

Cy-R-I

Team: SDMay20_17

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Problem and Need Statement

The devices currently used to detect rough and uneven pavement are expensive and require an excessive amount of manpower to use.

Functional Requirements

- Use accelerometer data from the device's onboard sensors
- Data acquired and logged includes GPS coordinates, accelerometer values in all axes, and IRI values among each step of the route
- Server backed on NodeJS framework
- Relevant data stored in a MongoDB database system
- Application has minimum support for Android Nougat

Non-Functional Requirements

- Failed login attempts are logged for auditing
- Errors propagated during server runtime are logged to a local file for evaluation
- Server is capable of handling 20 users simultaneously

Intended Users and Uses

- Iowa Department of Transportation
- Calculation of International Roughness Index (IRI) values for paved roads

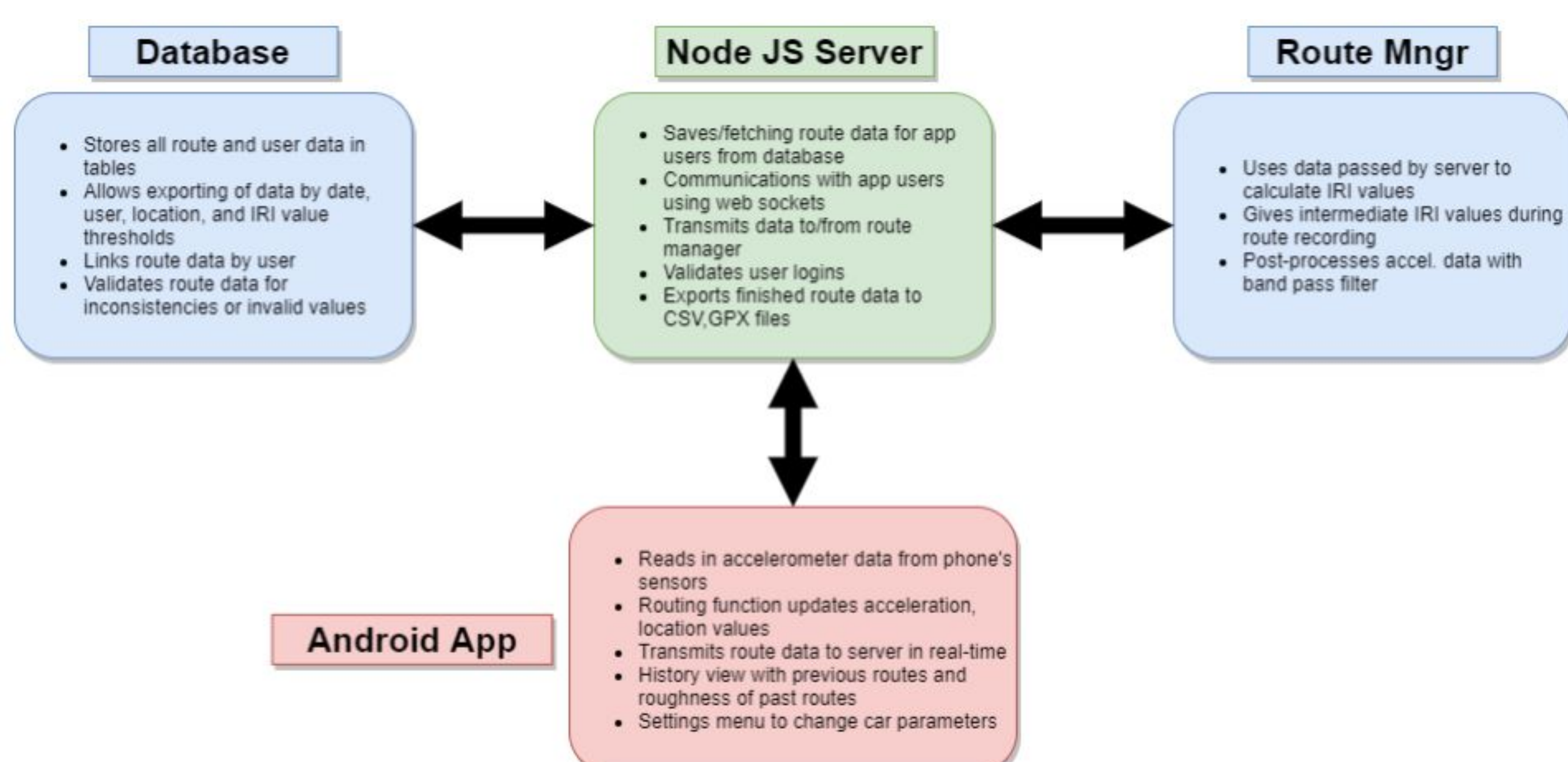
Testing

- Verification of the IRI calculation with known values to determine if the calculation is correct
- Driving routes while recording data to determine whether route recording, saving, and fetching works
- JUnit testing to check create user and login attempts

