APV's ability to predict and prevent accidents can significantly impact their bottom line by reducing accidents, associated costs, and downtime.

3. Insurance Companies: Insurance providers have a vested interest in minimizing accidents and their associated claims. APV can be a strategic tool for insurance companies, allowing them to offer lower premiums to customers who equip their vehicles with this safety system. It not only reduces the likelihood of accidents but also helps gather valuable data for risk assessment and claims processing.

4. Government Agencies: Road safety is a top priority for government agencies responsible for transportation and public safety. APV can be integrated into public transportation fleets, helping to prevent accidents and save lives. Additionally, governments may incentivize the adoption of APV in private vehicles through policies and regulations.

UNIQUENESS OF APV

What sets APV apart from existing solutions in the market is its simplicity, efficiency, and comprehensive approach to accident prediction and prevention:

Simplicity: APV employs straightforward logic to predict accidents, minimizing the processing time required for data analysis. Its user-friendly interface ensures that both drivers and vehicle operators can easily understand and interpret the system's notifications.

Efficiency: By utilizing real-time data and advanced algorithms, APV can provide rapid and accurate accident predictions. This efficiency is crucial in critical moments when swift action is needed to prevent accidents.

Comprehensive Safety: APV's holistic approach to safety, encompassing both vehicle dynamics and driver health monitoring, is a unique feature. Few existing systems combine these two critical aspects of safety in a single solution.

Wide Range of Applicability: APV's ability to adapt to various types of vehicles, from private cars to commercial trucks, and its potential for integration into public transportation make it a versatile and adaptable safety system.

3.3.2 SAFETY AND ENVIRONMENT

SAFETY:

1. **Accident Prevention:** The primary focus of APV is to enhance safety by proactively predicting and preventing accidents. By providing real-time feedback to drivers based on a comprehensive set of parameters, the system minimizes the likelihood of collisions, thereby reducing injuries and fatalities on the road.

2. **Driver Health Monitoring:** The incorporation of features like eye detection, pressure sensing, and fatigue detection contributes to driver safety. Monitoring the physical condition of the driver ensures that only alert and healthy individuals are behind the wheel, reducing the risk of accidents caused by driver fatigue or impaired health.
3. **Comprehensive Safety Measures:** APV goes beyond basic vehicle data and considers dynamic factors like weight distribution and center of gravity. This comprehensive approach to safety ensures that the system can adapt to various driving conditions, making it more effective in preventing accidents.
4. **Universal Applicability:** The system's versatility makes it applicable to a wide range of vehicles, including trucks, lorries, and container vehicles. This broad applicability ensures that safety enhancements are not limited to specific vehicle types, benefiting a diverse range of road users.

ENVIRONMENT:

1. **Accident Reduction Impact:** The proactive accident prevention capabilities of APV contribute to a reduction in the number of accidents. Fewer accidents result in decreased traffic congestion, which, in turn, helps reduce fuel consumption and emissions associated with idling vehicles during post-accident scenarios.
2. **Efficient Traffic Flow:** By preventing accidents, APV supports more efficient traffic flow. Smooth traffic flow reduces stop-and-go patterns, optimizing fuel efficiency and minimizing emissions from vehicles. This is particularly relevant in congested urban areas where traffic disruptions are common.

3. **Encouraging Responsible Driving:** The real-time monitoring and feedback provided by APV encourage drivers to adopt safer and more responsible driving behaviors. This, in the long term, can contribute to fuel-efficient driving practices and a reduction in overall vehicle emissions.
4. **Future Integration into Passenger Cars:** As the APV system explores integration into passenger cars, it has the potential to influence the environmental impact of a broader spectrum of vehicles. By introducing advanced safety features to individual cars, the system indirectly contributes to safer and more environmentally conscious driving practices across various segments of the population.

