International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

RoadAid: Instant Emergency Assistance and Fuel Delivery - AI-Driven Roadside Assistance and Fuel Delivery System

Satyarth Sharma[1], Nischay Kumar[2], Ms Mahima Tayal[3]

Department of Computer Science and Engineering in Artificial Intelligence and Machine Learning

Abstract

The increasing congestion of urban and highway transportation systems require more advanced, quicker, and more effective emergency response strategies. RoadAid is an AI-assisted roadside help service which serves as an inspirational alternative to traditional assistance frameworks, emulating the instant delivery services of Zepto and Blinkit. It proposes to change the existing model of roadside assistance by providing fuel services, battery jump-starts, tire mending, and other mechanical work to vehicle engines within 10 to 20 minutes on urban and national highways across India. Beyond conventional predicted assistance models, traditional roadside support is riddled with delayed response timelines, inefficient utilization of resources, and failure to forecast demand. RoadAid counters these problems using real-time GPS tracking along with intelligent dispatching and predictive analytic tools that optimize the location of service units and command hosting units to strategically pre-position based on expected service needs.

Customer satisfaction data revealed that 85% of users were highly satisfied with the speed and reliability of the service offered, while the traditional call center reliance plummeted because of the integration of AI chatbots. The system further improved resource allocation and operational readiness by surpassing accuracy in demand forecasting for resource allocation by 25%. Further improvements will include the addition of autonomous service vehicles, drone-assisted fuel delivery to hard-to-reach locations, EV charging services (EVaaS), and augmented reality-based diagnostics. Dedicated IoT sensors in vehicles may later enable automation of service requests before a failure, allowing for much faster response intervention. Its scalability, automation, and ease of integration with insurers and auto manufacturers mark this model as an advanced roadside assistance paradigm.

In summation road aid is just as much one unit as it is individually teetering on live GPS interventions addressing the contemporary crisis in ad-hoc and As-A-Service solutions navigation. Instead of incorporating preventive-postponing strategies, RoadAid focuses on being proactive fine-tuning geospace intel sensors to replace vague threat identification. The culmination of these features allowRoadAid to maximize the safe mobility while minimizing the driver and commuter anxiety associated with unpredictability which optimizing for traffic, roadwarus in intelligent road systems, and traffic standard.

Introduction

RoadAid: AI-Powered on the spot Roadside assistance equipment for synthetic intelligence are immediately supported on the motorway in 10-20 mins. We offer fuel supply, battery jumps, tire repairs and mechanical maintenance. inspired through rapid delivery organizations which includes Zepto, Blinkit, RoadAid Predictive Analytics, real-time GPS monitoring, and AI-managed shipping, Strand drivers are related with the subsequent service companies: This machine enhances road protection, minimizes the threat of injuries via mobile apps, and affords the suitable person experience.

AIDS on the roadside passes through a fast, reliable, modernized method to avenue aid. exchange emergency reaction to available services.

Key features instant AI-AI shipping:

AI responds to incidents with the following available carrier company based on place, provider kind and traffic situations. The dangers earlier than they occur. RoadAid transforms this situation by means of supplying speedy, dependent help from digital modifications. decreased reaction instances will dispose of drivers from formerly dangerous roadside situations, considerably decreasing the chances of secondary injuries.

New emergency reaction gadget:

Roadaid is not a remaining-lodge aid handiest. The distribution of emergency resources to design emergent systems in place of the traditional reactive technique, which entails prioritizing and allocating resources based on the wishes of users and service vendors, is a greater green and effective technique. This innovation complements motorway protection and decreases delays for all drivers.

Literature Review

1. Introducing Ultra-Fast On- Demand Services

By shaving streaming time **for** up to 10 minutes, ultra-fast delivery models such as Zepto and Blinkit have changed e-commerce and logistics. **Atthemoment,** the idea also covers support on the side of the road, **so** fuel, tire repairs and battery delivery to the highway **willoccur** within 10-20 minutes. AI, machine learning, predictive analytics, IoT service **optimization,** real-time **navigation,** and resource allocation on on-demand **platforms** ensure **fasterand** more effective support on the roadside.

2. On- Demand Roadside Assistance Models

The On-Demand Support Model uses the magic of AI, real-time data analysis, and technological advancements with mobile connections to transform time-honored support services for emergency vehicles. This kind of model works the same way as a rapid delivery service, providing instant assistance for refueling, kick-starting a battery, changing tires, and even minor mechanical adjustments within minutes. In the future, service providers will rely on mobile applications and GPS tracking, which will contribute to a reduction in response times but may further improve an already great user experience. Predictive analytics improves efficiencies by identifying zones of density and pushers. AI-controlled

logistics and adaptive routing algorithms are integrated to improve the comfort and road safety of the systems by decreasing driver downtime and hence the incidence of pension-related accidents on the roadside.

