Pothole Detection System: Bike Trip Scenario

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The Pothole Detection System (PDS) will allow users to safely navigate through urban and suburban routes, alerting them of potholes and hazardous conditions in real-time. This first scenario outlines the user experience from initiating a bike trip to its completion, utilizing the PDS app's features. A key feature implemented is the dynamic reading of a data file, which integrates Google Maps API and a backend database, allowing for flexibility and up-to-date information on pothole locations. Refer to Pothole_Sample_Database (Figure 1) and PDS_Mobile_App_UI_Design (Figure 2) below for more details.

Scenario: "A Safe Bike Trip with PDS"

Starting the journey

The user decides to take a bike ride across the city. They open the Pothole Detection System (PDS) app on their phone. The app greets them with a welcome screen that briefly describes its features and how to use them. A "Continue" button takes them to the main interface.

Permission and Interface

The user then grants the app permission to access their location. The main screen loads, displaying a Google Map centered on their current position. Red, orange and yellow icons indicate the areas of known potholes of varying sizes, pulled from a backend database.

Setting the Destination

The app's straightforward UI includes a top search bar for destination entry, along with easy-to-navigate buttons like "Current Location", "Destination", "START", "STOP", "HELP", and "REPORT POTHOLE" are displayed.

The user inputs their destination and hits "START." After a quick computation, an optimized route appears on the screen, aimed at avoiding known potholes. The voice alert system activates, primed to provide timely warnings.

On the Move

While riding, the app sounds a warning: "Pothole ahead in 500 ft." A notification also appears on their screen. The distance counts down as they get closer, allowing them to navigate around the pothole safely. On this notification, they would be able to report whether the pothole is "Still there" or "It's fixed". This would help update the database to the most recent road conditions.

Route Recalculation

Later, another warning is triggered, suggesting an alternative route due to multiple potholes ahead. The user taps “Accept”, and the app recalculates a safer route for them to follow.

Community Contribution

During their ride, the user notices an unmarked pothole. They safely stop their bike and tap the "REPORT POTHOLE" button on the app. After capturing a photo, they submit the new pothole location to the database.

Reaching the Destination

Approaching the destination, the system indicates that no more known hazards lie ahead. The user stops the bike and selects the "STOP" button on the app. A summary report appears, displaying the number of avoided potholes and contributions made to the database.

Feedback Loop

Before exiting the app, a final screen asks if they'd like to share their experience or leave a review. Satisfied with the safer journey the app has provided, the user decides to leave a positive review, already planning their next bike trip using PDS for a safer, more informed ride.

In this way, the Pothole Detection System serves its purpose effectively, offering real-time pothole alerts, enabling user contributions to its database, and ensuring a safer traveling experience for future users.

Pothole_ID	Latitude	Longitude	Size	Date_Reported	Reported_By
1	41.869565	-87.678390	Small	2023-09-01	User_123
2	41.869790	-87.676890	Large	2023-08-15	User_234
3	41.869900	-87.675100	Medium	2023-07-22	User_345
4	41.869300	-87.674000	Small	2023-09-05	User_456
5	41.869450	-87.67012	Medium	2021-09-03	User_567
6	41.869750	-87.668200	Large	2021-09-10	User_678

Figure 1 - Pothole_Sample_Database: This robust database holds key information on potholes, such as location, size, and reporting user, ensuring up-to-date navigational data.

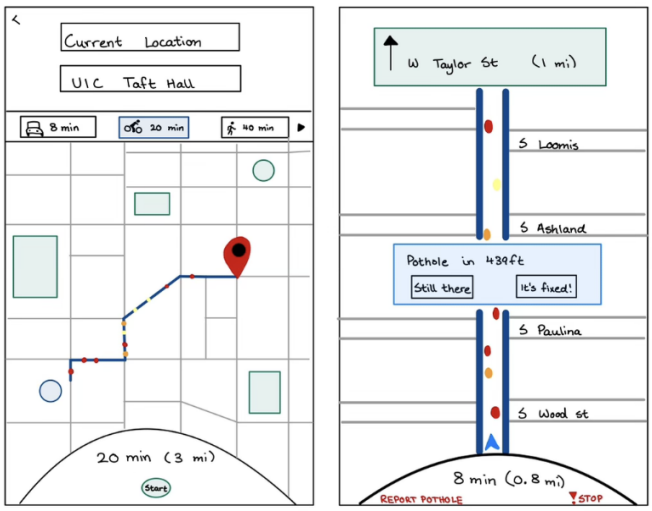

Figure 2 - PDS_Mobile_App_UI_Design: A visual representation of the app's user interface, showing the layout and arrangement of buttons, search bars, and other interactive elements.