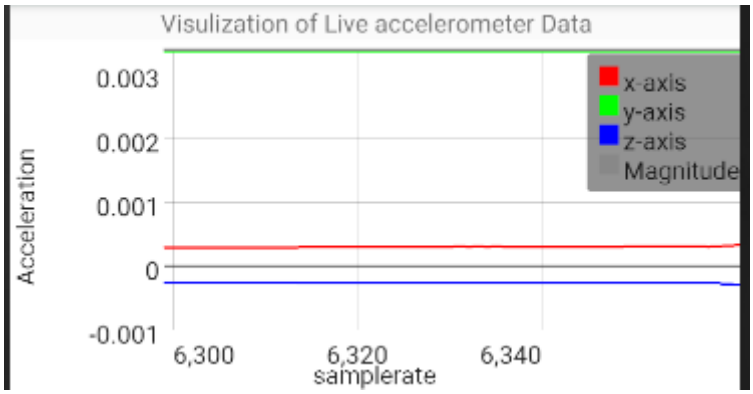
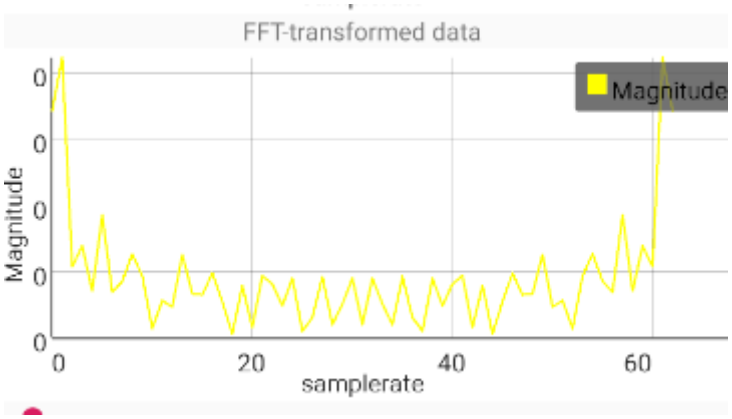
PART A: SENSOR DATA PROCESSING

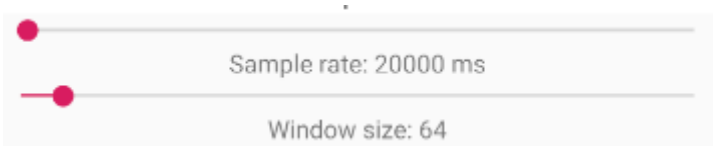
• A View component which visualizes live accelerometer data as four lines (red/green/blue lines for each axis + white line for magnitude).



• A second view with live FFT-transformed data (just transforming & displaying the absolute magnitude is enough).



• Two SeekBar which allows you to modify the sample rate and the FFT window size.



PART B&C: ATIVITY RECOGNITION & BONUS

We have Implemented the gesture detector which will recognise following Gestures

1. Shake Detection
2. Pick up the device recognition
3. Rotation of the Device
4. Device is Flat or not

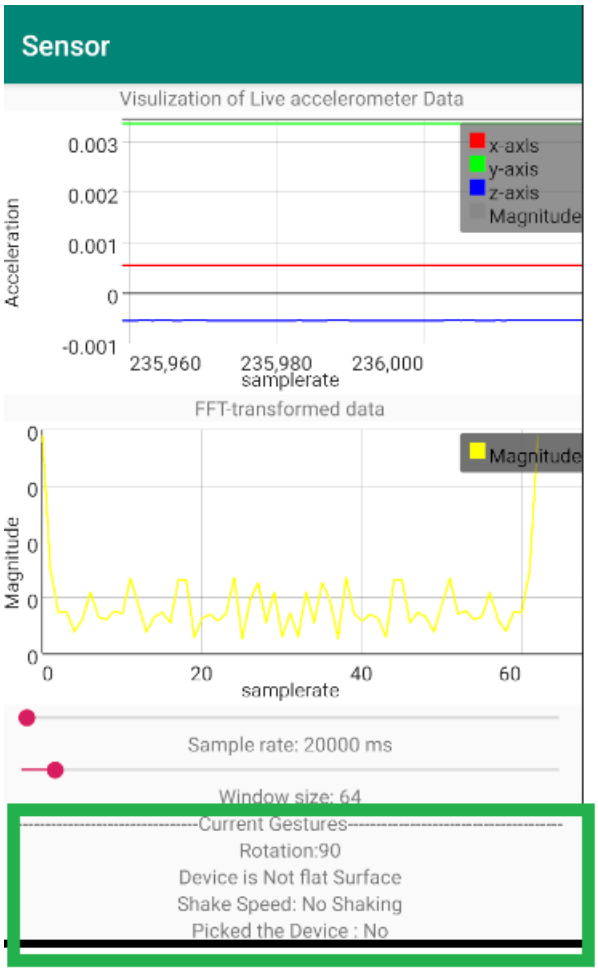


Figure: Current Gestures of the Device

MIS_Ex_3 - Sensors and Context

Shake Detection

We have taken Intial SHAKE_THRESHOLD = 10000 which will decide to detect the Shaking. At the first We have calculated the speed parameter and we have compared with SHAKE_THRESHOLD. If it reaches, then shaking of the device has been detected with certain speed.

