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Black Spot Area Alert Notification System

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Abstract: ***Road safety is a major concern in the present situation. With increase in traffic volume across the globe resulting in higher road accidents which considerably cause negative impact on economic growth, then after this traffic safety become a major concern. It is found that road accident happening are more frequent at certain specific locations i.e blackspot. An accident blackspot is a zone where road accidents have been historically reported. This paper gives the design and paradigm of a GPS based web application. Adding to an idea, we use Nodejs and express Authorization json web token on the Fatal Accident dataset to address this problem. API Map Live is popular technique that identifies the accident-prone areas. In this project, we develop a web application by using React through which traveller came to know the upcoming blackspot notification before 500m and notify the traveller. For small scope we will provide dataset of Blackspots in Uttar Pradesh taken from officially government website (north.gov.in). The conclusive goal is to identify blackspot and notify the traveller by providing safety guidelines.***
Keywords: Blackspot, GPS, Web application, Mongo Db, Notification, API Map live.

I. INTRODUCTION

Road accident is an unexpected event, typically sudden in nature and associated with injury, loss, or harm. Motor vehicle accidents are a major cause of death, and, despite improvements in automobile safety, projections have indicated that deaths from traffic crashes and the deaths from traffic crashes will increase significantly by 2030 because of increased motor vehicle ownership. Based on the recent statistics, more than one million people were died due to road accident, and approximately twenty to fifty million people were physically disabled as a result of Road accident for the past few years. In many situations the family members or emergency services are not informed in time. So, this is an intention to implement an innovative solution for this problem by developing a Black Spot Notification System.

Road accident is most important and common issue for government and people. Road accidents have been the leading cause of deaths worldwide with the last three decades seeing a substantial increase in this regard. So, road accident has been major public health concern. We all as a human being want to stay safe and avoid accidents. In order to find the solution to avoid accident and drive safe we have to create database to get useful information.

II. LITERATURE SURVEY

The paper [1] titled “Accident Spot Detection using Android”, the author proposed a system to identify the causes of accident of road accident by using Association Rule Mining technique. In this K-means algorithm are used to accident locations into four levels and takes accident level count as a factor to cluster the locations. [1]

The paper [2] the author gave a detailed explanation about the black spot area and a procedural approach for the identification of black spot based on Weighted Severity Index. Also it gave a methodology to identify various traffic and road related factors causing accidents. And the author proposed some methods to improve the transportation system. [2]

In paper [3] the author gave a predictive control of engine speed using MPC controller. The paper describes the automated control of engines speed and to maintain vehicle drivability. The paper [4] named “Automatic Vehicle Accident Detection and Reporting with Black Spot” the author proposed a system to collect location information to manage and focus using GPRS provided by Google Earth. Further, MEMS sensor detects the surplus vibration in case of accident. This method ends up only with detection of accidents but not any way to prevent or control the accidents.[1] As a result of increase in Road accidents , there is a much need in road safety. Black spot are the place where frequent accident can be seen. In previous years the remedial steps taken to decrease the blackspot are (I) identify the existing blackspots (II)making precaution (III) planning for remedies in case if any accident occurs. Making precautions is using the manual approach of indicating a speed restriction, straightening bends, hairpin bends through a roadside indicator. In the case , the human are unable to seen the signal or the roadside indicator is being damaged, the accident occurs. There is no such any notification system that helps the traveller . Sometimes, the drivers see the indicator, he/she does not follow that. In such ways, the measures taken to prevent accidents are improving road safety.

III. TECHNOLOGY STACK

A. *React JS*

ReactJS tutorial provides basic and advanced concepts of ReactJS. Currently, ReactJS is one of the most popular JavaScript front-end libraries which has a strong foundation and a large community. ReactJS is a declarative**,** efficient, and flexible JavaScript library for building reusable UI components. It is an open-source, component-based frontend library which is responsible only for the view layer of the application. It was initially developed and maintained by Facebook and later used in its products like WhatsApp & Instagram.

B. *Redux*

React redux maintains the state of the application in a single place called Redux store. React component can get the latest state from the store as well as change the state at any time. Redux provides a simple process to get and set the current state of the application and involves below concepts.

