Signs with Smart Connectivity for Better Road Safety

Team ID:PNT2022TMID52316

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Project Report

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1. INTRODUCTION:

1.1 Project Overview:

- The Objective of this is to replace the static signboards. Instead, smart connected sign boards are used.

- These smart connected sign boards get the speed limitations from a web app using weather API and update automatically. Based on the weather changes the speed may increase or decrease.

1.2 Based on the traffic and fatal situations the diversion signs are displayed. Guide (for Schools), Warning, and Service (Hospitals, Restaurants) signs arealso displayed accordingly **Purpose:**

The Purpose of this project is to develop a digital sign board system where the normal signs are displayed with their actual names. And also, to create awareness of the road safety to everyone and obey the traffic rules. To create a better view and warn in the night time.

2. Literature Survey:

2.1 : Existing Problem:

- Damage criteria in static sign boards:
  - Paint deterioration ○ Folded Sheets ○ Pole Bent
  - Concealment by Vegetation
- Drivers can face confusing road signs at certain circumstances.
- The National Crime Records Bureau (NCRB) 2022 report states that there were 155,622 fatalities, highest since 2014, out of which 69,240 deaths were due to two-wheelers.
- A study by IIT Delhi points out that the national highways constitute only 2% of the length of roads in India, but they account for 30.3% of total road accidents and 36% of deaths.
- Deaths by accidents on roads increased by almost 17 per cent in 2021, indicating an increase in the rate of deaths per 1,000 vehicles.

3. S . I c .	**Title and Author**	**Year and Publication**	**Inferences**

1.	**Wireless digital traffic signs of the future.** Chai K. Toh, Juan-Carlos Cano, Carlos Fernandez-Laguia, Pietro Manzoni, Carlos T. Calafate.	2018, Institution of Engineering and Technology (IET).	The issues and challenges facing current traffic signs, and how it will evolve into a next-generation traffic sign architecture using advanced wireless communications technologies.
2.	**Traffic Sign Board Detection and Recognition using Augmented**	2020, International Research Journal of	Real-time approach for fast and accurate

	Reality. Akshata Anant Prabhu, Deepika V.D. , Muralikrishna .N, P. Vaishnavi Acharya, A.R.Manjula	Engineering and Technology (IRJET).	framework for traffic sign recognition Which superimposes virtual objects onto a real scene under all types of driving situations, including unfavorable weather conditions and gives a voice alert with the help of speakers.
3.	**Automatic Signboard Detection System by the Vehicles** Anushree. A.S, Himanshu Kumar, Idah Iram, Kumar Divyam, Rajeshwari. J	2019, IJESC.	Signboard detection system in the vehicle which will detect the signboard and warn the driver about it. It displays the alert message or information on provided LCD and voice alert through speakers.
4.	**Development and Testing of Road Signs Alert System Using a Smart Mobile Phone** Eric M. Masatu, Ramadhani Sinde, and Anael Sam	2022, Hindawi Journal of Advanced Transportation).	The paper is based on the research about Advanced Driver Assistance system which is one of the salient features of intelligent system in transportation.
5.	**A Wi-Fi based Electronic Road Sign for Enhancing the Awareness of Vehicle.** A Bhawiyuga, R A Sabriansyah, W Yahya, R E Putra.	2016, IOP Publishing Ltd.	Employment of vehicular network concept in which a vehicle can communicate with other vehicles or with the infrastructure installed along the road.
6.	**Automatic Detection of Road Signs to Control Vehicle Speed** Anuja Nanal, Pooja Motwani,	2019, International Journal of Computer Applications.	Electronic Display controller meant for controlling vehicle speed and monitors the zones,

	Pragati Pawar, Rajat Nirhale, Rahul Patil.		and which can also display the speed to the rf reader with the help of unit attached in the car.