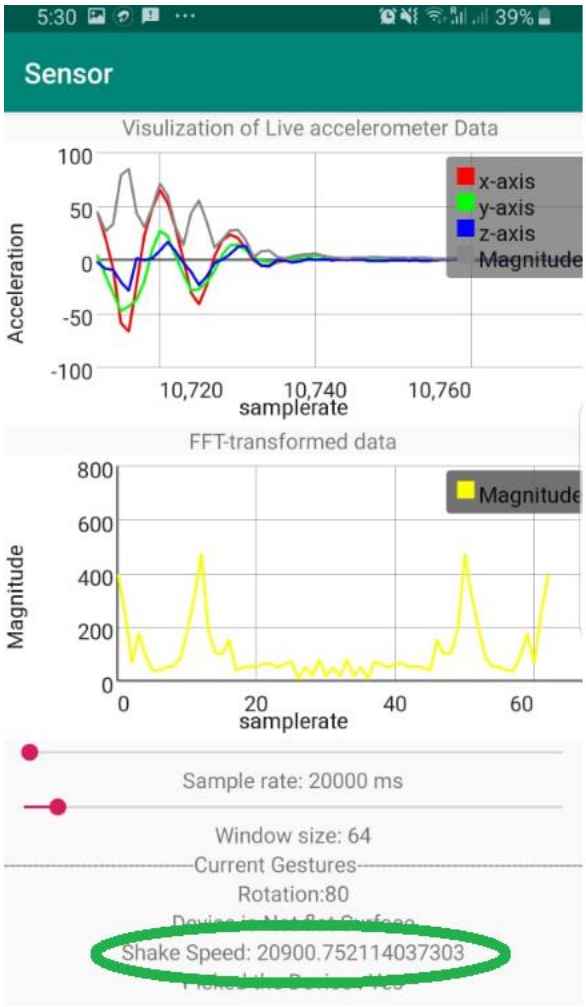


Figure: Shaking the device

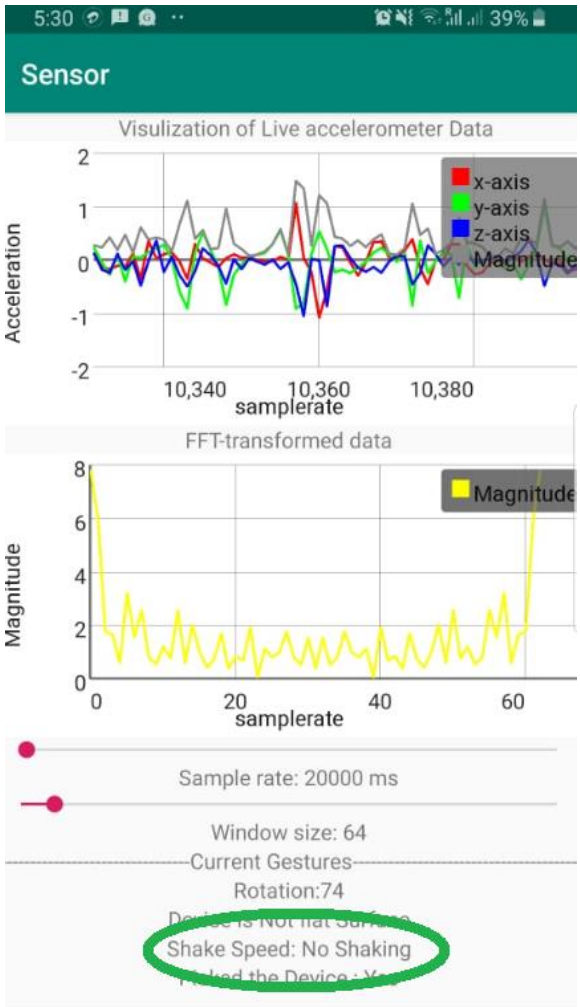


Figure: Without Shaking

MIS_Ex_3 - Sensors and Context

Pick up the device recognition

At the first we have calculated the vector sum for Accelerometer data(Event Values) using Square root function . If it meets the more than 11 it will tell that we have picked the device or not.

