

**Shri Madhwa Vadiraja Institute of Technology and Management,
Bantakal – 574115
Hackothsava 2023 – Synopsis**

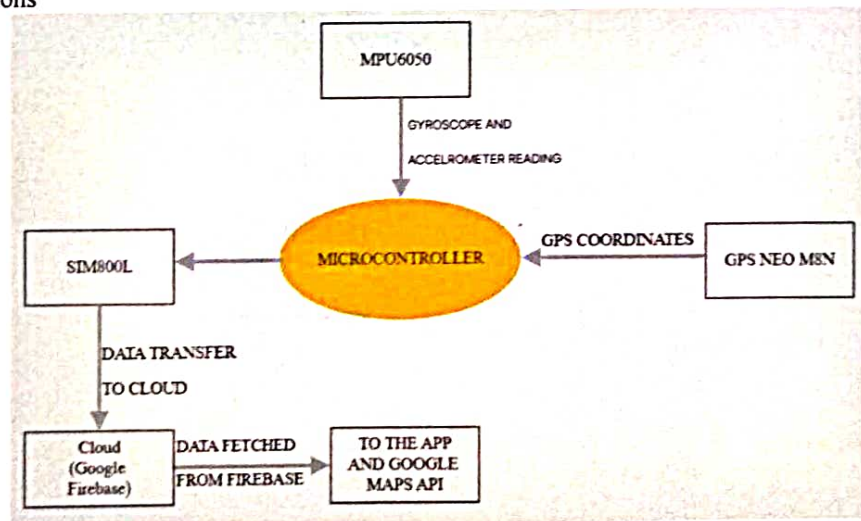
Team Name:		TEAM DELTA				
College Name and Address:		Manipal Institute of Technology, Udupi - Karkala Rd, Eshwar Nagar, Manipal, Karnataka 576104				
Theme of submission: (Check mark the relevant box)		Transformative Education <input type="checkbox"/>		Sustainable Industrialization <input checked="" type="checkbox"/>		
Team Members:		Name	USN	Sem	Mobile no.	email - ID
1	Leader	PRAKHAR GANERIWAL	210932136	IV	9024365109	prakharganeriwal@gmail.com
Project Title:		Road Quality Index Measurement Device				
Abstract of the proposed project: (word limit 300)		<p>The Road Quality Index (RQI) measurement device project aims to develop a portable and cost-effective device that can measure the road quality index of a given road network. The device will use two sensors: MPU6050, a six-axis accelerometer and gyroscope sensor, to measure the road vibrations, and M8N GPS to obtain location and time data. The device will also use an SIM800L module to upload the data to a cloud-based server and visualize the results through a mobile application.</p> <p>The device will be designed to be easily mounted on any vehicle, such as cars or bicycles, and will collect data while in motion. The MPU6050 sensor will measure the road's vibrations, which are directly related to the roughness of the road. The M8N GPS module will provide location and time data for each vibration reading, allowing for the device to collect data on different sections of the road network. The collected data will be uploaded to a cloud-based server using the SIM800L module, and the results will be visualized through a mobile application.</p> <p>The device's cost-effective design will enable widespread use and deployment, allowing governments and road authorities to monitor the road network's condition continuously. The collected data can be used to identify areas that require maintenance, prioritize road repairs, and allocate resources effectively. The real-time data provided by the device will enable prompt action to be taken to address the road's issues and improve the overall quality of the road network.</p> <p>In conclusion, the Road Quality Index measurement device is an innovative approach to monitor the road network's condition. The device's cost-effective design, ease of use, and real-time data analysis will provide valuable insights to road authorities and enable them to take proactive measures to improve the road network's quality.</p>				

Detailed Methodology with proper diagrammatic representation:

The Road Quality Index (RQI) measurement engineering process involves the following steps:

- **Data Acquisition**
Gyroscope and Accelerometer data will be collected from MPU6050(for the first prototype) then this raw data from MPU6050 and NMEA data (The NMEA standard defines the electrical signaling, data protocol and sentence formats for a baud serial data bus) from Neo M8n will go into ESP32 which will be processed further.
- **Data Processing**
ESP32 will then process and run tinyML to determine if the vibration was caused due to a speed breaker or pothole and bad road. ESP32 will be already trained to determine this and identify and further send this data to sim800L to upload it to cloud.
- **RQI Calculation**
The RQI is calculated using a mathematical formula that considers various factors such as the severity and extent of road damage, traffic volume, and road surface condition and acceleration if the sensor at that time.
- **Cloud storage and display**
The processed data will then be uploaded to the googles firebase cloud-based service then from there we can access that data from anywhere in the world.

In further stage we can use Google Maps API to integrate our data with the maps to optimize our route based on potholes on the road, just like the way it does with traffic congestions



Software/ hardware required for the implementation:	<ul style="list-style-type: none"> • A development board (Preferably ESP32/TEENSY/ NANO 33 BLE) • Gyroscope and Accelerometer (MPU6050) • GPS Module (Preferably NEO 6M/ NEO M8N) • SIM Module (800L) • Arduino IDE
Benefit to the society from the project	<p>Improved driving safety: The road quality index feature would allow users to identify poorly maintained roads and avoid them, reducing the risk of accidents due to potholes or other hazards.</p> <p>Better transportation planning: The road quality index would provide data on the condition of roads, allowing city planners and governments to identify areas that need repairs and allocate resources more effectively.</p> <p>Reduced vehicle maintenance costs: Drivers could use the road quality index to plan their routes and avoid roads that are known to cause excessive wear and tear on their vehicles. This could reduce maintenance costs and extend the life of vehicles.</p> <p>Environmental benefits: better road quality could lead to reduced emissions from vehicles, as smoother roads can improve fuel efficiency and reduce the number of pollutants emitted by vehicles.</p> <p>Improved quality of life: Smooth and well-maintained roads make for a more comfortable and enjoyable driving experience. This could lead to an overall improvement in the quality of life for individuals and communities.</p> <p>Overall, the road quality index feature in Google Maps could have significant benefits for society by improving driving safety, transportation planning, reducing vehicle maintenance costs, providing environmental benefits, and enhancing the overall quality of life for individuals and communities.</p>

Prakharg.

Signature of the team leader

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Signature of the HoD/Principal with seal

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