3.1 References

1. Torralba, J. P. García-Martín, J. M. González-Romo, M. García-Castellano, J. Peral-López and V. Pérez-Mira, "An Autonomous, Intelligent Sign Control System Using Wireless Communication and LED Signs for Rural and Suburban Roads," in IEEE Intelligent Transportation Systems Magazine, vol. 14, no. 2, pp. 115-128, March-April 2022, doi: 10.1109/MITS.2021.3049375.

2. Toh, C.K., Cano, J.-C., Fernandez-Laguia, C., Manzoni, P. and Calafate, C.T. (2019), Wireless digital traffic signs of the future. IET Netw., 8: 74-78. https://doi.org/10.1049/iet-net.2018.5127

3. A., Aparna & Shiravale, Sankirti. (2016). Real Time Traffic Signboard Detection and Recognition from Street Level Imagery for Smart Vehicle. International Journal of Computer Applications. 135. 18-22. 10.5120/ijca2016908267.

4. A Bhawiyuga R A Sabriansyah, W Yahya and R E Putra *et al* "A Wi-Fi based Electronic Road Sign for Enhancing the Awareness of Vehicle Driver", in IOP Publishing Ltd 2017 *J. Phys.: Conf. Ser.* 801 012085

5. Karthikeyan D, Enitha C, Bharathi S, Durkadevi K, 2020, Traffic Sign Detection and Recognition using Image Processing, INTERNATIONAL

6. Bhawna Saini 1, Rachna Devi 2, Shilpi Dhankhar 3, Mohammad-ziaul-Haque 4, Jagandeep Kaur 5, Smart LED Display Boards, International Journal of Electronic and Electrical Engineering. ISSN 0974-2174 Volume 7, Number 10 (2014), pp.
1057-1067.

7. Ramalingam, Mritha & chandrasegar, & gowrishankar,. (2014). A survey of light emitting diode (LED) Display Board. Indian Journal of Science and Technology. 7. 185-188. 10.17485/ijst/2014/v7i2.3.

8. Eric M. Masatu, Ramadhani Sinde, Anael Sam, Development and Testing of Road Signs Alert System Using a Smart Mobile Phone, Journal of Advanced Transportation, 10.1155/2022/5829607, **2022**, (1-14), (2022).

9. Zoltán Fazekas, Gábor Balázs, Csaba Gyulai, Péter Potyondi, Péter Gáspár, Road-Type Detection Based on Traffic Sign and Lane Data, Journal of Advanced Transportation, 10.1155/2022/6766455, **2022**, (1-19), (2022).

