CS 440 - Coding Summary
Pothole Detection System - An Application Aimed to Enhance Road Safety
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The Pothole Detection System (PDS) is a mobile application designed to improve road safety and navigation by alerting users to potholes and other potential hazards along urban and suburban routes. This software offers a dynamic map service that interfaces with Google Maps API to enable turn-by-turn navigation while actively avoiding areas with reported potholes. It does this by utilizing real-time data and user-generated content.

At its core, PDS is a community-driven project aimed at urban infrastructure management and road safety. It relies on user contributions to report and validate pothole locations, with the added feature of allowing government officials to update the status of repairs. This engagement with local municipalities aids in the maintenance of public infrastructure and is particularly useful in areas where seasonal weather can cause rapid deterioration of road conditions.

Features and Technical Aspects

At the heart of PDS lies the Firestore NoSQL database, part of the Firebase suite, which efficiently handles the application's data requirements. These include user profiles, pothole reports, and navigational data. Through meticulous data modeling, the app guarantees consistency and functionality across user interactions and backend processing.

The first release of PDS established the groundwork for the essential features that are essential to our goal of enabling users to confidently navigate urban environments. Our features, which included integrating a dynamic Google Maps interface with polyline pathways and securing location rights, were released in a way that complemented the user's everyday activities. Users were not just passive navigators but became active contributors, reporting potholes and sharing feedback, thus fostering a collaborative community spirit.

Building on this, we enhanced the app's functionality with our second version, which included a user-friendly login process and a predictive destination search that expedites the route planning procedure. We also demonstrated a leaderboard that encourages the experience of contributing to public safety, along with a real-time display of travel factors like distance and projected time of arrival.

With its third release, the app made great progress toward connecting citizens' efforts with those of the municipalities. We launched a dedicated government official login portal, providing a

platform for city stewards to interact directly with issues that the community reports. Here, authorities could go through reports of potholes, which are sorted based on size for immediate attention, and change the status to "fixed" when they were fixed. This tactical element not only accelerated the restoration process but also gave urban administration accountability and transparency.

Testing and Quality Assurance

A comprehensive testing approach was used to determine the dependability of the frontend and backend elements. Many capabilities were tested, such as the ability to start applications on various devices, the responsiveness of the user interface, the ability to integrate maps, the ability to generate routes, the ability to update material dynamically, and the ability to collect user feedback. Backend tests assessed user identification, real-time data synchronization, database connectivity, data retrieval and storage, and leaderboard correctness.

Project Inspection and Results

Strict adherence to the inspection procedure was maintained to ensure strong feature integration and excellent code quality. Using Jira for task management and collaborative development, the team implemented agile approaches. The inspection results demonstrated that crucial features, such as route generation using polylines, database updates containing pothole information, and the real-time update functionality, were executed successfully.

Project Reflections and Future Directions

In hindsight, the PDS project represents a significant addition to smart city goals, combining neighborhood collaboration and modern technology to address the continuous problem of commuting safety and road maintenance. Strategic planning, iterative development, and thorough testing are key components of the project's success since they guarantee that every release improves the user experience in measurable ways.

Moving forward, the focus will be on bolstering security measures, particularly within the login process, and enhancing the accuracy of the app's navigation system, which is heavily reliant on user-reported data. These advancements aim to elevate the reliability and user trust in the Pothole Detection System as it continues to serve the community.