Economic road anomaly detection

Project Guide: Dr.Prasad J C
Presented by:
Abhinav Asok - 2
Abhishek P Nair - 3
Bhavyasree Raj -37
Devika Ajith - 45

Federal Institute of Science And Technology (FISAT)

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Contents

- PROBLEM STATEMENT
- OBJECTIVE
- PROJECT MODULES
- INDIVIDUAL CONTRIBUTION
- SCHEDULE OF FUTURE WORK
- CONCLUSION

1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

PROBLEM STATEMENT

- From the literature review done in the first phase we compared the advantages and disadvantages of different models.
- Referring to those literature review papers we designed our system for implementation.
- We have implemented an algorithm which is the main disadvantage in the referred models.

1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

OBJECTIVE

- Road surface quality is essential for improving driving experience and reducing traffic accidents
- The manual approach is to visually inspect road conditions and record data regarding the condition of road surfaces. It is always costly and inaccurate
- In this project, we are trying to analyze different multiclass supervised machine learning techniques to effectively classify road surface conditions using accelerometer, gyroscope and GPS data collected from smartphones
- With the expected increase in autonomous vehicles that possess multiple sensors, more data would become available for road surface assessment and better quality.

1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

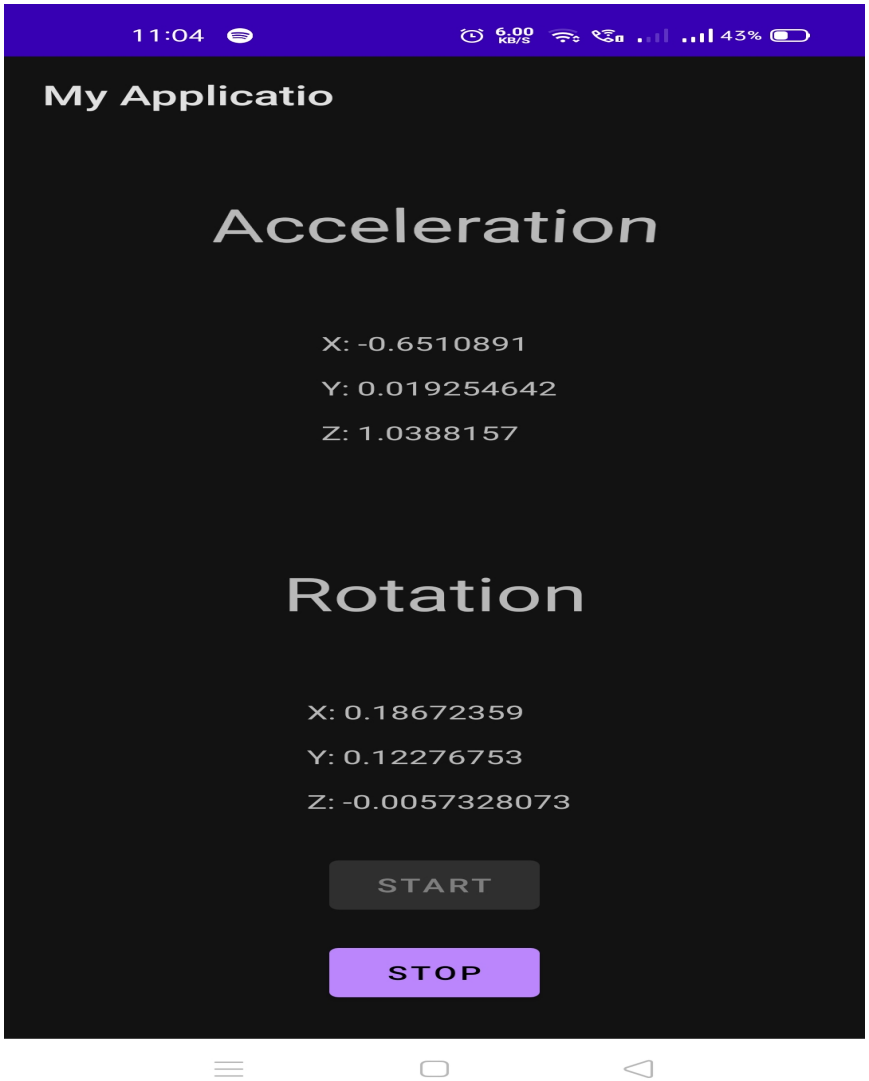
PROJECT MODULES

- Module 1 : App creation
- Module 2 : Implementation of reorientation algorithm
- Module 3 : Data Acquisition
- Module 4 : Data Preprocessing
- Module 5 : Training of the data using machine learning techniques
- Module 6 : Testing the model using a test data set.

MODULE 1-App creation

- To build the system, an Realme 6 was chosen to collect the data.
- An Application was developed using Android studio V4.1.3 using the programming language Java.
- The application Displays data of linear acceleration along 3 axis and gyroscope readings of the phone and save these data to a csv file.
- The app produces 4 sensor readings per seconds.

