Real-Time Road Pothole Complaint Registration App

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Abstract
Road maintenance is the process of preserving and maintaining a road's regular structure. By enhancing safety, comfort, and lowering the cost of operating a car, road maintenance has a dramatic and immediate positive impact. "Real-Time Road Pothole Complaint Registration App" is a digital initiative to empower citizens to notify the authorities of any defects or problems in the roads managed by government. The images of the pothole or maintenance issues are added by capturing image at the time and location is added from the background, in order to prevent fault report. The purpose of the App is to improve the response time of road maintenance issues and to enhance road user satisfaction.

I. INTRODUCTION

Street upkeep is the interaction protecting and keeping street structure as typical as could really be expected. Drivers, highway managers, and automated driving in the future in smart cities will all benefit greatly from real-time road surface information observation and analysis. High-quality road condition is the foundation of urban development. However, there will be numerous imperceptible roughness after years of usage. These potholes will increase vehicle structural noise and have a negative impact on NVH, which will make driving and riding in the car unpleasant for the driver and passengers. When a pothole is outwardly discernible and inconspicuous or undeniable by the driver, it is probably going to harm the vehicle's suspension, move out of the driving path, or cause a backside impact by crisis slowing down, in this manner compromising the life and soundness of the driver and travelers. High-quality roads condition will enhance the comfort and safety of the driver and passengers. The road surface without the obvious defects improves the speed of the vehicle as much as possible to ensure the efficiency of life and production. However, the temperature, external forces, overloads, and human damage bring road damage. It poses a significant safety risk to vehicles and motorists if the road damage cannot be observed and resolved in time. Although researchers in the past have proposed various methods, they are inadequate in spatial and temporal resolution and efficiency. All of these factors emphasize how crucial it is to gather information about such poor road conditions, distribute it to a government agency, and collect it. This helps to make aware the government authorities and thereby forcing them to take immediate response. Reducing the number of road maintenance issues thereby reduces the number of accidents and loss of life.

II. LITERATURE SURVEY

[1] While the vehicle is moving, vibration from uneven impacts like potholes and breaks in the road will affect the comfort of the driver and passengers as well as the vehicle's lifespan. Additionally, the resulting vibration and noise propagation will have a greater impact on the neighborhood's residents and nearby buildings. Therefore, accurate and timely labelling of road service performance research is crucial because it may quickly alert drivers to avoid seriously vibrating roads and provide the highway department timely notice to repair

seriously damaged roads. Identifying road potholes that compromise driving comfort and transportation safety is the key to effective road condition monitoring. In order to provide motorists with a smooth road infrastructure, monitoring the road surface is a crucial problem. Based on the collection of road vibration data by vehicle vibration sensors, the method presented in this paper is straightforward, effective, and precise. The vibration acceleration is processed using the discrete fast Fourier transform, and the RMS value of the vibration acceleration at 1/2 octave is calculated. The road vibration level is then calculated.

[2] Everyone strives to reach their destinations as soon as possible in this world that moves at an ever-increasing rate. The significant restriction to this fantasy is the inappropriate, sporadic streets. The sudden appearance of hazardous potholes and bumps on the road prevents the drivers from driving the vehicle at a regular speed. This also causes significant damage to the car. Current street surface observing purposes human work to check the condition and nature of the street which makes the cycle additional tedious and less effective. Most of the time, road imperfections like potholes and bumps make it difficult to travel comfortably and cause major damage to vehicles. Identifying street potholes and street unpleasantness levels is a key to street condition observing, which influences on transport security and driving solace. This paper proposes a strategy that plans to screen street surfaces, identify street potholes and mounds and foresee their seriousness by investigating the upward vibration signals created by the vehicle while it moves. The suggested method records the vehicle's vibrations using the accelerometer on a smartphone; the Z-axis measurement corresponds to the vehicle's vertical vibrations. Gaussian model based digging calculation is proposed for the strange occasion location, X-Z proportion separating is applied for occasion arrangement as pothole or mound. The relation between the vehicle's relative vertical displacement and vertical acceleration is utilized in the proposed severity estimation algorithm.

[3] Spatial topological relation is one of the most common spatial relations in GIS. Most of the traditional spatial topological relation models such as 9 intersection model are applied in vector methods based on a set of points, but they are relatively difficult to analyze the topological relations of spatial objects in raster data. In addition, the existing spatial topological relation models based on raster methods can analyze remote sensing image directly, but disadvantages exist like raster models cost a large amount of calculation and the analysis of topology relations in different resolution remote sensing images is of high complexity. A spatial topological relationship model based on GeoSOT, one of the global subdivision grids, was developed to address the drawbacks of the high difficulty and complexity of studying the spatial topological relation method on various resolutions of remote sensing images. This paper introduces the subdivision location identification technique for expressing spatial objects on various resolutions of remote sensing images. The model then compares location identifications in a combined table to determine a spatial topological relation. Finally, the test demonstrates that topological relations between spatial objects can be analyzed using GeoSOT, and that this method is particularly effective for complex spatial objects.

