

# Road i/o

Measuring, Monitoring  
& Mapping Road Quality



# Bad roads!

## Time

- 100 cars × 2 riders × 10 minutes = **33 hours lost**

## Life

- >**10k** lives lost in 2015, **7 fold** increase in Maharashtra\*

\*Bad roads killed over 10k people in 2015; 3,416 deaths due to potholes - Aug 1, 2016, The Times of India

# Mumbai

change.org

Petitioning Brihanmumbai Municipal Corporation (BMC) and 1 other

**Say No to Potholes!  
Lets ask for better  
Roads we pay for!**



13,476



Pankaj Agarwal  
India

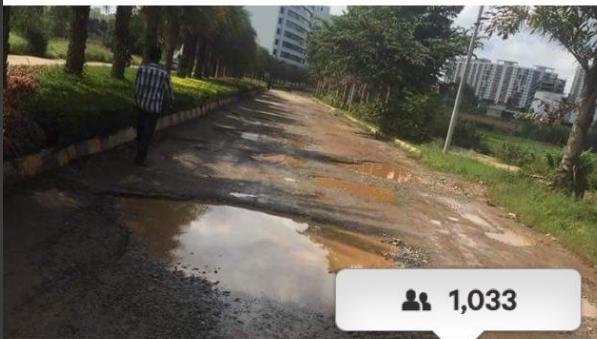
13,476

Supporters

# Bangalore

change.org

**Repair dangerous  
pothole filled roads  
in Neotown,  
Electronics City**



1,033



Swati Raje  
Bangalore, India

1,033

Supporters

# **Problem Statement**

To make a device that stores data about road quality parameter such as uniformity, presence and size of craters, water logging etc. and analyses this data to obtain a road quality map of the city.

# Idea in gist

## Hardware

Device mounted  
on vehicle logging  
road parameters

## Data Processing

Road quality score  
computation from  
the recorded data

## Mapping

Displaying the road  
quality score on  
the map in a  
smartphone app

# Requirements

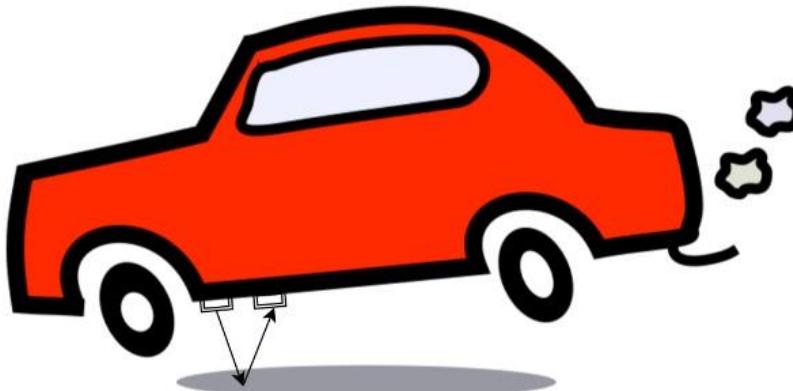
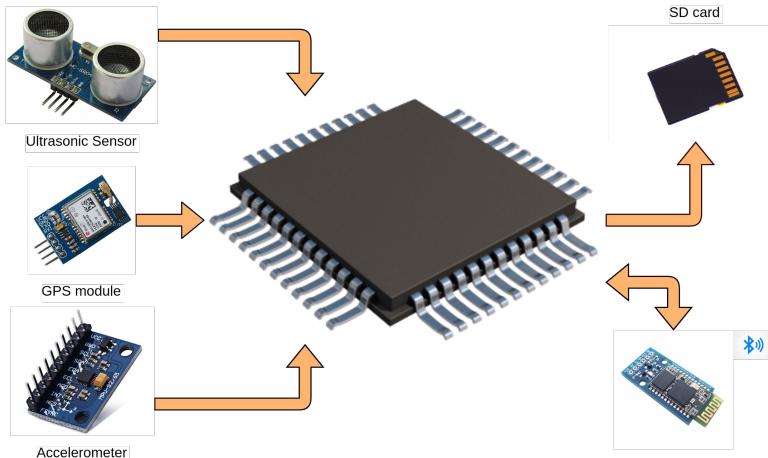
- Ultrasonic Distance Sensor - Timer
- Accelerometer - I<sub>2</sub>C
- GPS module - UART
- SD card - SSI
- PCB for putting all the sensors together
- Mechanical assembly

# – Plan followed

- Get all the ultrasonic, accelerometer and GPS and SD card working independently
- Integrate the codes for all the sensors and SD card
- PCB after all the hardware is working on breadboard powered it by a battery
- Encased on a PVC Box and mounted on a bicycle