1) *Store:* The central place to store the state of the application.
2) *Actions:* Action is an plain object with the type of the action to be done and the input (called payload) necessary to do the action. For example, action for adding an item in the store contains ADD_ITEM as type and an object with item's details as payload

C. *Mongodb*

MongoDB, the most popular NoSQL database, is an open-source document-oriented database. The term 'NoSQL' means 'non-relational'. It means that MongoDB isn't based on the table-like relational database structure but provides an altogether different mechanism for storage and retrieval of data. This format of storage is called BSON (similar to JSON format). SQL databases store data in tabular format. This data is stored in a predefined data model which is not very much flexible for today's real-world highly growing applications. Applications are storing more and more data and are accessing it at higher rates.

Relational Database Management System (RDBMS) **i**s not the correct choice when it comes to handling big data by the virtue of their design since they are not horizontally scalable**.** If the database runs on a single server, then it will reach a scaling limit. NoSQL databases are more scalable and provide superior performance. MongoDB is such a NoSQL database that scales by adding more and more servers and increases productivity with its flexible document model.

D. *Node JS*

Node.js is an open-source server environment. Node.js is cross-platform and runs on Windows, Linux, Unix, and macOS. Node.js is a back-end JavaScript runtime environment. Node.js runs on the V8 JavaScript Engine and executes JavaScript code outside a web browser.

Node.js lets developers use JavaScript to write command line tools and for server-side scripting. The functionality of running scripts server-side produces dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying webapplication development around a single programming language, rather than different languages for server-side and client-side scripts.

E. *JSON Web Token*

JSON Web Token (JWT) is an open standard that defines a compact and self-contained way for securely transmitting information between parties as a JSON object.

This information can be verified and trusted because it is digitally signed. JWTs can be signed using a secret (with HMAC algorithm) or a public/private key pair using RSA. Authentication: This is the typical scenario for using JWT, once the user is logged in, each subsequent request will include the JWT, allowing the user to access routes, services, and resources that are permitted with that token.

Single Sign On is a feature that widely uses JWT nowadays, because of its small overhead and its ability to be easily used among systems of different domains.

Information Exchange: JWTs are a good way of securely transmitting information between parties, because as they can be signed, for example using a public/private key pair, you can be sure that the sender is who they say they are. Additionally, as the signature is calculated using the header and the payload, you can also verify that the content hasn't changed.

F. Map Libre

Map Libre is a community-governed non-profit organization that develops, maintains, and promotes free, open-source software. Each project under the Map Libre umbrella is part of the map visualization stack, from the raw data to the map visualization and interaction. Map Libre started as an open-source fork of the popular Mapbox rendering libraries after their switch to a proprietary license in December 2020. Often "MapLibre" still refers to these key rendering libraries: MapLibre GL JS, which is a TypeScript library for rendering maps in web browsers, and MapLibre GL Native, which is a C++ library to show maps in mobile apps on iOS, Android, and other native targets.

G. Map API

Google Maps APIs are pre-packaged pieces of code that let you quickly and easily include maps on your websites or in your mobile apps – and then add extra functions to your applications. They're available for Android, iOS and web browsers, and as HTTP web services that let you pass information between systems.

IV. METHODOLOGY

A. Front-End Of The Website

In this we use technology like React and Redux to create the webpage.

1) *React:* React is a JavaScript library for building user interfaces. React is used to build single-page applications. React allows us to create reusable UI components.
2) *Redux:* React redux maintains the state of the application in a single place called Redux store. React component can get the latest state from the store as well as change the state at any time. Redux provides a simple process to get and set the current state of the application and involves below concepts.
3) *Store:* The central place to store the state of the application.
4) *Actions:* Action is an plain object with the type of the action to be done and the input (called payload) necessary to do the action. For example, action for adding an item in the store contains ADD_ITEM as type and an object with item's details as payload.

By using these technology we create some pages of our website like:-

- Home page our website
- Login page to use some other functionality of our website
- Signup page was created to register the user to the database.

B. Back-End Of The Website

In backend we use technology like NodeJs and MongoDb.

1) *NodeJS:* Node.js is a cross-platform environment and library for running JavaScript applications which is used to create networking and server-side applications. Our Node.js tutorial includes all topics of Node.js such as Node.js installation on windows and linux , REPL, package manager, callback, event loop, OS, path, query string, cryptography, debugger, URL, DNS, Net, UDP, process, child processes, buffers, streams, file systems, global objects, web modules etc. There are also given Node.js interview questions to help you better understand the Node.js technology.
2) *MongoDB:* Mongodb is a mostly used NoSQL database which is open-source, document oriented database .NoSQL means non relational so is not a table oriented database for storage and retrieval of data. Modern applications are more networked, social and interactive than ever**.** Applications are storing more and more data and are accessing it at higher rates. So we use it to store information about the user while signing up and also to check the entries while login from the database. And in the home page we use it to store all the data of cities like black spot areas etc.