3.4 FUNCTIONAL BLOCK DIAGRAM

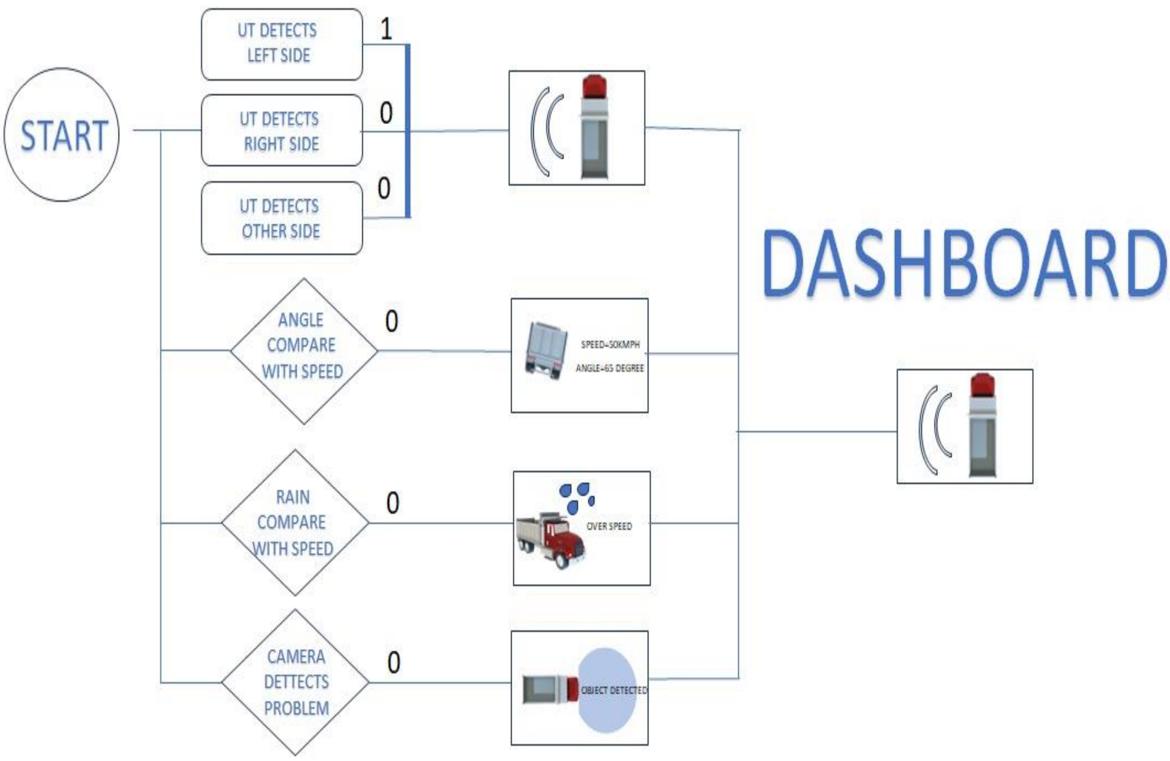

Figure 3.4 FUNCTIONAL BLOCK DIAGRAM

3.5 WORKING PRINCIPLE OF THE PROPOSED SYSTEM

```
/*How to use rain sensor.
   created by the SriTu Tech team.
   Read the code below and use it for any of your creations.
 */
 const int trigPin = 12;
 const int echoPin = 11;
 const int trigPin1 = 9;
 const int echoPin1 = 8;
 float REV = 0;
 int RPM_VALUE;
 int PREVIOUS = 0;

 int TIME;
 int s;
 long duration1;
 int distance1;
 long duration;
 int distance;
 int m;
 int n;
 int k;
 int p;
 int j;
 #include <Adafruit_MPU6050.h>
```

```
#include <Adafruit_Sensor.h>
#include <Wire.h>
Adafruit_MPU6050 srituhobby;

void setup() {

  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT);
  pinMode(trigPin1, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin1, INPUT);
  Serial.begin(9600);//enable serial monitor
  Wire.begin();
  srituhobby.begin();

srituhobby.setAccelerometerRange(MPU6050_RANGE_8_G);//2_
G,4_G,8_G,16_G

srituhobby.setGyroRange(MPU6050_RANGE_500_DEG);//250,50
0,1000,2000
srituhobby.setFilterBandwidth(MPU6050_BAND_21_HZ);

  delay(100);
  //define LED pin
}
void loop()
```

```
{
 rain();
 ms();
 fast();
 Serial.begin (9600);
 attachInterrupt (1,INTERRUPT,RISING);
 ldistance();
 ldistance1();
 k=ldistance();
 p=ldistance1();

Serial.println("*******************************************
");
 if (p < 26){
   Serial.println("see left");
  }



 if (k < 26){
   Serial.println("see right");
  }
 /////////////////////////////////////////////////////
 j=ms();
 Serial.println(j);
 if (j > 83 ) {//check condition
```

```
  if (n > 80 ){
  Serial.println(" g Drive slow");
 }
 }
 else if ( j> 74 ){

  if (n > 70 ){
  Serial.println("g  Drive slow please");
 }
 }
 else if (j > 68)
 {



if (n > 55 ){
  Serial.println(" g over speed Drive slow");
 }
 }
 /////////////////////////////////////////////////////////////////////////////////////////



 m=rain();
```

```
Serial.println(m);

if (m > 500 ) {//check condition
  if (n > 90 ){
  Serial.println(" Drive slow");
}
}
else if (m > 300 ){

 if (n > 70 ){
  Serial.println(" Drive slow please");
}
}
else if (m > 200 || m < 200)
{
 if (n > 55 ){
  Serial.println(" over speed Drive slow");
}
}
////////////////////////////////////////////////////////////////////////////////



n=fast();
Serial.println(n);
```

```
Serial.println("********************************************
");

Serial.println("********************************************
");
 delay(1300);

}

int rain() {
  int value = analogRead(A3);//read value
   return(value);
}
//////////////////////////////////////////////////////////////////////////////////////

int ldistance(){
   digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in
microseconds
```

```
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2;

 // Prints the distance on the Serial Monitor
  return (distance);

}
//////////////////////////////////////////////////////////////////////////////////////////////
int ldistance1(){
  digitalWrite(trigPin1, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin1, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin1, LOW);
  // Reads the echoPin, returns the sound wave travel time in
microseconds
  duration1 = pulseIn(echoPin1, HIGH);
  // Calculating the distance
  distance1 = duration1 * 0.034 / 2;

 // Prints the distance on the Serial Monitor
  return (distance1);
  delay(1000);
```