We have defined different thresholds like 15,20,30, at the end it recognises at the value of 11. If the value is more than 11 then we have picked the device , Otherwise we have not picked the device.

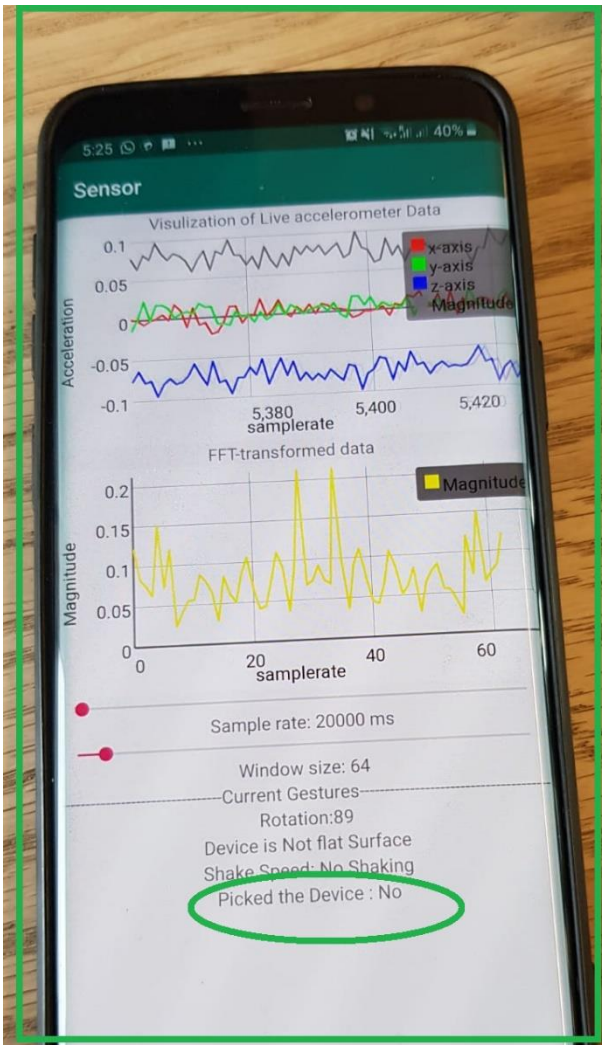


Figure: Device placed on the table

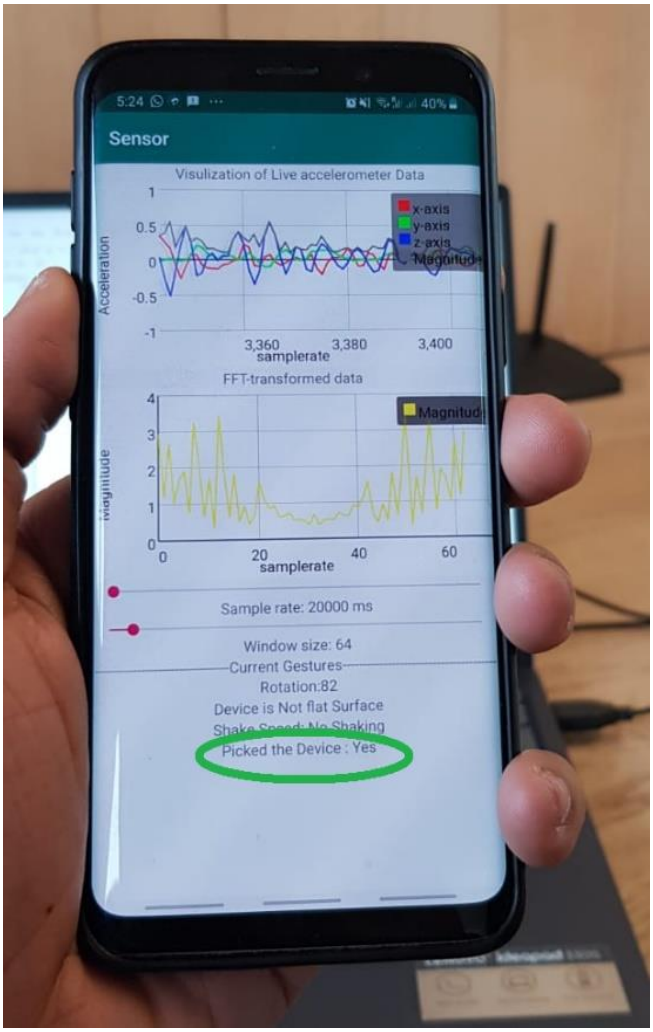


Figure: Device holding on Hand

MIS_Ex_3 - Sensors and Context

Rotation of the Device

We have normalized the accelerometer data Then we converted the x and y values to the angle using Math.atan2() method. Which will return the numeric value between -π and π representing the angle theta of an (x, y) point. This is the counter clockwise angle, measured in radians, between the positive X axis, and the point (x, y).