C. Authorization

For authorization of the user we use Json web tokens so that user can be authorized and able to use some extra functionality of the website that we provide to the user or admin. JSON Web Token (JWT) is an open standard that defines a compact and self-contained way for securely transmitting information between parties as a JSON object. This information can be verified and trusted because it is digitally signed.

1) Working

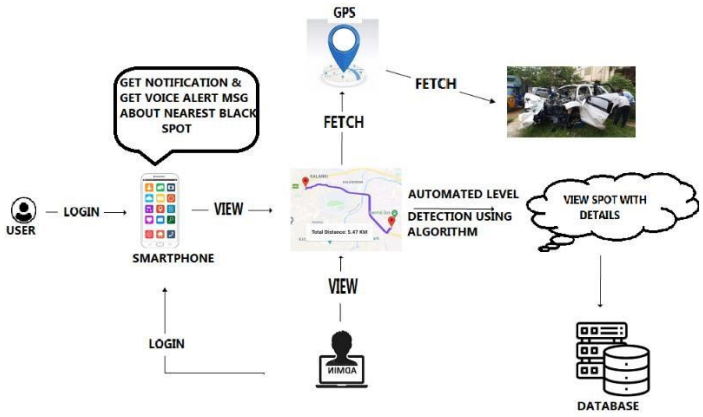

Fig 4.1

2) Website Consist of Two Main Components

a) User: User can integrate google map in their mobile with android application. After integrating google map user can see the crime and crime spot on that map, using these spots user can choose their root of traveling which is beneficial for them. In road travelling they also see the crime spot. All crime spot are included by the police. Police added crime black listed spot on integrated map which is help people to travel. If tourist or people reach on any crime location and they use this android application then our proposed system send voice message to people and get alert them and send information about nearby blackspot on which crime which will held hence that spot is counted in black list spots.

b) Admin: Admin is the person who made the application , so he can view what user are doing with his application and he has the access of database , so he can add or delete data from the database . In this website first user give the details of source and destination where he want to go and he is able to see the map which gives all the information about the path and the blackspot areas and when any blackspot comes in the range of 500 meters, application alert the user and also provide precautions which must be followed by the user. In this GPS used to track the location of the user and the vehicle.

V. RESULT AND DISCUSSION

It is difficult to find the blackspot and their respective speed limit or any of the caution in the road. In these cases, the designed system will automatically alert the user by sending a notification of the heading blackspot to prevent from accident. Message alert provided by the application. Sending a notification alert is lot easier convenient because all of the essential functionalities reside together. Thus, the developed application gives notification to the user before 500 meter which helps the user to reduce the vehicle speed to the respective limits with in the time the vehicle reaches the blackspot.

VI. CONCLUSION AND FUTURE SCOPE

In this study, the technique of association rules with a set of accidents data to identify the reasons of road accidents were used. The main result of this study is that although the characteristics of humanity and behavior are very important in occurrence of all road accidents but we can understand that spatial features and infrastructure play a major role in the accident. In this study it is tried to choose the interesting and superior rules to provide a lot of valuable information for policies to provide better safety policies. This article can be a step towards providing useful information for highway engineers and transportation designers to design safer road.

Thus, we have successfully made web applications who will help riders to drive safe and be safe and road accidents can be reduced. We are considering this project for small scale i.e. for small range of region. In future, it can be implemented for large region.

A visual representation of one of the accident-prone locations is displayed, along with accident occurrence date information and accident occurrence time information associated with the accident-prone location can also be add. We can add sensor device to sense the accidents if it is happened then the application automatically sends message to their family member or anyone else whose data may have been fed into the user application. The proposed system leans to just providing drivers about the black spot information and directives. This system can be extended to cover entire traffic events such notifying the drivers about the road blocks on the roads, alerting drivers whenever there is an accident a head and perhaps whether this accident can result to traffic jams so that he/she can change course.