[7] India, those second the majority populous nation on universe with quickly developing economy, will be referred to need a gigantic organize about streets. Roads are those transcendent technique for transportation secured close by India today conveying practically 90% for country's traveler development and 65 percent of its freight. In any case, by far most of the roads to India would restrict additionally blocked with unfortunate surface individual fulfillment without upkeep. The roads that are currently India's primary mode of transportation are the subject of this paper's proposal. These days potholes and protuberances on the streets the serious issues in emerging nations. In our day-to-day lives, we hear about a lot of road accidents, many of which are caused by potholes. Road fatigue, inadequate pavement thickness, poor road condition, heavy vehicle movement, and heavy rainfall all contribute to the formation of potholes. The upkeep of roads typically focuses on indecent roads with potholes, bumps, and other problems.

[8] Roads are important means of transport which carry 90 percent of country's passenger traffic. Road maintenance is a significant issue in developing nations. We are aware that the majority of Indian roads are congested, narrow, and have poor surface quality, and road maintenance is subpar. Potholes have developed as a result of poor road maintenance and upkeep. Potholes, according to a survey conducted by the Automation Association, are one of the main causes of road accidents. There is a high risk of collision with the vehicle that is following a driver who reduces the vehicle's speed. As a result, we believe that sharing information is crucial to reducing accidents and avoiding the effects of potholes. A pothole is a hole in the road's normal surface. Because they are not visible at night, larger potholes occasionally result in breath-holding accidents and fatalities. Disgraceful state of streets is a helping factor for gridlock and mishaps.

III. POTHOLE COMPLAINT APP

The project is designed in such a way that there are three types of users - Public, PWD Contractors, Kerala Government. All the public users have to login the App by filling up their details such as name, email id etc. Whereas the PWD Contractors and Government Officials will be having a unique Id and password as credentials. The public can raise a complaint via our app when he sees a pothole. The app is designed in such a way that the location is fetched from the phone's GPS and also the photo can be taken only via camera and

uploaded to the complaint column. These features will help in eliminating fake complaints by users. Once the public raises a complaint the complaint will be passed to the respective PWD Contractor who is responsible for that particular road which you raise the complaint Will be fetching from the Database along with the Government Officials. The raised complaint will be only visible to the PWD Contractor and Government at the time of complaint registration. Once the complaint is raised the PWD Contractor and Government will have an option to update him about the necessary steps taken. If no response or action is taken within 15days of complaint registration, the complaint will show cased in a public feed on the app where all the app user's will be able to view the complaint.
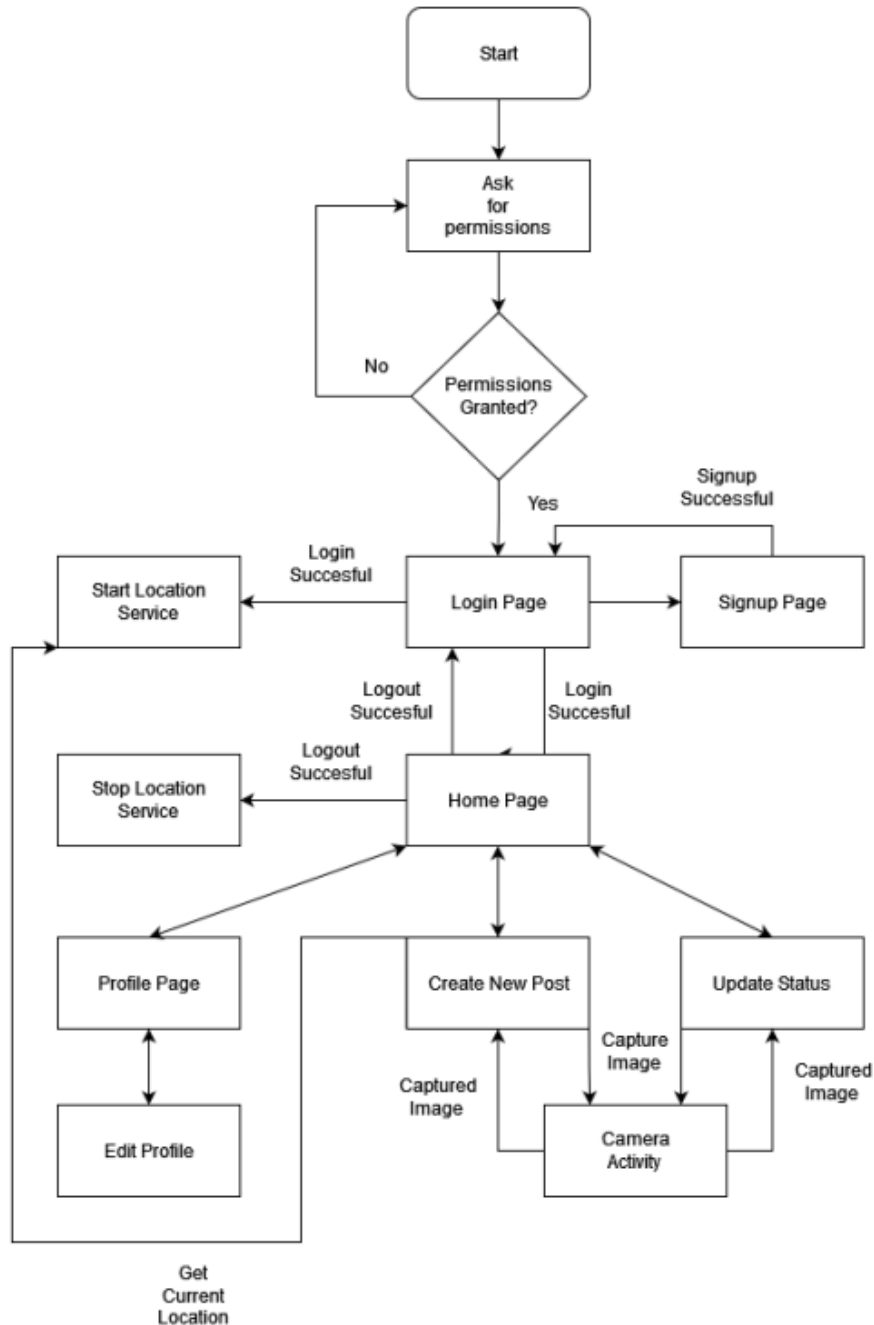