```
}
//////////////////////////////////////////////////////////////////////////////////////////////////

void INTERRUPT (){
  REV++;

}

//////////////////////////////////////////////////////////////////////////////////////////////////
int fast (){

delay(1000);
detachInterrupt(0);
TIME=millis()-PREVIOUS;
RPM_VALUE=(REV/TIME)*60000;
PREVIOUS=millis();
REV=0;

s=0.1885*RPM_VALUE*0.029;
attachInterrupt(1,INTERRUPT, RISING);
return(s);

}
/*MPU6050 sensor with servo control.
   https://srituhobby.com
```

```
*/

//////////////////////////////////////////////////////////////////////////////////////////////////
///

int ms() {

  /* Get new sensor events with the readings */
  sensors_event_t a, g, temp;
  srituhobby.getEvent(&a, &g, &temp);

  int value = a.acceleration.y;



  value = map(value,  -10, 10, 180, 0);
  return(value);
  //delay(10);
```

3.6 METHODS AND MODERN TOOLS USED

APV owes its effectiveness to the relentless advancements in technology. The system relies on a network of sensors and data analysis tools to gather and process real-time information from the vehicle. These technological components include:

Speed Sensors: APV constantly monitors the vehicle's speed, allowing it to calculate the appropriate gyroscope values for different driving conditions.
Gyroscope Sensors: These sensors measure the rate of rotation of the vehicle, which is crucial in understanding its stability and potential for accidents.
Height and Weight Sensors: These sensors help determine whether the vehicle is loaded or unloaded, affecting the center of gravity and, consequently, the gyroscope readings.
Driver Health Monitoring: Incorporating technologies like eye-tracking, pressure sensors on the steering wheel, and fatigue detection algorithms, APV ensures that the driver's physical state is also considered in accident prediction.
Communication Interfaces: APV seamlessly communicates with the driver through audio alerts, visual displays, and even integration with mobile devices to ensure that safety information is conveyed effectively.

These technological components, working in unison, allow APV to provide accurate and timely predictions of potential accidents. This combination of sensors, data analysis, and communication interfaces is the backbone of APV's success.

CHAPTER 4

CONCLUSION

The Accident Prediction on Vehicle (APV) system is an innovative product that enhances transportation safety through real-time data analysis. It predicts accidents by monitoring speed, gyroscope readings, and center of gravity, distinguishing loaded and unloaded states. APV also includes driver health monitoring features. It effectively detects potential safety issues, appealing to vehicle owners and insurance companies. APV is efficient, offering rapid data processing and comprehensive safety measures. Its simplicity and effectiveness make it a promising tool for road safety and accident prevention in the future.demonstrated its ability to integrate with the circuit by allowing it to achieve as programmes are set and improve system functionality, such as avoiding obstacles and inflating the jacket's air pump.This will require further study on tailoring practicality and the insertion of electronics into the textile to create better flexibility for cyclists through the integration of all aspects of a circuit into a fully functional.

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