

## Motivation

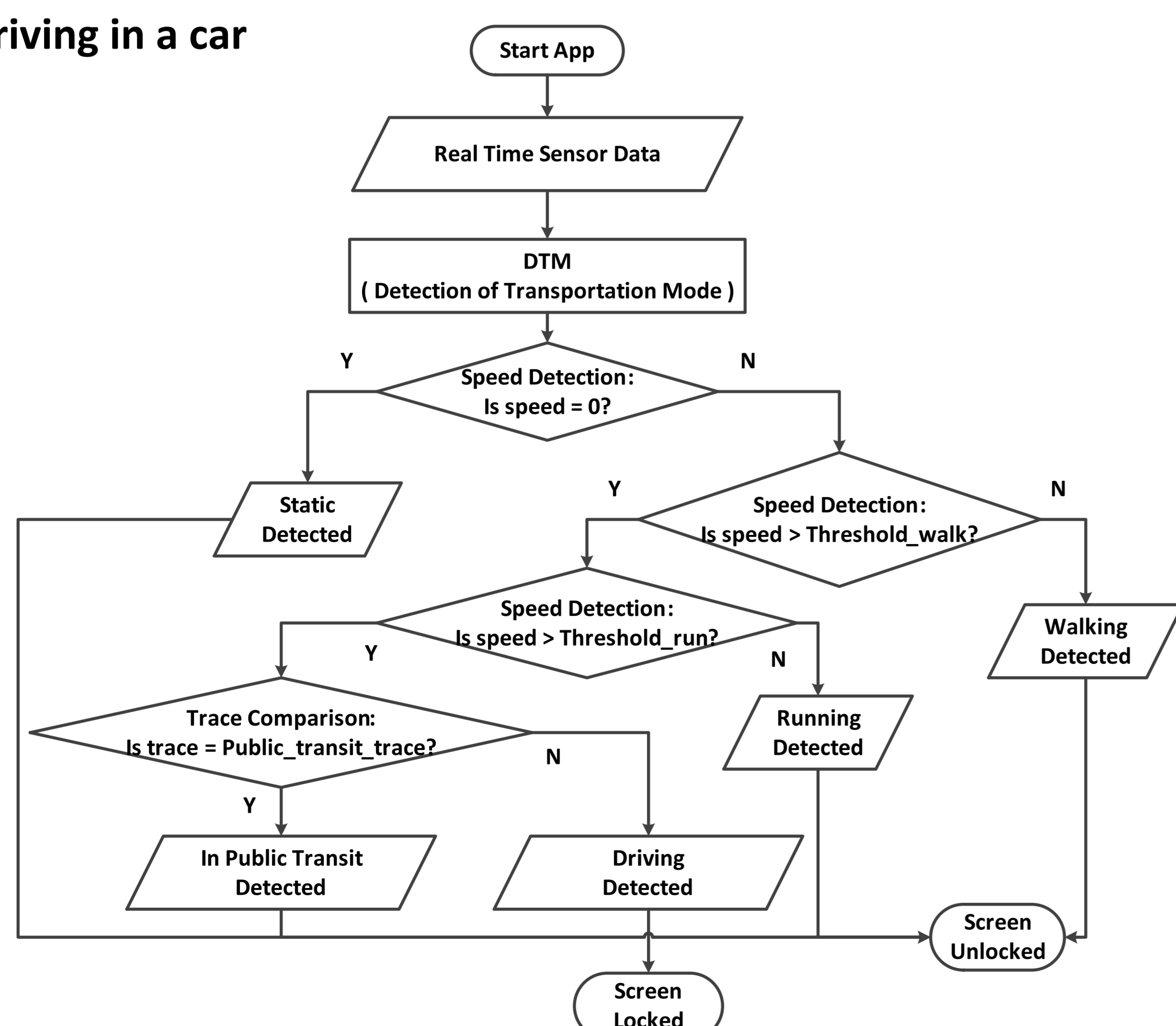
- **Distracted driving is dangerous to the safety of driver, passenger and even pedestrian**
  - It becomes a very dangerous epidemic on the roadways in recent years
  - According to the U.S. Department of Transportation's National Highway Transportation Safety Administration (NHTSA) Report, 3328 people were killed and 421,000 were injured in distraction-affected crashes in 2012
- **Using smartphone when driving is by far the most alarming driver distraction**
  - A lot of activities may lead to distracted driving, such as texting, making phone calls, using GPS, etc.
- **We need to design an app on smartphone for reducing the smartphone-related distracted driving**
  - It takes a long time for new techniques to be deployed in most cars. Smartphones advance in sensing capabilities to infer contextual information, such as accelerometer, gyroscope, magnetometer, proximity, NFC, camera, microphone, etc. Therefore an effective app on smartphones is useful and feasible to be implemented.