Module 1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Y: 0.019254642
Z: 1.0388157
Rotation
X: 0.18672359
Y: 0.12276753
Z: -0.0057328073
START
STOP

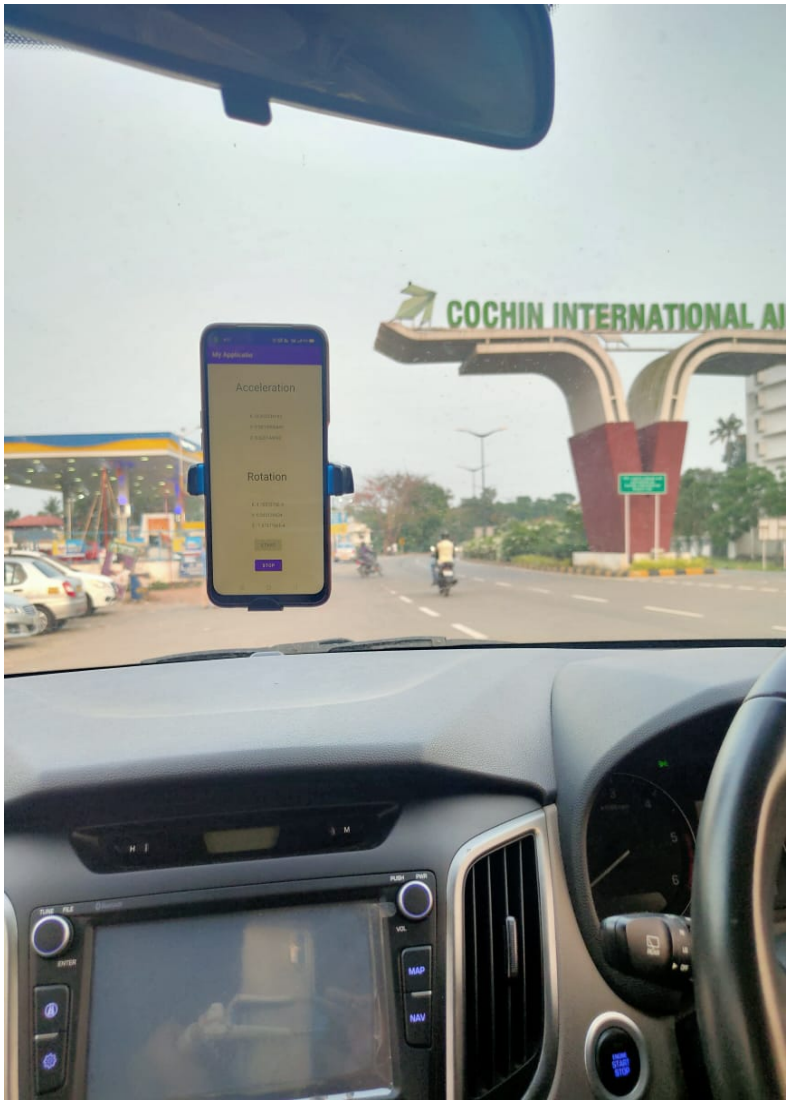
MODULE 2-Reorientation algorithm

- The reorientation algorithm performs accelerometer data reorientation using Euler's angles.
- The Euler angles included the angle pie, angle theta and angle alpha and sequentially rotates around the X-, Y-, and Z-axes, respectively.
- Reorientation was performed to transfer acceleration data from the smartphone coordinate system to the vehicle coordinate system