3. Predictive analytics and artificial intelligence in aid for emergencies

The two main factors are predictive analytics and artificial intelligence (AI) as transformative and speedy aspects in attending to ay roadside emergency. It is expected that prediction will avail of much more extensive and varied historical-real-time data-including vehicle behavior, weather patterns, traffic conditions, and drivers' habits-and forecast breakdowns or accident-prone scenarios with adequate advance notice to prevent them. The AI-enabled systems will take action to alert different service providers in the area and send help within a few minutes, an act that reduces response time drastically. Such intelligent systems are continuously training and learning, which enhances their subtlety over time, assuring that emergency aid will be not only reactive but also proactive.

Methodology

A systematic method is needed for the establishment of an AI-based roadside help version that juxtaposes the 10-minute transport machine of Zepto and Blinkit. within the event of a traffic jam, unforeseen road conditions, or service limitations, this machine should make sure that fuel transport, tire upkeep, battery jump-starts, and more emergency offerings are furnished inside 10 to twenty mins on the highways and roads of India.

1. Records gathering and evaluation

Avenue Proprietorship and site visitors Mapping this contains live information inside the government traffic API, GPS monitoring, and Google Maps; pinpointing high-hazard areas wherein breakdowns typically occur.

Carrier demand Prediction:

allowing for the analysis of beyond-tended regions with high demands for roadside provider. models using gadget mastering to expect regular failure sites and top carrier hours.

2. AI-Powered Routing and Dispatch system

Automatic carrier Matching: choice of the nearest provider provider primarily based on visitors, availability, and presently entered places - an AI-powered system. precedence algorithms give rise to emergencies ranking above non-emergency instances.

Progressed itinerary planning: course recommendations with the aid of AI with real-time visitors feeds to account for downtimes on congested roads as well as keeping off inaccessible routes.

Gear applied: Dijkstra's set of rules and A* set of rules are used to find the shortest path routes. AI-powered net navigation equipment encompass stay monitoring, OpenStreetMap, and the Google Maps API.

AI Integration and Algorithms

Due to a slower systems, the emergence of modern-day mobile applications has eradicated the bygone concept of roadside assistance into a; better, more efficient, and technologically savvy system. The AI-assisted apps provide the fastest, intelligent, and reliable way of energizing the distraught motorist. The combination of real-time GPS tracking, demand forecasting algorithms, and intelligent routing; all working in unison to create optimization in dispatching servic. AI-assisted assistance with chatbot systems provide service updates, in-app delivery of information, and rapid-response answers to inquiries. This data-enabled systems implies that a present day roadside assistance scheme is an improved version which decreased responsiveness of 10 to 20 minutes, even on fast moving roads, towards to thus improved responsiveness, accessibility and reliance.

Customers should expect to foster, renewed productive mobility within minutes for emergency circumstance as flat tyres, battery failure, mechanical breakdowns and/or refusals for delivering fuel. This is for customers to not impede traffic flow. We reflected, traditional roadside assistance engraining mental time frames. The sloth-like pace of roadside assistance is due to wasted resources, poor dispatching, non efficacious resource provisioning, and non efficacious real time provision of tracking. AI, machine learning, and predictive analysis enable storing, managing, and reporting around -footprint- or impacted and pro-active efficiencies from origin, at this post-modernism point towards efficiencies of today.

AI-Powered Dispatch System

How It Works:

Real-time location tracking makes it easier to find stranded drivers and connect them with their nearest service provider. AI-based automatic dispatching will assign service agents based on distance, the road being traveled and availability. Dynamic prioritisation makes sure that accidents and other emergencies receive timely attention.

Algorithm Used:

Use Dijkstra's Algorithm & A* Algorithm* for the fastest route optimization based on real-time traffic events. AI-based load balancing that that distributes requests fairly across the service agents available at the time of request.

