GIS based Road Network Assessment using Open source Technology

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Abstract: *Finding one's way with a map is a relatively recent phenomenon. In pre-modern times, maps were used, if at all, mainly for planning journeys in advance, not for guiding travelers on the road.*
The app "Road Factor", build to run on any android platform, provides the condition of the roads in a selected city or area by tracking your GPS location. It provides data that would help our government to know the conditions of the roads in a particular area and take necessary measures accordingly. One can easily know when and how many times a particular road was modified in the past ten years. This app also facilitates easy governance and monitoring of the roads in an area. The app has a user friendly interface that allows an individual to select his state ,city and the road whose condition is to be viewed.

I. INTRODUCTION

In Developing countries an extensive and well-maintained network of primary, secondary, and feeder roads is critical for economic growth and poverty alleviation. Because of their high and diverse functionality and wide range of beneficiaries, roads have become an essential component of all national transport systems, usually consuming the greatest proportion of public and private investment resources in both infrastructure and services. Road Agencies in turn are required to deliver high quality road projects in time and according to the budgetary allocations. Use of obsolete methods and technology must be avoided. Proper steps should be taken by considering into account, the recent survey reports and analyze the loop holes in this system and try to bring in a change. This calls for the need to develop a strong and well developed road transportation system.

This app helps one to visit any site/road and get a detailed report about the condition and maintenance of that particular road based on the user's current GPS location. One can easily avoid duplication in the process of resurfacing of bad roads, as the app provides clear information of the dates, when a particular road was modified last. There is also a provision to retrieve data about all the roads in a particular city that are either in good or bad condition so that necessary action can be taken accordingly, thus building a healthy road transportation system to ensure easy and safe flow of men and material around the world.

The GPS (Global Positioning System) a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

This feature, used in the app helps user to retrieve his current location and displays the details of the road that he is presently at. This helps him to analyze and develop a detailed report about when the road was last resurfaced and how many times were it reconstructed in the past decade. Based on this report the concerned authorities can make a decision whether to include this particular road in their next development plan or not.

II. METHODOLOGY
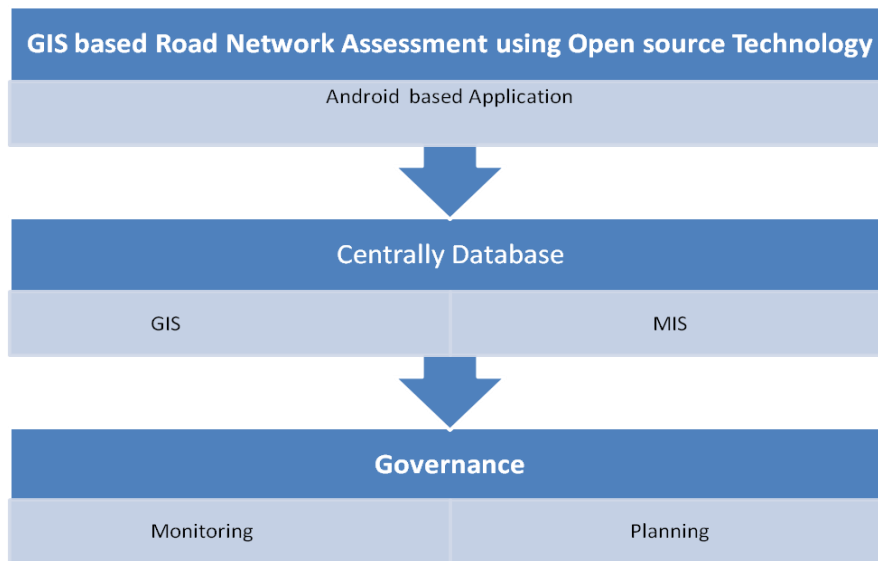
III. GOVERNANCE AND MONITORING

The fact that transportation is a service with great social importance, significant externalities, and public good characteristics is at the heart of governance problems in the sector. Roads are a classic example of a "public good": roads are often non-excludable, and non-rival (except at high levels of congestion). Central and state governments overwhelmingly fund roads because of their social importance. Because of road's public good characteristics, road funding typically comes from general taxation or a levy on road users (for instance, a petrol tax or vehicle registration charges), or both, rather than through user fees.
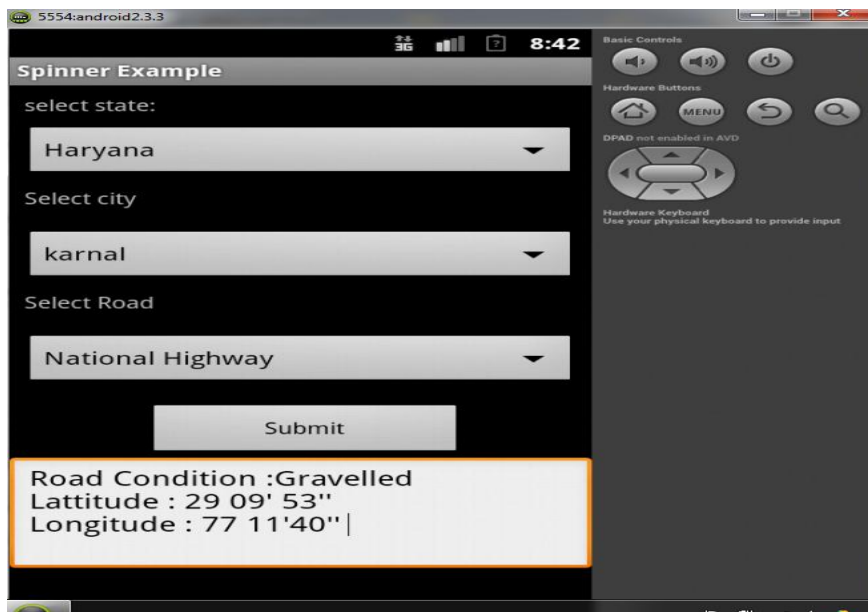
This app facilitates easy governance by monitoring the rate and quality of work done by the officials at the site by tracking their GPS location on a particular day and the report submitted by them. This prevents malpractices which usually occur in this field by monitoring how sincerely and effectively each employee is working and developing an intelligent Road Investment Strategy.

