

Project proposal for DST & Texas Instruments Inc. India Innovation Challenge Design Contest 2018 Anchored by NSRCEL, IIM Bangalore

Automated Guidance System for Motor Vehicles

Indian Institute of Technology Guwahati

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Project Abstract

The “Automated Guidance System for Motor Vehicles” aims to curb the rising problem of motor vehicle accidents through the constant monitoring of the vehicles’ surroundings. Internal monitoring focuses on ensuring the driver is fit to drive at all times. Human error is the primary cause of accidents and thus it is of utmost importance that the driver is cognitively aware of his/her surroundings. Externally, we intend to provide 360 degree analysis by providing warnings of incoming traffic (including pedestrians) in the blind spots and suggesting minimum braking distance (depending on road conditions and speed). Furthermore, the system guides a vehicle steering off course back on the road. Thus, the system will help prevent accidents by acting as a personalized mentor and helping us make the best decisions while driving.

Team Members – Roles & Responsibilities

SNo	Student Name	Role	Justification
1	Mayank Baranwal	Technical	Product design and visualization
2	Utkarsh Jain	Technical	Product conceptualization and UI Development
3	Srijan Sankrit	Marketing	Creating the business value proposition for customers
4	Nitin Chauhan	Operations	To assess the feasibility and scalability (to mass production)
5	Prateek Manocha	Other	Project guidance and support

Market Analysis

A. Customer Need Identification -

Road safety is one of the most overlooked aspects of wellbeing in India. Monetarily, the figures are staggering: according to the transport ministry of India, a staggering 55,000 crore (3% of Indian GDP) is lost through road accidents. As such, our guidance system is crucial as it helps protect the lives of motorists. Our system also will help control stress levels of the people at the wheel as the need not constantly worry about their surroundings.

B. Serviceable Addressable Market (SAM) Identification & Justification -

Our total addressable market (TAM) is any vehicle owner as guidance systems can be used for any vehicle. However, our research indicates that commercial owners are more inclined towards buying this product as it not only saves lives but helps mitigate financial losses. Our business model is thus oriented towards commercial transport systems, who form the core of our Serviceable Addressable Market (SAM). Certain safety-conscious citizens may also be interested in our product and can be a part of the SAM.

C. Product Differentiation w.r.t. Competition & Justification -

In a significant proportion of accidents, while humans are able to detect oncoming traffic, there isn't enough time to act and prevent an accident. A great deal of countermeasures thus focus on improving the reaction time of humans or providing some form of early warning. Our system has

the novel idea of providing real time minimum braking distances. While empirical data on minimum braking distances is readily available, no systems exist that guide drivers to maintain the required distances. Our system takes in environmental variables such as temperature, precipitation, ice, humidity, current speed etc and apply ML and other analysis to determine the optimum minimum braking distance.

D. Understanding of your customer & user-

The guidance system is suited for any kind of automobile like cars, buses, motorcycles, trucks and even public transport vehicles such as auto-rickshaws. It is directed at two broad categories: companies such as car-hailing apps, truck driving companies and personal automobile owners. In India, most roads are operated well beyond capacity and are built in a haphazard fashion, with multiple blind corners, extremely narrow roads etc. Consequently, our system is beneficial in these dense urban environments, especially with the decline of visibility due to rising smog. As the guidance system is relatively cheap, we expect that any car/truck/bus owner will be able to afford such a system.

E. Distribution Channel Identification -

Our distribution channel strategy is three-fold

- Tie-ups with mega corporations (e.g. car manufacturers, transport service providers like Ola)
- Retail market chain (for individual customers)
- Online marketing through own website and online retailers like Flipkart, Snapdeal