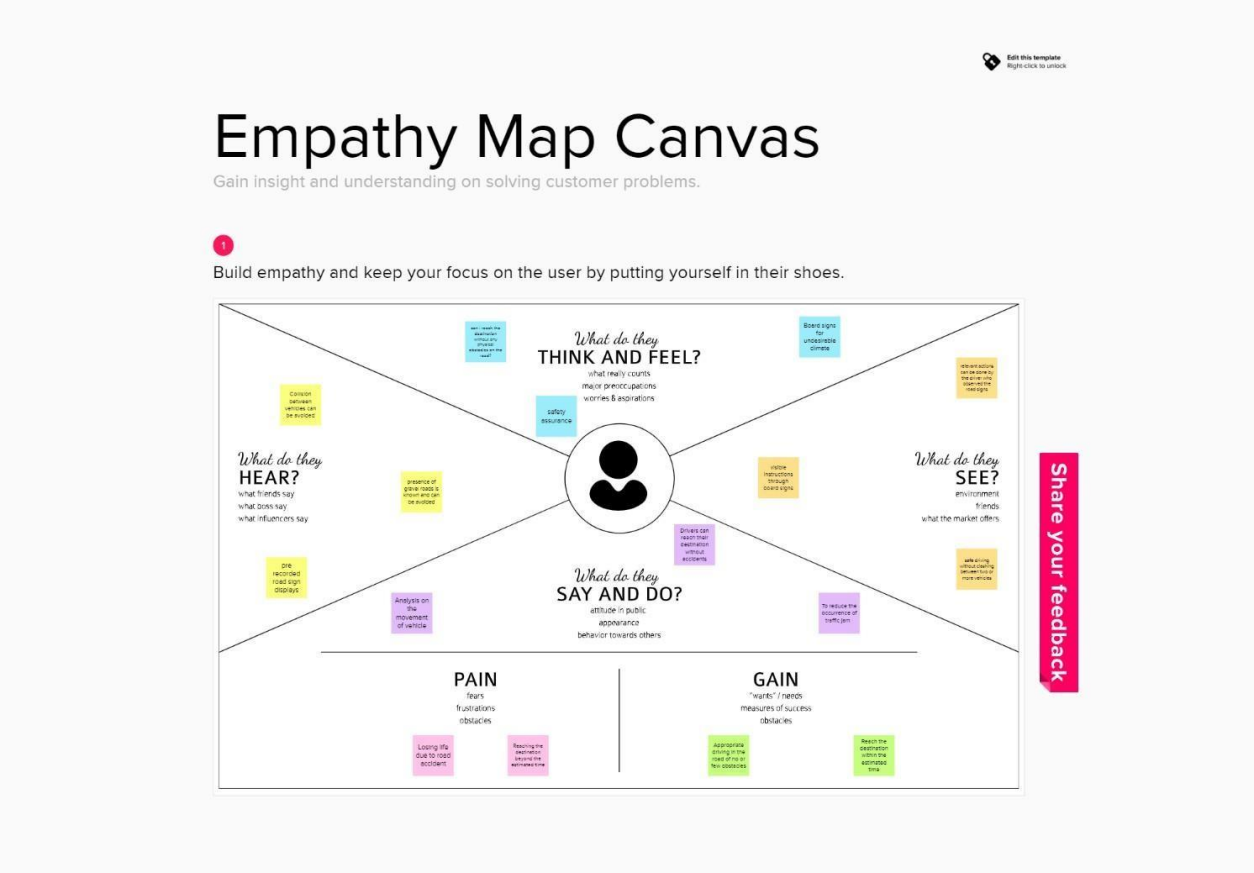
10. Juanhong Xie, Guojian Shi, Weizhi Zhu, Intelligent Recognition Technology for the Segmentation of Traffic Indication Images Concerning Different Pavement
Materials, Applied Bionics and Biomechanics, 10.1155/2022/6278240, **2022**, (1-7), (2022).

2.3. Problem Statement Definition:

To replace the static signboards, with smart connected digital sign boards. These smart connected sign boards get the speed limitations from weather API and update automatically. Based on the weather changes the speed may increase or decrease. It will display the normal signs in necessary places with wordings to be aware of the signs. Based on the traffic and fatal situations the diversion signs aredisplayed. Guide (Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly. Change of modes will take place automatically.

3. Ideation and Proposed Solution:

3.1. Empathy Map Canvas:



3.1. Ideation & Brainstorming:

3.2. Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In present Systems the road signs and the speed limits are Static. But the road signs can be changed in some cases. We can consider some cases when there are some road diversions due to heavy traffic or due to accidents then we can change the road signs accordingly, if they are digitalized. This project proposes a system which has digital sign boards on which the signs can be changed dynamically. If there is rainfall then the roads will be slippery and the speed limit would be decreased. There is a web app through which you can enter the data of the road diversions, accident prone areas and the information sign boards can be entered through web app. This data is retrieved and displayed on the sign boards accordingly.

2.	Idea / Solution description	The Idea is to replace the static signboards. Instead, smart connected sign boards are used. These smart connected sign boards get the speed limitations from a web app using weather API and update
		automatically. Based on the weather changes the speed may increase or decrease. Based on the traffic and fatal situations the diversion signs are displayed. Guide (for Schools), Warning and Service (Hospitals, Restaurant) signs are also displayed accordingly. Additionally, Speed camera integrated with image processing technique is added to detect any traffic speed violations and charge fines.
3.	Novelty / Uniqueness	Usage of speed camera integrated with Image Processing technique for detection of speed violation.
4.	Social Impact / Customer Satisfaction	Diversion Indication System if traffic or constructions ahead. Speed limit Instructions. Guide (for Schools), Warning and Service (Hospitals, Restaurant) signs are displayed.
5.	Business Model (Revenue Model)	Since Image Processing and APIs are used for monitor, this project employs a decent business strategy and enhance services.
6.	Scalability of the Solution	Low-cost Implementation and Maintenance. Durability is of the product is high.