The project can also be made around to be a data generating system for further analysis by traffic experts. For instance, it can be providing data to traffic control agencies on the impact it has on drivers' behavior around the black spots. This information can assist the government make decisions on possibilities of deploying the projects to various transport systems.

Modified to report the accident to the nearest emergency like hospital, police and rescue team. This will enable the responders to track the exact location of the accident on a Google map and save the victims in a limited time without any loss of life. We intern to take this system to the next level by introducing a new technology to use the mobile application without Internet connection in less connectivity area.

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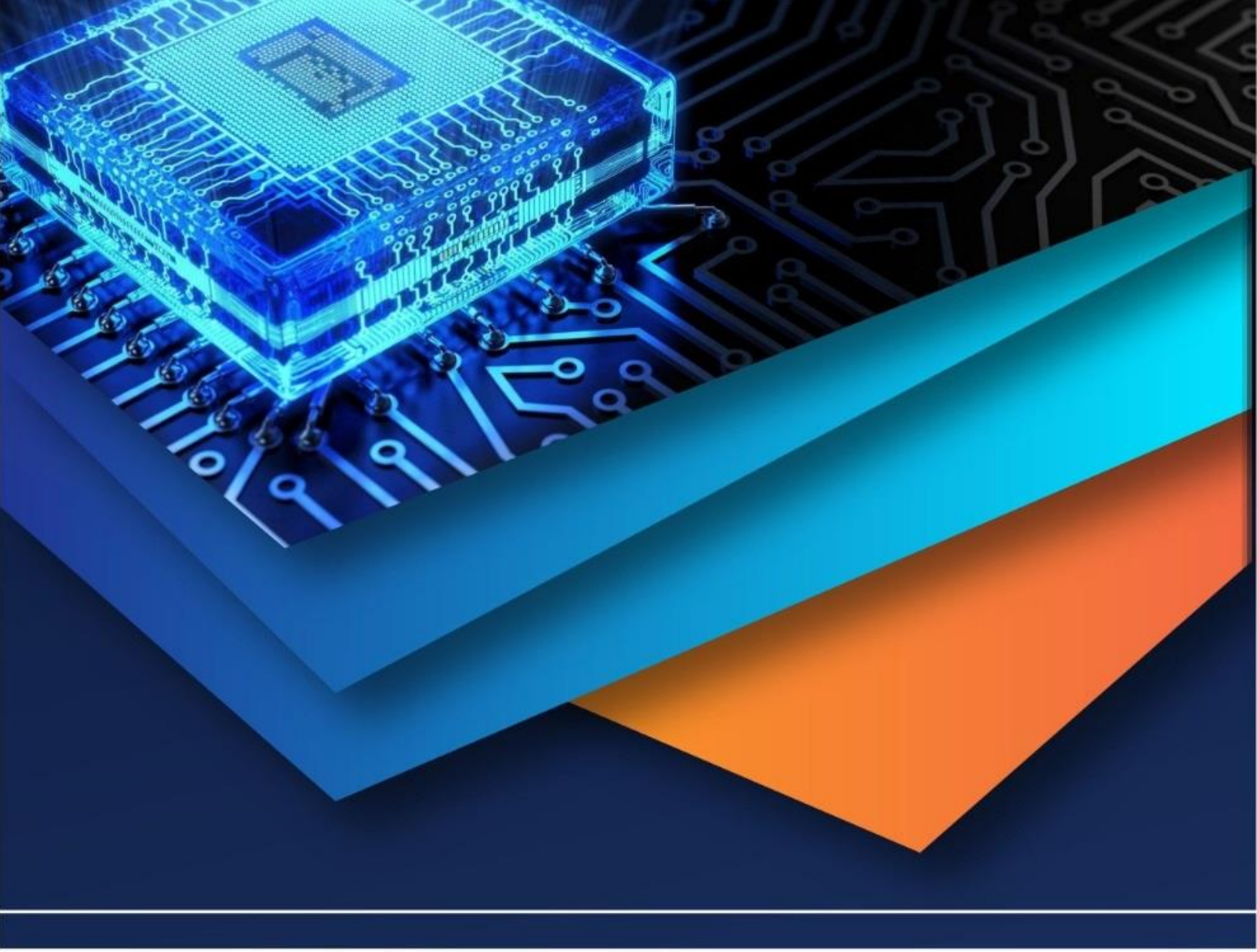

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