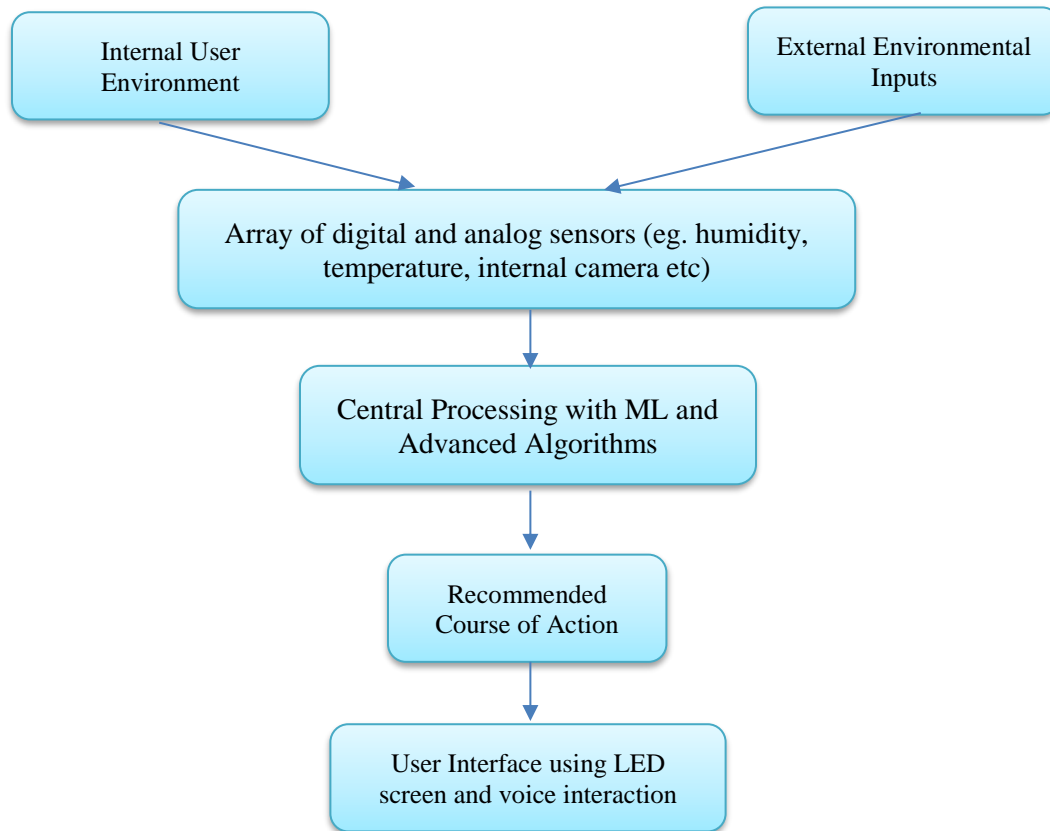
Proposed Design

A. Objective -

The main objective of the “Automated Guidance System for Motor Vehicles” is to drastically reduce the life-endangering problem of motor vehicle accidents by constantly monitoring the surroundings of automobiles.

B. Proposed Solution

a. Block Diagram -



C. Component Used -TI Parts

IC/ EVM	TI Part Number	Link to Parts on TI Website	Qty	How is it being used in the solution?	Available in the TI Store
	BOOSTXL-SHARP128	http://www.ti.com/tool/BOOSTXL-SHARP128	1	LCD will display the minimum braking distance for the instant.	Y
	TMDSCM572X	https://store.ti.com/TMDSCM572X-TMDSEVM572x-Camera-Module-P50225.aspx	1	For giving video input to the Beaglebone Black	Y
	AWR1642	http://www.ti.com/product/AWR1642	1	mmWave Radar Detector for Vehicle	Y
IC	HDC1080	http://www.ti.com/product/HDC1080	1	For taking temperature and humidity of external environment	Y
	BEAGLEBK	http://www.ti.com/tool/BEAGLEBK?keyMatch=beaglebone%20black&tisearch=Search-EN-Everything	1	For doing all processing of input data and recommending course of action	Y

Innovativeness of the Proposed Solution

Our core technical innovation is the determination of real time minimum braking distance. We take in various inputs from the vehicle such as current velocity, current situation of tyres and from sensors like the distance to preceding vehicle, temperature, humidity, precipitation, ice build-up etc. To determine the minimum braking distance, we apply machine learning, training our model based on widely available data on braking distances. Note that while there is data on each individual parameter varying, no data exists on the collective variance of all parameters exists. The resultant distance is then compared with the current distance with the preceding vehicle and the recommended action is then provided based on the output.

This is implementation that marks a shift from existing reactive technology (like emergency braking etc) to one that is predictive in nature, as has been the general trend with the boom of Big Data. As a result, our product is more cost-efficient and has a greater capability to prevent accidents.

Impact of the proposed solution

Annually, around 150,000 citizens of India lose their lives in motor vehicle accidents, making it one of the largest causes of preventable deaths in India. The social impact on families and corporations is immense as accidents are life changing events. Our theoretical predictions indicate, that after thorough analysis of raw data using ML and other noise reduction algorithms, our system can sense and identify obstacles up to 100m and provide an 85% accuracy in recommending the next course of action. Thus, the automated guidance system can help improve the life of motorists all around the world.