3.3.SOLUTION FIT

1.CUSTOMER SEGMENT(s) CS

- Awareness towards road infrastructure.
- Data is usefull in understanding the road user behavior & flow of traffic

6.CUSTOMER CONTRAINTS CC

- Customers no need to spend any power (or) Network connection.
- If they fail to obey traffic rules, then their money were marked as charged fines as per the court.

5.AVAILABLE SOLUTIONS AS

- Record traffic offenses & provide existing data to collect ,monitor, analyze with the periodic maintenance.
- Monitoring the road events in low light (or) in bad weather conditions.

2.JOBS-TO-BE-DONE/PROBLEMS J&P

- Keep providing of valid data through dynamic sign board system helps to allow people predicting day to day complexities face along the roadway.
- Flow of data updating is quick & speedy , convenient and flexible.

9.PROBLEM ROOT CAUSE RC

- Especially most of the people busy with their mobile phone actions leads to get distracted & they lose attention of traffic.
- Simply , road accidents either due to carelessness(or) due to lack of road safety awareness

7.BEHAVIOUR BE

- The IOT cloud behaves as the instructor to the smart board about the road condition in regular intervals.

3.TRIGGERS TR

- Creating a note that gives a direction on how to recognize that system effectively.

4.EMOTIONS :BEFORE/AFTER EM

- Before: Already existing of man-made static boards raising challenges due to un updated real-time issues & current changes of road events.
- After: This system is better than existing method , of having automation of road signs & communication strategy in the manner of smart city to alert the drivers to reduce relay & congestion while travelling time.

10.YOUR SOLUTION SL

- Pre-function record of specific voice record mode of data along with LED display provide in waiting time at traffic signs.
- In this proposed system is interface with Rain Drop Sensor check if it rainy there, to transmit data over IOT helps to display on LED to along with WIFI connection of internet changing data dynamically with current reporting of event sensing flow of data.

8.CHANNELS OF BEHAVIOUR CH

- The traveller can use the smart board signs to know the road condition whether the traveller from anywhere and the following instructions is one of the big task for the traveller.
- The customers can directly send a feedback mail or message to the departments.(Nearby Patrol Officers)

3.5.SOLUTION ARCHITECTURE

4.PROJECT DESIGN PHASE II

4.1.CUSTOMER JOURNEY

4.2DATA FLOW DIAGRAM

4.3.FUNCTIONAL REQUIREMENT

4.4.TECHNOLOGY ARCHITECTURE

5.PROJECT PLANNING PHASE

6.PROJECT DEVELOPMENT PHASE

Conclusion:

The project concluded by replacing the static signboards with smart connected digital sign boards. Digital road signs are an important part of modern infrastructure and are becoming increasingly common. Digital road signs are becoming more common as technology improves and more states adopt them. The use of digital road signs is expected to continue to grow in the future as it would beobserved user-friendly, economic, environment friendly, profitable promoting roadsafety. Digital road signs are designed to improve road safety and efficiency by providing real-time information to drivers. These signs can display a variety of information, including speed limits, traffic conditions, and weather warnings.

Digital road signs can help drivers by providing information that is not always available from traditional static signs.

Future Scope:

- In the future a speed cam will be integrated with the digital sign board.
- Using Image processing & AI, the details of the driver who breaks thetraffic rules will be updated in the cloud database.

No parking and One way rule violations can also be detected and appropriate action can be taken. Violations of stop signs in intersectionwill also be detected using AI