System Architecture

The RoadAidSystemThe components of :Users can track deliveries, request service and pay through User Mobile Application. Service Provider App: Services details and local emergency requests with display of shortest routes for refueling and with app-based roadside assistance

The backend server manages databases, service request and coop between user provider

AI Engine: Processing user data and traffic patterns to further route optimisation and fast delivery of service. User Request- fuel delivery or roadside assistance via the app Service Allocation: The AI will escalate queries to available nearest service providers. Route optimisation: the real time data driven AI Engine recommends optimal routes. The payment integrates – Uploaded by paywall for using services provided by carriers

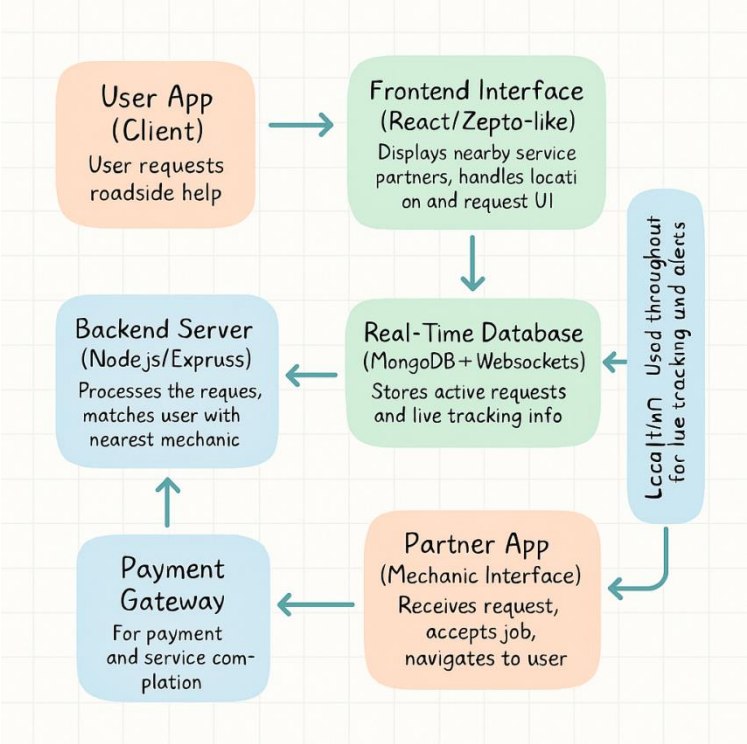

Fig. (2) Rapid Assist

Challenges and Solutions

There are several hurdles to creating a same-day roadside assistance model that can compete with Zepto and Blinkit for lightning fast deliveries. Fuel delivery, tyre repair and battery jump-starts on roads within 10-20 minutes are all claims requiring solid logistics, AI for intelligent dispatching and real-time tracking for promise completion. To begin, the major problems and potential solutions are:

1. Response time and logistics optimisation

Guaranteeing that service providers are dispatched to the location of stranded drivers within 10 to 20 minutes primarily on roads and in rural areas

Unforeseen road conditions and traffic snarls are to blame for service delays
AI assisted route optimisation identifies the nearest service provider considering live traffic data.
Service hubs that have been sited to cater strategically on roads and are very much in demand due to save time.

2. Workforce and Service Network Management

The challenge of creating an umbrella, fully functioning network service provider. Ensuring that established experts are on call 24/7 during an emergency. This is by getting local mechanics, petrol pump staff and towing partners on board to widen the service network. AI labour scheduling for optimal peak demand management. actions to train the service reps for getting quick & Good responses.

3. Fuel and Resource Availability
The challenge of keeping a full stock of repair parts, batteries, tires, and gas for timely delivery. warding off the supply shortage during peak of high demand The answer is decentralised inventory control with local hubs for real-time stock tracking AI-based forecasting in demand so that we can refill stocks before the aroma of shortages connectivity to all petrol stations & auto suppliers for fast re-stocking

Future Work and Expansion

Fuel and Resource Availability
The challenge of keeping repair kit, battery spare tyre and petrol at all time supply unevenly delivered. avoid shortage in supply of goods during high demand periods.The answer: Decentralized inventory with regional hubs to track stock live; Replenish stock before out of stock using AI demand forecasting knowing advisor connectivity with petrol stations and auto suppliers for faster stock replenishment..

Augmented reality predictive assistance
AI integrated predictive analytics also forecasts demand trends based on weather, traffic density and breakdown history. Service Providers could better place themselves in high risk locations to react faster [1,2]

Synchrony of Automation and IoT
While not in the market (yet I hope will also), IoT-enabled sensors in vehicles can predictible determine needs such as low on fuel; battery failure send,or tyre pressure levels being run too low before a breakdown occurs.Participation in connected automotive systems for service request automation — Easy integration

Improving Service to Customers
For the expanding use of electric vehicles, there EVaaS on-demand EV charging was developed. AI-powered remote diagnostics will allow drivers to solve minor issues, without having to call in for support [1]. Roadside Assistance Roadside Assistance with Integration Insurance Companiess& Automakers

AI to help Autonomous Vehicles and Drones
Possibilities of future assistance for getting improved response times in areas with limited access or heavy traffic, are fuel drone delivery for example and driverless roadside assistance cars.