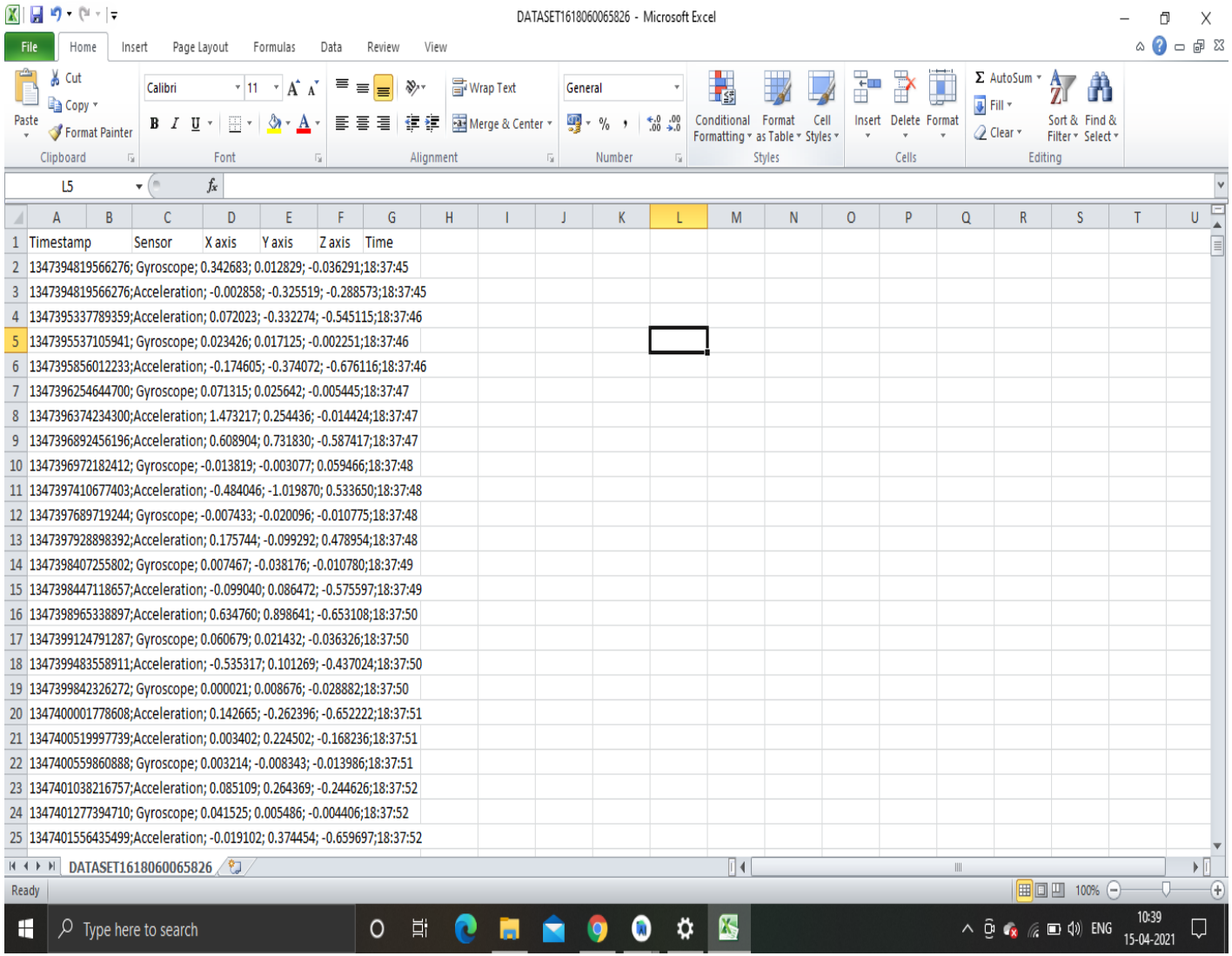
MODULE 3-Data Acquisition

- To build the system, an realme was chosen to collect accelerometer, gyroscope and GPS data in this pilot study and Hyundai Creta was used for the data collection.
- The Timestamp was recorded for Labeling.
- The Phone running the Vibration Recorder app was mounted to the windshield of the car with a phone mount.
- Another Phone was used to record video of the road surface to facilitate the road condition labelling in the pre-processing stage.

MODULE 3



MODULE 3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1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

Individual contribution

- Member 1: Abhinav Asok
- Involved in app creation which is the the first module of the implementation
- Our group splitted for implementing the reorientation algorithm and found out the Euler's reorientation algorithm.
- The paper referred for the Euler's reorientation algorithm is "An Automated Machine-Learning Approach for Road Pothole Detection Using Smartphone Sensor Data"
- Involved in data collection.

Individual contribution

- Member 2: Devika Ajith
- Involved in app creation which is the the first module of the implementation
- Our group splitted for implementing the reorientation algorithm and found out the virtual reorientation mechanism
- The paper referred for the virtual reorientation mechanism is "Wolverine : Traffic and Road Condition Estimation using Smartphone Sensors" but was difficult in implementing and led to crashing of the app and hence found an alternative algorithm.

Individual contribution

- Member 3: Bhavyasree Raj
- Involved in app creation which is the the first module of the implementation
- Our group splitted for implementing the reorientation algorithm and found out the Euler's reorientation algorithm
- The paper referred for the Euler's reorientation algorithm is "An Automated Machine-Learning Approach for Road Pothole Detection Using Smartphone Sensor Data".

Individual contribution

- Member 4: Abhishek P Nair.
- Involved in app creation which is the the first module of the implementation
- Our group splitted for implementing the reorientation algorithm and found out the virtual reorientation mechanism
- The paper referred for the virtual reorientation mechanism is "Wolverine : Traffic and Road Condition Estimation using Smartphone Sensors" but was difficult in implementing and led to crashing of the app and hence found an alternative algorithm.
- Involved in data collection.

1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

Schedule of future work

- Works that are yet to complete are data pre-processing,development of ML model ,training and testing.
- We plan to complete our data pre-processing by the end of this month.
- By the middle of may we plan to develop a ML model with high precision and by the end of May we plan to complete training and testing part.

1 PROBLEM STATEMENT

2 OBJECTIVE

3 PROJECT MODULES

4 INDIVIDUAL CONTRIBUTION

5 SCHEDULE OF FUTURE WORK

6 CONCLUSION

Conclusion

- We have designed an android application in order to collect data from the mobile sensors namely accelerometer and gyroscope.
- Reorientation algorithm has been implemented in this application in order to get accurate results.
- We have completed our Data Acquisition part from different road conditions.
- Currently we are on the data preprocessing stage and and the project will be completed within the given timeline.