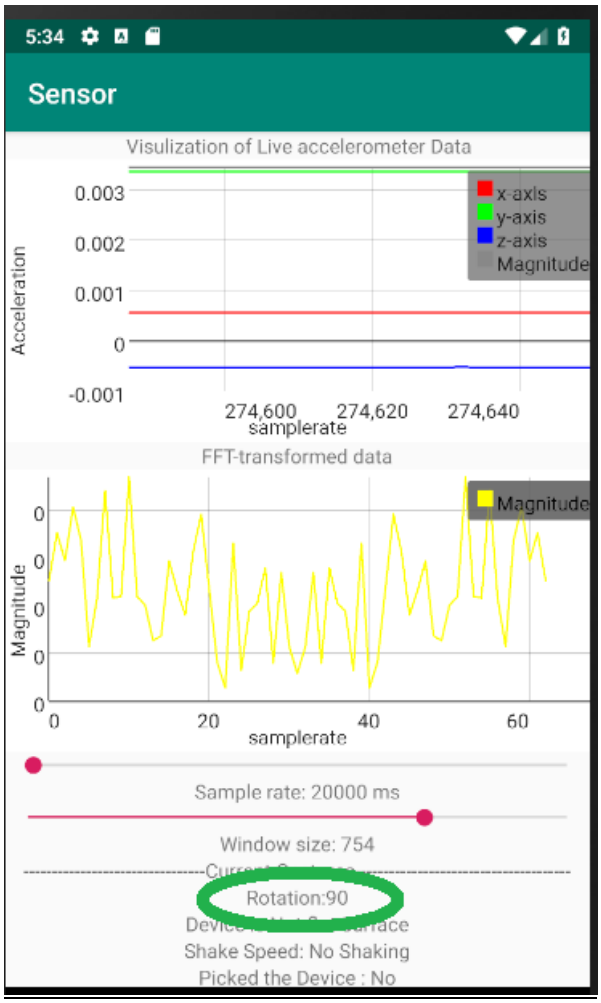


Figure: Rotation of the Mobile

MIS_Ex_3 - Sensors and Context

Device is Flat or not

To check this, we have calculated Inclination parameter with accelerometer z value using Math.acos() method which will returns a returns a numeric value between 0 and 180 radians for z between -1 and 1. At the end we have checked with two different thresholds 25 and 155 . If it's the value between those thresholds, then the device must be in flat surface.

We have defined different thresholds to detect the Flat or not. Unfortunately, we have failed to set the constant thresholds. We could see sometimes its working as expected and sometime its failing.