Fig. Diagram for Road Pothole Complaint App

It captures the dynamic behavior of the system. Other four outlines are utilized to show the message stream starting with one item then onto the next yet action chart is utilized to show message stream starting with one action then onto the next. An individual system operation is called activity. In addition to illustrating the dynamic nature of a system, forward and reverse engineering techniques are used to construct the executable system using activity diagrams. The message portion of the activity diagram is the only thing that is missing. Similar to a flowchart or data flow diagram, an activity diagram depicts a system's sequence of actions or control flow visually. Action graphs are much of the time utilized in business process displaying. They can also use a use case diagram to describe the steps.

IV. CONCLUSION

Through this application the people can register complaint to the authorities directly. The authorities will become aware of maintenance issues, thereby reduces response time. By improving the quality of road eventually reduce the no. of accident. High-quality roads condition will enhance the comfort and safety of the driver and passengers. The road surface without the obvious defects improves the speed of the vehicle as much as possible to ensure the efficiency of life and production. However, the temperature, external forces, overloads, and human damage bring road damage. It poses a significant safety risk to vehicles and motorists if the road damage cannot be observed and resolved in time. Although researchers in the past have proposed various methods, they are inadequate in notifying the authorities about the road maintenance issues on time. Through this application the people can register complaints to the authorities directly. It's a digital initiative to empower the citizens to notify about any defects or problems in the road managed by government. Complaints are registered by attaching pictures that are captured at the moment and background location. A fifteen days of response time is provided and if there is no response from the authorities the complaint will be forwarded as a public feed which is visible to all app users. The authorities become aware of the issues and thereby reduces their response time. By improving the quality of road eventually reduces the number of accidents.

REFERENCES

[1]. W. Shi,M. Li, J. Guo, and K. Zhai, "Evaluation of road service performance based on human perception of vibration while driving vehicle," J. Adv. Transp., 2020, Art. no. 8825355.

[2]. P. M. Harikrishnan and V. P. Gopi, "Vehicle vibration signal processing for road surface monitoring," IEEE Sensors J., vol. 17, no. 16, pp. 5192–5197, Aug. 2017.

[3]. D. Chen, C. Cheng, S. Song, F. Dong, and R. Chen, "Research of spatial topological relation model based on GeoSOT," in Proc. IEEE Int. Geosci. Remote Sens. Symp., 2013, pp. 786–789.