# Work division

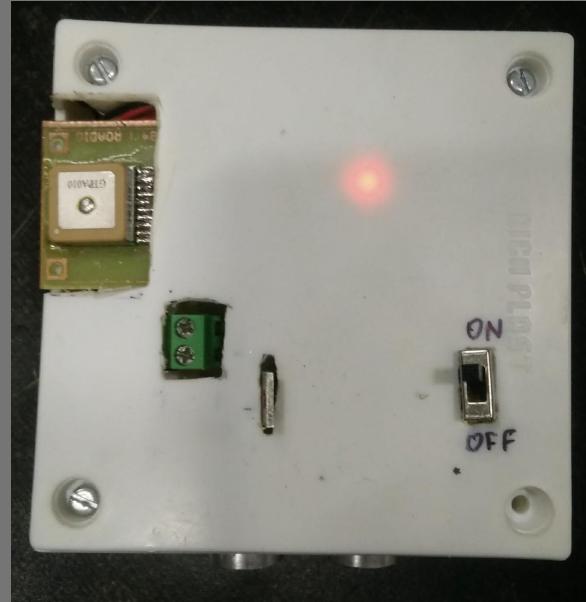
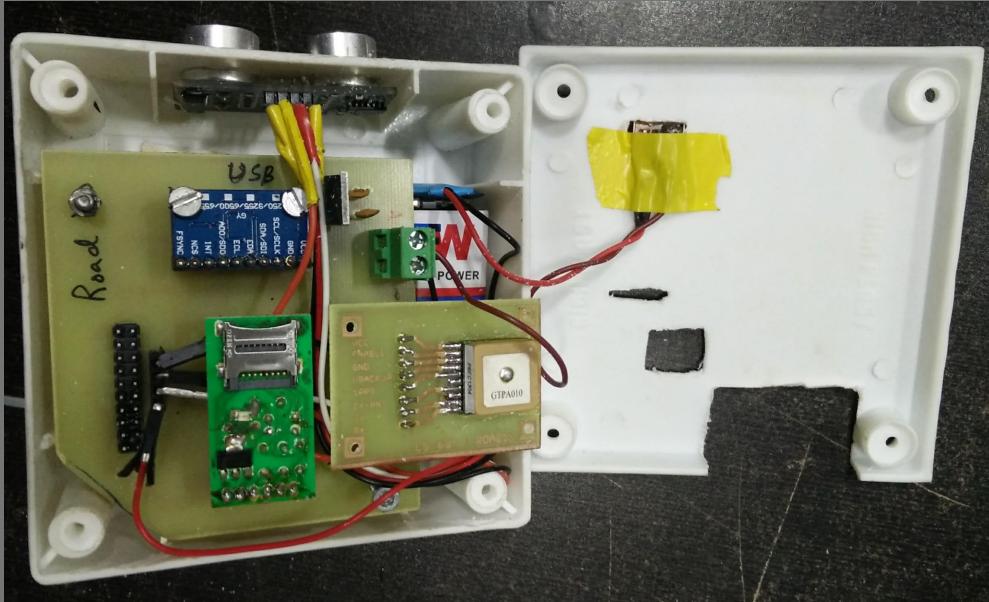
- Mustafa - Accelerometer (2 weeks) & SD card (2 weeks)
- Shalaka - GPS module and Android App UI
- Umang - Ultrasonic Sensor, PCB Module Design and Solder (GPS & Booster Pack)



# Hardware

- Standalone device
- Data transferred to smartphone when connected
- Retrofit on vehicle (undersurface of car, bus or bike)

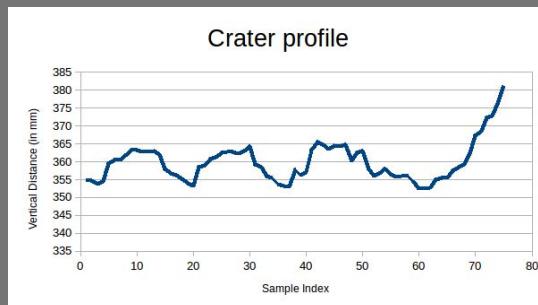
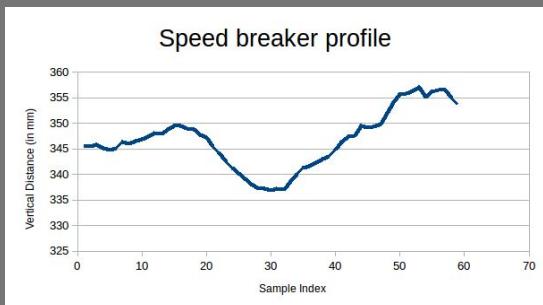
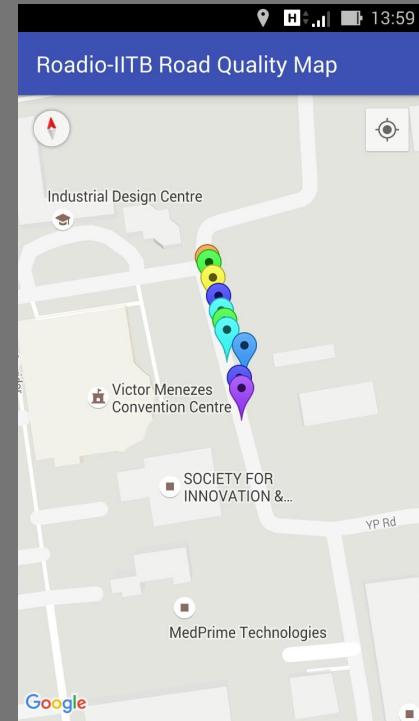
# The Device



# Data Collection



# Results



# Challenges

- GPS module - reliability an issue
- SD card interfacing - protocols were challenging
- Rigid mount on vehicle
- Water- and weather-proofing [future]

# – Reusability

- The interfacing sensors with TIVA - ultrasonic, accelerometer (MPU9250), GPS module (MT3333) and SD card are fairly independent - so can be used in individual interfacing as well.
- Logging data on the SD card is a general requirement in many projects.

# Impact

- Civic authorities can be informed with the pinpointed location of potholes and bad quality roads
- Continuous road quality monitoring
- Repair and maintenance done in a timely and cost effective manner

# What's next?

- Wireless data transmission - Bluetooth
- Cloud Processing - IoT
- Machine Learning

---

# Thanks!