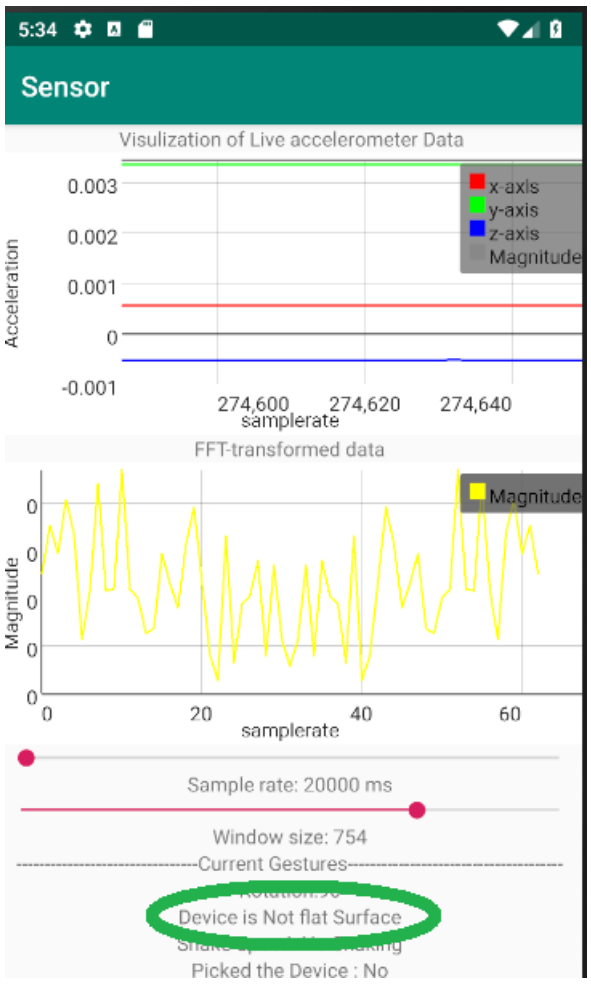


Figure: Device is not in flat surface

MIS_Ex_3 - Sensors and Context

We have tried to detect the starting and ending positions of the gesture but it can be done in the conditions it self. It will detect automatically when we performed the gesture on the device. And above results are poove the same. We have identified one more problem that accelerometer detects the gravity, it is important to keep the phone's orientation constant in normal where you need to accurately measure acceleration without gravity. If your phone rotates throughout the testing, that will affect your data. For example, When you measuring shake speed in the app, we observed that few gestures data was showing wrong. Those examples screenshots has been taken after shaking the phone we kept the phone on the table. Its not recognising the input properly due to fuzzy or distorted input data that has been passed to the condition.

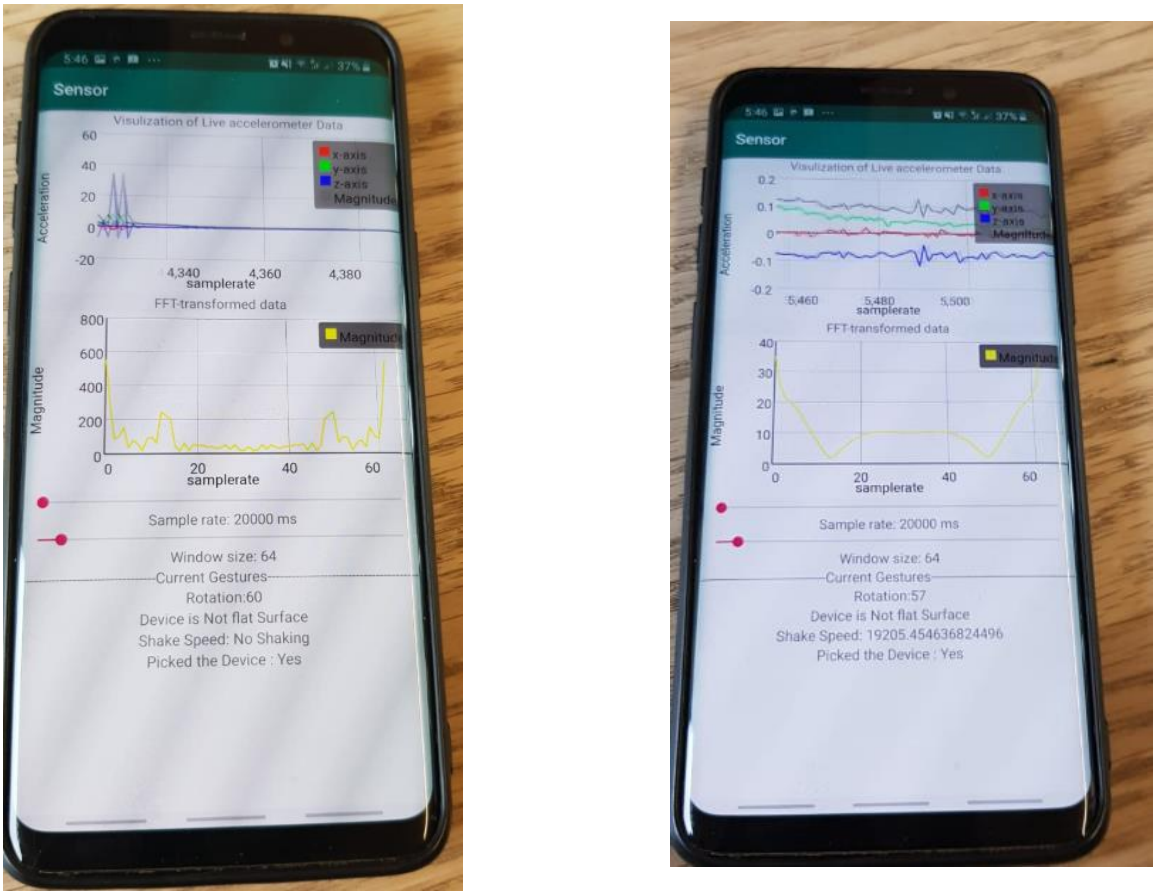


Figure: Inaccurate results

Note: Accurate results will appear after couple of seconds(This is just to prove distorted input causes in inaccurate results)