[4]. W. Li, M. Burrow, and Z. Li, "Automatic road condition assessment by using point laser sensor," in Proc. IEEE Sensors, 2018, pp. 1–4.

[5]. Babu, S. V. Baumgartner, and G. Krieger, "Approaches for road surface roughness estimation using airborne polarimetric SAR," IEEE J. Sel. Topics Appl. Earth Observ. Remote Sens.

[6]. Kathane, Samyak&Kambli, Vaibhav& Patel, Tanil& Kapadia, Rohan. (2015). 'Real Time Pothole Detection and Vehicle Accident Detection and Reporting System And Anti-theft (Wireless)", International journal of Engineering Trends and Technology. 21. 187-190. 10.14445/22315381/IJETT-V21P232.

[7]. H. Guan, J. Li, Y. Yu, M. Chapman, and C. Wang, "Automated road information extraction from mobile laser scanning data," IEEE Trans. Intell. Transp. Syst., vol. 16, no. 1, pp. 194–205, Feb. 2015.

[8]. S Gayathri, Mamtha RG, Manasa B, Menita Patil, Sanjana BM, ―Automatic Pothole Detection System‖, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, NCRACES - 2019.

[9]. Y. Li, C. Papachristou, and D. Weyer, "Road pothole detection system based on stereo vision," in Proc. IEEE Nat. Aerosp. Electron. Conf., 2018, pp. 292–297.

[10]. R. Fan, U. Ozgunalp, B. Hosking, M. Liu, and I. Pitas, "Pothole detection based on disparity transformati- on and road surface modeling," IEEE Trans. Image Process., vol. 29, pp. 897–908, 2020.

[11]. G.Jianyaet al., "Progress and application for intergraded sensing and intelligent decision in smart city, "Acta geodactica et Cartographica Sinica, vol. 48, no. 12, pp. 1482–1497, 2019.

[12]. C.J.Doddsand J.D.Robson,"The description of road surface roughness," J. Sound Vib., vol. 31, no. 2, pp. 175–183, 1973.

[13]. C.Gaffney and C.Robertson, "Smarter than smart: Rio de janeiro's flawed emergence as a smart city," J. Urban Technol., vol. 25, no. 3, pp. 47 –64, 2018.

[14]. P.Cocron, V.Bachl, L.Fr¨uh, I.Koch, and J.F. Krems,"Hazard detection in noise-related incidents the role of driving experience with battery electric vehicles,"Accidentinal.Prevention,vol.73,pp. 380–391.

[15]. S.Nath, J.Liu, and F.Zhao, "Sensor Map for wide-area sensor webs," Computer, vol. 40, no. 7, pp. 90– 934, Jul. 2007.

[16]. H. Guan, J. Li, Y. Yu, M. Chapman, and C. Wang, " Automated road information extraction from mobile laser scanning data," IEEE Trans. Intell. Transp. Syst., vol. 16, no. 1, pp. 194–205, Feb. 2015.

[17]. Y. Li, C. Papachristou, and D. Weyer, " Road pothole detection system based on stereo vision, " in Proc. IEEE Nat. Aerosp. Electron. Conf., 2018, pp. 292–297.

[18]. A. Dhiman and R. Klette, " Pothole detection using computer vision and learning, "IEEE Trans. Intell. Transp. Syst., vol. 21, no. 8, pp. 3536–3550, Aug. 2020.

[19]. C. J. Dodds and J. D. Robson, "The description of road surface roughness," J. Sound Vib., vol. 31, no. 2, pp. 175–183, 1973.

[20]. R. Fan, U. Ozgunalp, B. Hosking, M. Liu, and I. Pitas, "Pothole detection based on disparity transformation and road surface modeling," IEEE Trans. Image Process., vol. 29, pp. 897–908, 2020.

[21]. A. Babu, S. V. Baumgartner, and G. Krieger, "Approaches for road surface roughness estimation using airborne polarimetric SAR," IEEE J. Sel. Topics Appl. Earth Observ. Remote Sens., vol. 15, pp. 3444– 3462, 2022.

[22]. L. Krysi ´nski and J. Sudyka, "GPR abilities in investigation of the pavement transversal cracks," J. Appl. Geophys., vol. 97, pp. 27–36, Oct. 2013.

[23]. C. Wu et al., "An automated machine-learning approach for road pothole detection using smartphone sensor data," Sensors, vol. 20, no. 19, Sep. 2020, Art. no. 5564.

[24]. T. Wu, H. Shen, J. Qin, and L. Xiang, "Extracting stops from spatio temporal trajectories within dynamic contextual features," Sustainability, vol. 13, no. 2, Jan. 2021, Art. no. 690.