## System Design

- **Run in the background:** save much energy
- **Collect smartphone embedded sensors' data:** accelerometer, GPS, magnetometer, gyroscope
- **Detect current transportation mode:** computing the current speed and comparing the travel trace with the public transit trace to determine whether the user is on a public transit or driving
- **Lock the screen when driving detected (no password required):** a user cannot unlock the phone while driving until he/she slows down or parks the car on the roadside

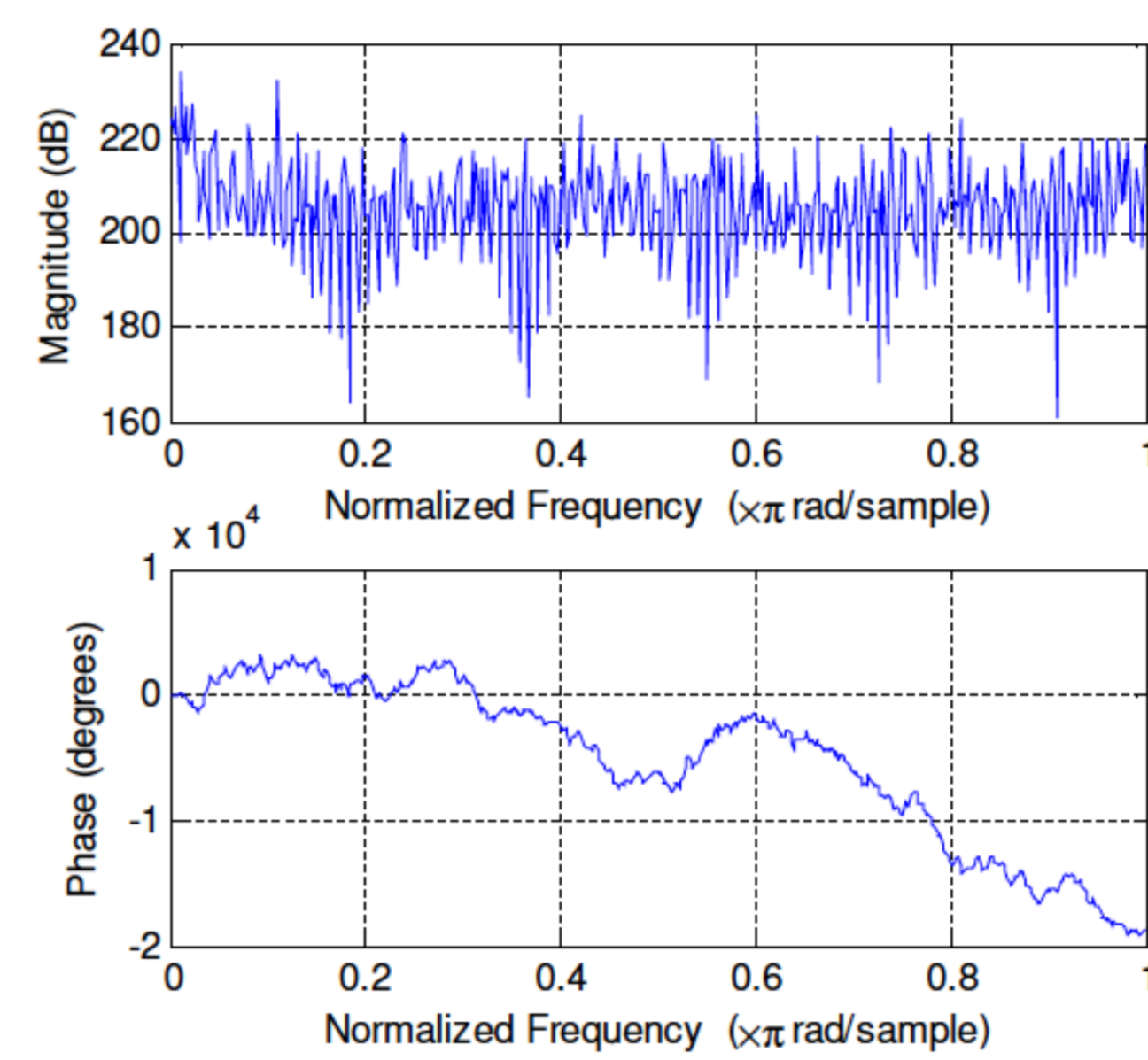
## DTM Algorithm - Detection of Transportation Mode

