Detection of User‘s Device Orientation Based on Android Development

Second Presentation

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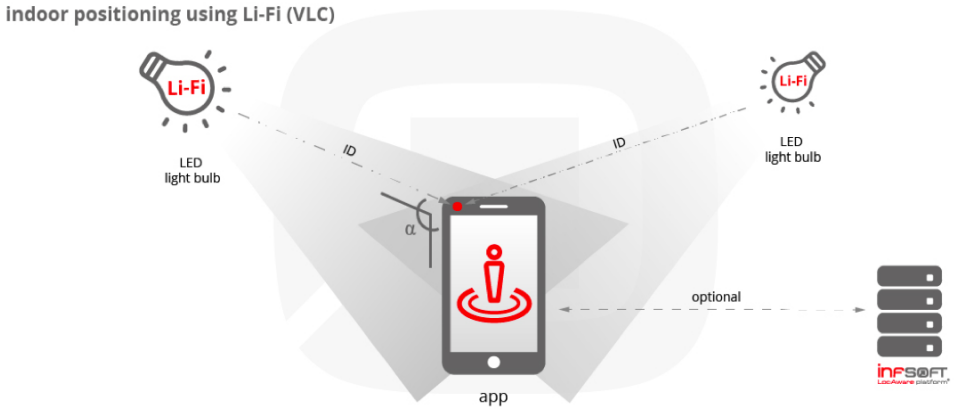
Previous Mission Statement

- Advantages of VLC (visible light communication)

- Difficulties
  - Body Blocking
  - Spatial Orientation



https://www.indoornavigation.com/wiki-en/vlc-visible-light-communication

- Develop our own app to get orientation data

Previous Mission Statement

Able to detect directions.

Done

Could operate stably even in the backstage.