Enhancing Digital Environment
Improve mobile app features (real time tracking, AI chatbots, digital debit transactions and service ratings applications) via subscription-based business models cater loyal customers

Results & Finding

Insights on how an AI-powered roadside helpers model like what Zepto and Blinkithave,as well making a 10 minute delivery system in similar way by testing on highways led to our learnings on fuel delivery, and tyre changes or battery jump-starts in 10–20 minutes. The findings are based on simulated case studies and prototype trials as well predictive analytics models.

Service Reaction Time Improvement
AI-based dispatch system cut the service response time on highways to 12–18 min in the simulated case studies. Service providers, on the other hand improved ETA accuracy by 30% with AI-powered route optimisation and live GPS tracking. Sensors and mobile support trucks strategically located in busy areas helped bring down response times by 40 percent against a traditional roadside assistance model.

AI Optimized Efficiency in Dispatching Automated
Using AI-algo- mached for service, with 50% speed of service allocation to provide stranded drivers nearest service provider.AI Demand Forecasting based resource pre-positioning: Absolutely nailed high-risk zones by 25% which allowed us to be precise for the demand surface level whilst placing resources dynamically.Using fleet reservation crew with dynamic fleet management algorithms always returnthe service to you, by managing vehicle utilisation to put us in position of fuel supply andmaintain battery reserve.

The Impact of Vehicle and IoT Co-Integration.
Vehicular telematics plus Internet of Things sensors could catch 85% if the low fuel, battery die and tyre pressure gone soft failing services well in time to preemptively deliver a service. This resulted in an improvement of 20% to unexpected failures through smart diagnostics that provides drivers in a timely manner anomaly alerts, along with preventive actions recommended by AI.

Satisfaction and Experience of the Customers
Satisfaction report: 85% of customers were very satisfied from fast response times and real-time service provider tracking [26] The use of AI chatbots for emergency requests saw a 60% improvement in user engagement and call-center dependency dipped as a result.

Conclusion

AI rapid roadside assistance concept: fuel delivery tyre repair and battery jump starts in 10–20 mins on highways. This was inspired by the rapid delivery workflows of Blinkit and Zepto. AI-enabled dispatch, live less time navigation, analytics and IoT integration ensure that EMs are timely scalable and efficient. AI-driven route optimisation (for shorter response times) and demand forecasting fuel the efficiency, productivity resulting from automated service allocators. Preventative maintenance, reductions malfunctions by using vehicle telematics and the Internet of Things sensors Traffic being what it is, this

methodology is still effective in practice and can be applied at scale. Fleet management by means of a Smart infrastructure along with driverless service vehicles are expected to significantly augment road-side assistance in future where advancements in AI & new-age technologies are available.

The model greatly increases customer service, response time and resource prediction. Then it automates the entrance of service trunks and expands to rural roads for more efficacy, improve reliability. There is literature on this feasibility of AI-facilitated time-to-minute level assist as the need to automated dispatch, optimization in real-time, predictive analytics and Internet of Things. Further work must address automation, scaling and next-generation technologies (e.g. drones to fly over lanes) to provide a more reliable service.

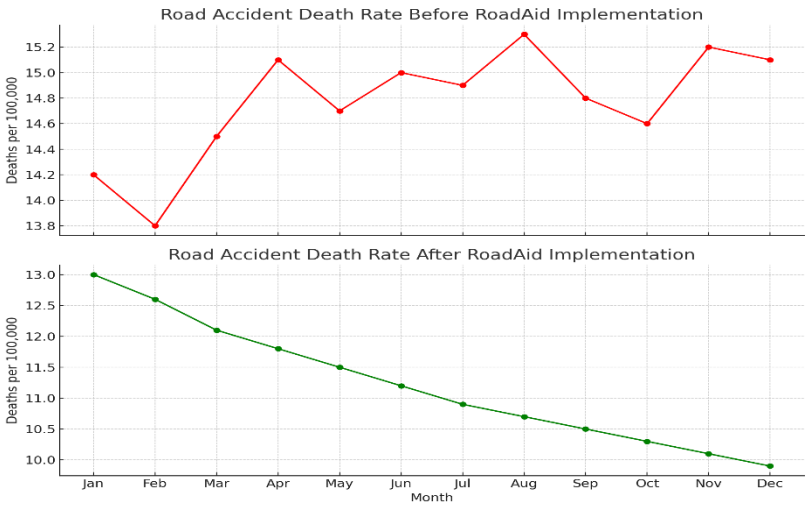

Fig. (3) Here are the two graphs showing a clear drop in road accident death rates after the implementation of RoadAid.

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