- **Static**
- **Walking/Running (with a customized function)**
- **On a public transit: bus, train, light rail, subway**
- **Driving in a car**

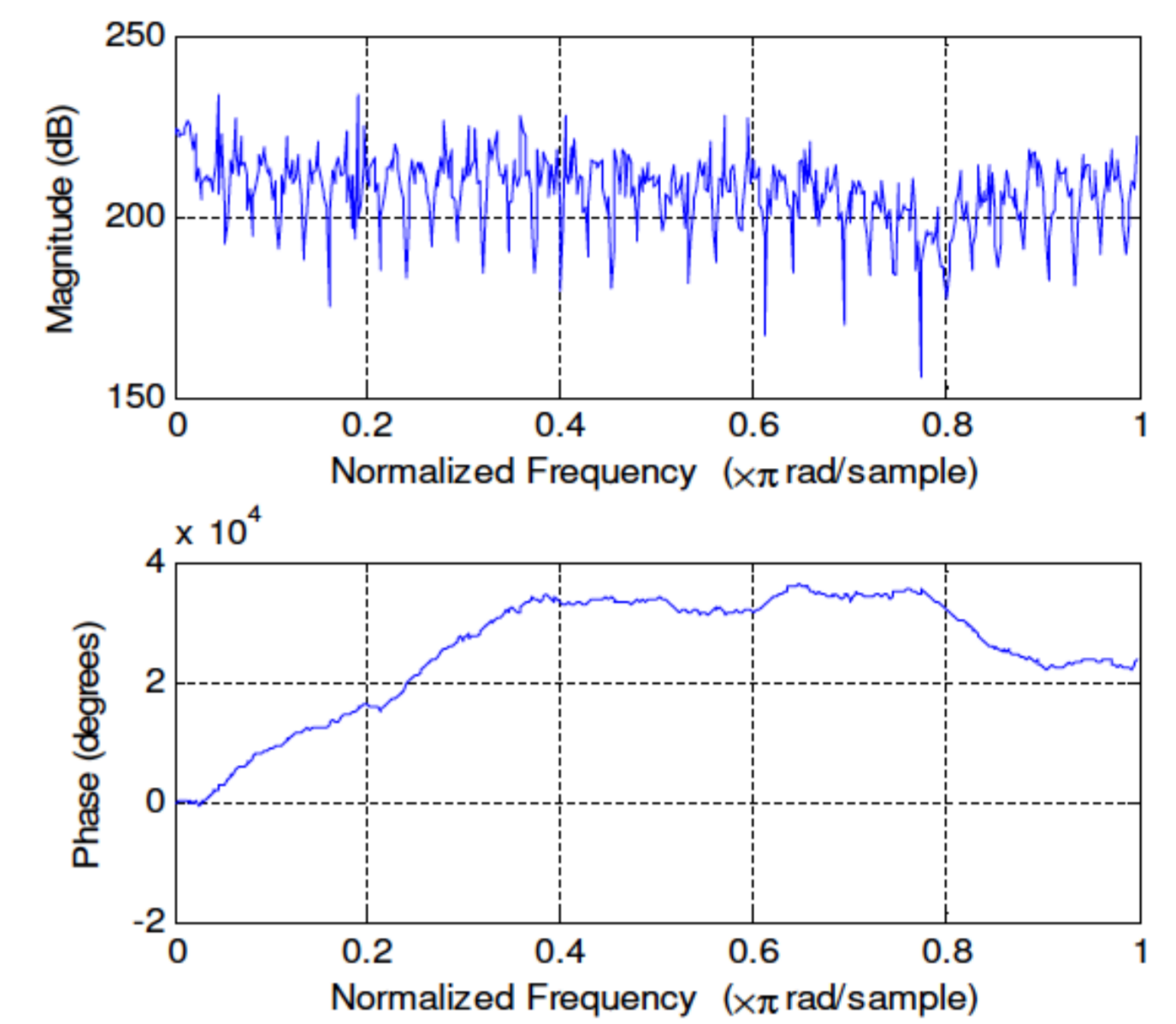