Engineering Standards and Design Practices

- Development in an Agile-based environment
- Documentation of code
- Websocket Protocol IETF RFC 6455

Block Diagram



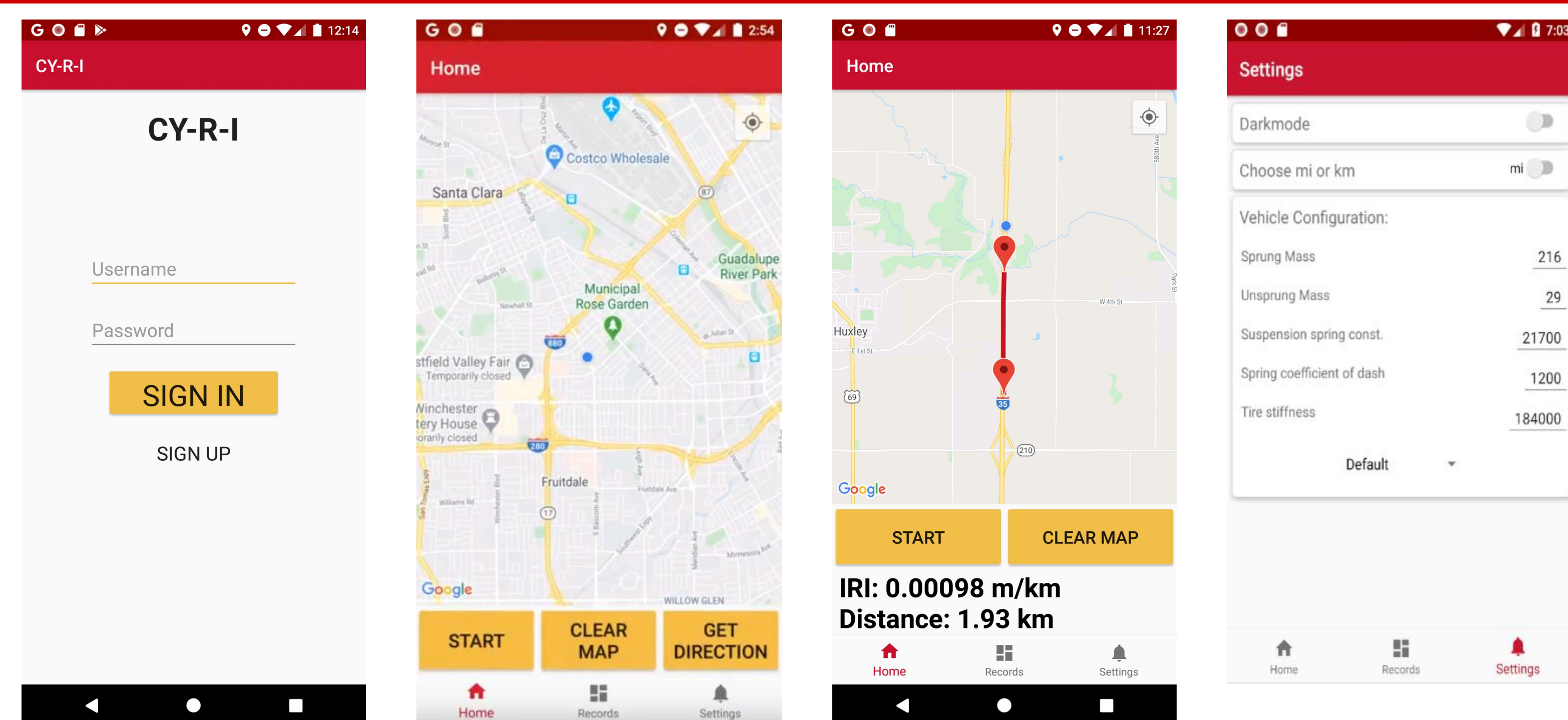
Solution

To create a mobile application that determines the roughness of a road by analyzing the accelerometer data from a mobile device mounted to the dashboard. An International Roughness Index (IRI) value using the quarter-car model is calculated using the accelerometer data.

Technical Details

- Database
 - Runs MongoDB, a cross-platform framework
 - Stores saved routes that the NodeJS server can access and share with users on the application
 - Information saved in JSON-like documents
- Server
 - NodeJS framework
 - Sanitizes the data received from frontend before being saved to the database
- Application
 - Application with minimum support for Android Nougat
 - Uses websockets to communicate with the server
- IRI Calculation
 - Python program managed by server
 - Calculates the average roughness of a stretch of road over a varying amount of distance driven

Application in Use



Database Structure