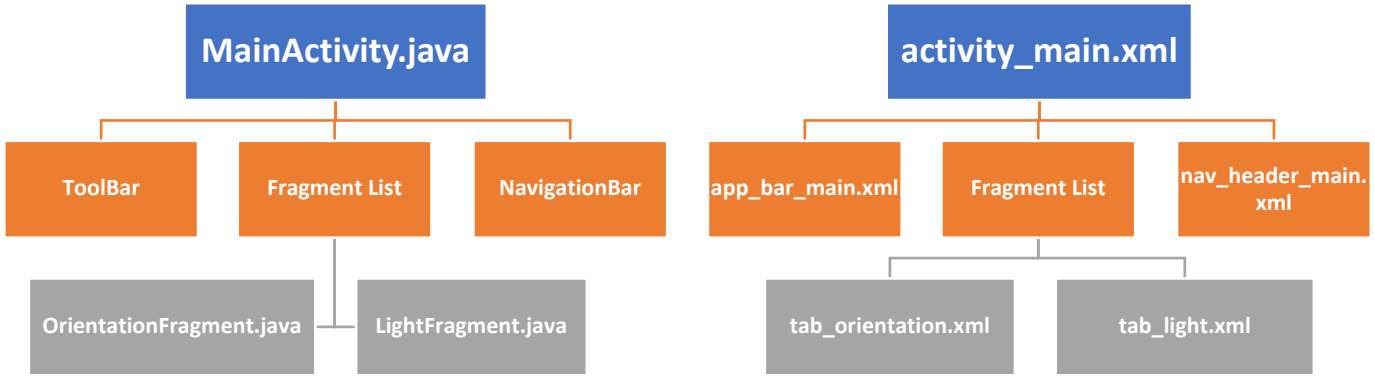
Done

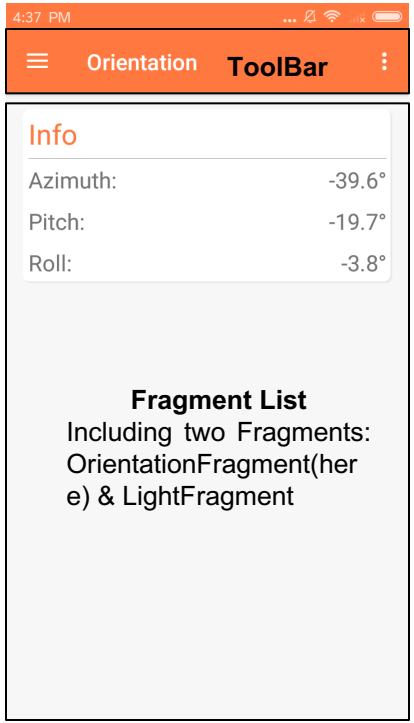
High-speed and regular sampling

have found the limitation and the resolution of the detected data

Extra feature: light strength detection

Basic Structure: Files

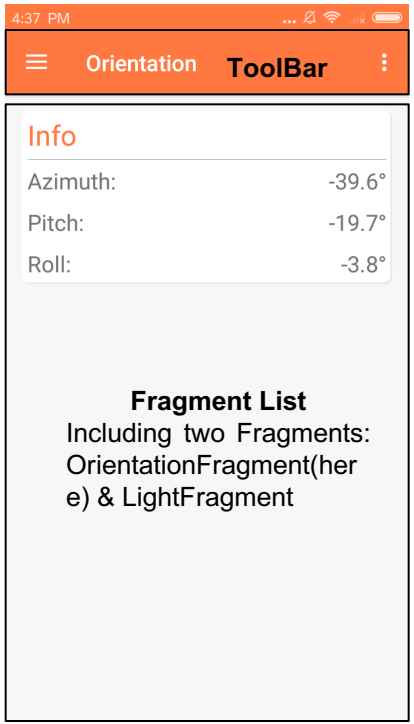




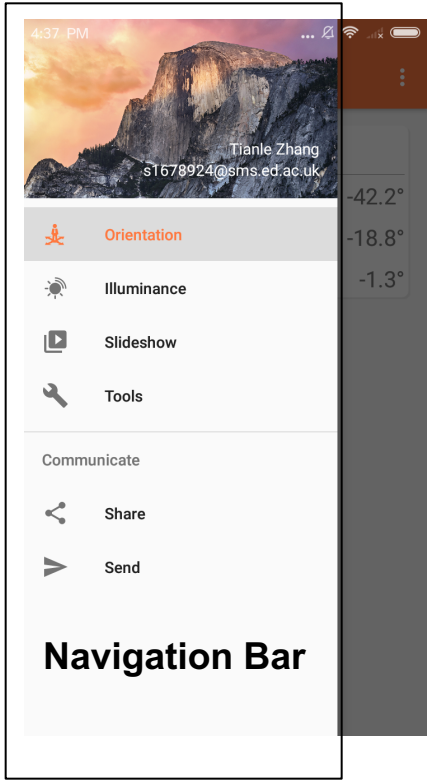
Java File and Classes ⟷ Cooperate with each other ⟷ **XML File Structure**

MainActivity.java appearance

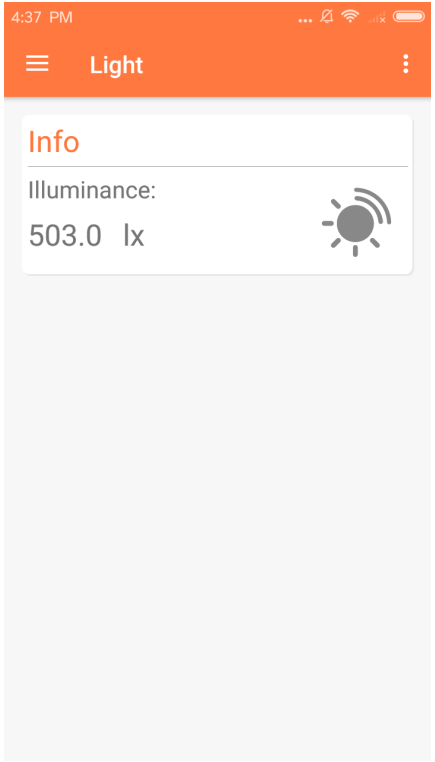
Basic Structure: UI



MainActivity.java appearance



Navigation Bar



Fragment: Light

Basic Structure: Threads

Main Thread

- *respond to user's normal operation*

Child Thread

- *display orientation and light data on the screen constantly*

Data Acquirement and Analysis

```
@Override
public void onSensorChanged(SensorEvent event) {
    if (event.sensor.getType() == Sensor.TYPE_ACCELEROMETER) {
        accelerometerValues = event.values;
    }
    if (event.sensor.getType() == Sensor.TYPE_MAGNETIC_FIELD) {
        magneticFieldValues = event.values;
    }
    calculateOrientation();
}
```

Function "onSensorChanged" provided by Android official document

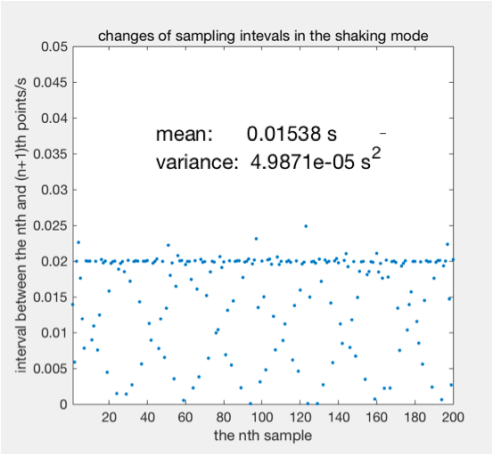
- In theory:

  be executed when the sensor detects that the orientation is changed

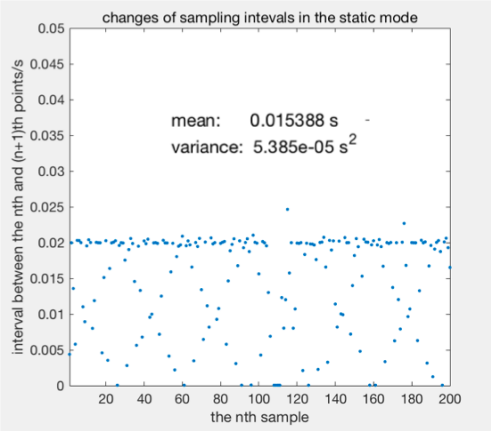
- In practice:

  happen frequently even in static status

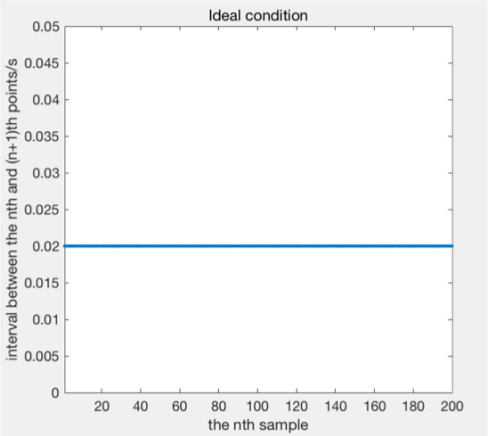
Data Acquirement and Analysis: sampling intervals



Keep static



Run fast

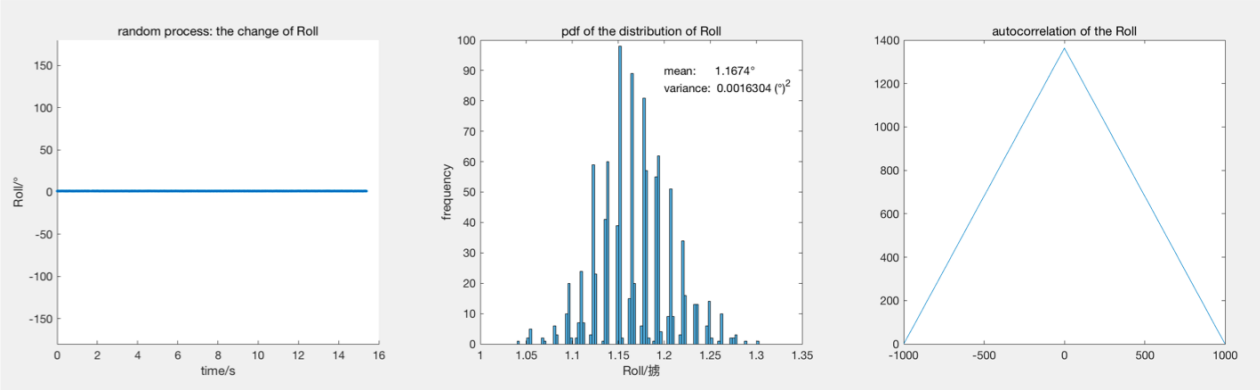


Ideal status

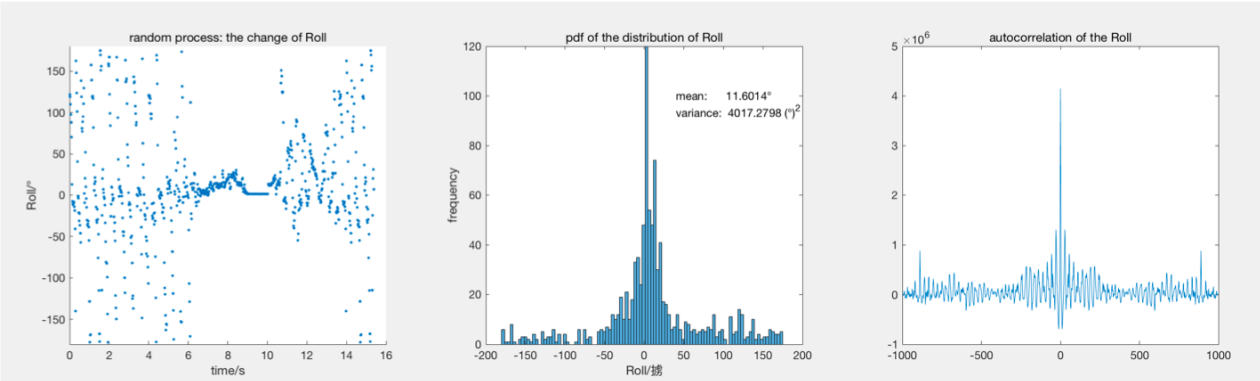
Interval = Time at which the $(N+1)^{th}$ measurement occurs − The N^{th} measurement occurs

Sampling intervals are not equal → sampling is not regular

Data Acquirement and Analysis: angle distribution



Keep static: normal distributed



Run fast: Laplace distributed

Next Step

- Find a method to get regular samples
- Analyse the relationship between the strength of light and orientation
- Body Blocking: begin with indoor localization?
- .....