By using the data obtained from this system we can set up new, discrete units – 'Road User Focus' within Passenger Focus and a 'Strategic Road Network Monitor' within the Office of Rail Regulation to repre-

sent the interests of all those who use and rely upon the strategic road network, and to monitor the efficiency and performance of the workers.

During emergencies, it is critical for the road management authorities to be able to collect and report current road status and damage assessments in a consistent and timely manner. Use of this application would enable the corresponding supervisors and managers to deploy limited department resources most effectively. In addition this app provides current road status information and report on the progress of response activities.

The major goal of the project is to minimize the lag time between obtaining a report in the field and providing that report to decision makers in the command centers. The development team accomplishes this by providing communication between the Road Status/Damage Assessment (RSDA) field tool and a multiuser geo database. When a PWD network connection is available (through a field office or secure VPN), RSDA will transfer new and revised reports to the enterprise geo database using the Upload tool. This capability greatly improves reporting speed.

Thus it helps to put in place a robust system of governance for road surveillance, giving the road operator the flexibility needed to operate, manage and enhance the strategic road network effectively, while ensuring clear accountability to the Secretary of State, Parliament and road users.

IV. THE MANAGEMENT INFORMATION SYSTEM (MIS)

This Application is link to centrally database server. From this database server we can generate serval MIS as well as GIS reports. Management information system, or MIS, broadly refers to a computer-based system that provides managers with the tools to organize, evaluate and efficiently manage departments within an organization. In order to provide past, present and prediction information, the management information system here includes software that helps in decision making, data resources such as centralized database, the hardware resources of a system, decision support systems, people management and project management applications, and any computerized processes that enable the department to run efficiently.

The centralized database provides data integrity. With all the information centralized, it is much easier to develop reports that show the details of the work done on a particular road in the past . With multiple databases, records need to be matched, de-duping needs to occur, and the opportunity for duplicate records is greatly increased. Here the MIS manager with the help of centralized database can typically analyze the report and take controlled decisions thereby avoiding duplication in the process of resurfacing of roads. Thus MIS brings coordination and makes control easier.

This app makes use of the SQL Server as the centralized database containing information about the road conditions in various cities of different states in India. Thus a user can view with ease all the data corresponding to a road in particular location with a simple tap of his finger. The user can retrieve information such as when the road was last resurfaced and how many times was it resurfaced in the past 10 years. The user can also view the list of all roads that are presently in poor condition in a particular city and need to be resurfaced.

V. POSSIBLE FUTURE IMPROVEMENTS

PWD emergency operations centers can be set up in every state that use information collected by RSDA to prioritize repair and cleanup work. The map-based view of damage assessments can provide crews with a view of problems nearby, allowing more work to be accomplished on a single trip. The RSDA Viewer could be provided and thus by using the same operational picture at both locations, the state and county can coordinate their response activities better.

This application can be used for assessment of the hazardous materials transport risk in a multi-commodity, multiple origin – destination setting. The risk assessment methodology can be integrated with a Geographical Information System (GIS), which can make large-scale implementation possible. A GIS-based model of the shipments of dangerous goods via the highway network can be developed. Based on the origin and destination of each shipment, the risk associated with the routes that minimize (1) the transport distance, (2) the population exposure, (3) the expected number of people to be evacuated in case of an incident, and (4) the probability of an incident during transportation can be evaluated. Using these assessments, a government agency can estimate the impact of alternative policies that could alter the carriers' route choices. A related issue is the spatial distribution of transport risk, because an unfair distribution is likely to cause public concern. Thus, an analysis of transport risk equity in every state can be provided.

VI. CONCLUSION

A proper implementation of this app would be useful to a large section of people in different ways. Common people can use it as a reference while travelling in order to decide which road to take. The GPS feature used in this app helps track the current user location and provide details based on it. This app provides the PWD department with the necessary data about the condition of the roads which helps them to take necessary actions for the development of an efficient transportation system in the city. With proper centralized road network assessment data in hand the PWD department can plan the budget accordingly and allocate money for the same. At the same time ensuring that the same road is not resurfaced repeatedly irrespective of its condition.

Thus implementing an e-Governance of roads through mobile apps and various other software ensures improvements in planning, implementation and operation of the road sector through provision of timely, reliable, sufficient and accurate detailed data which will facilitate the decision making activities.

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