## Data Analysis

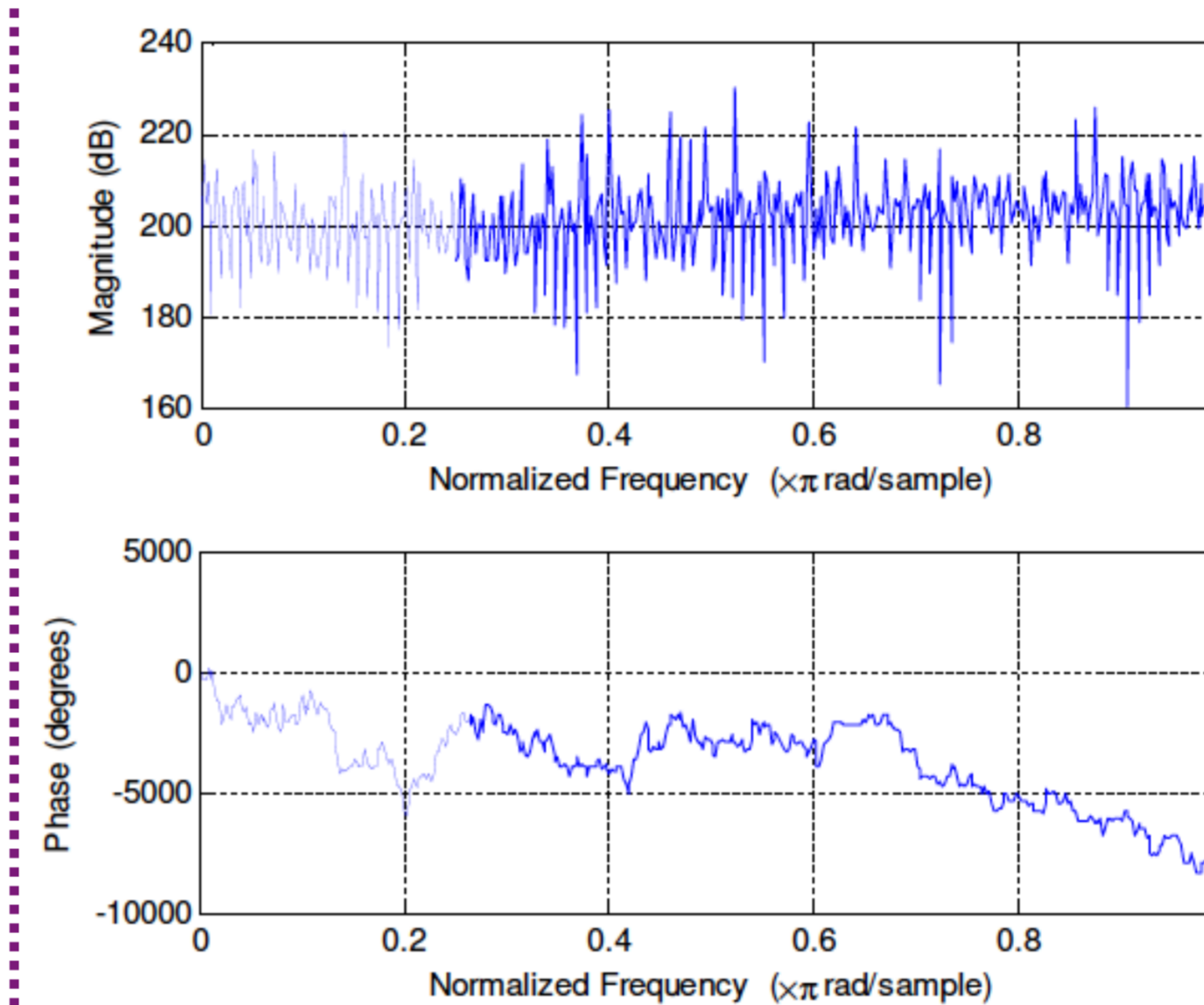
- **The Experimental Data:** We do data analysis on accelerometer sensor data and magnetometer sensor data when the user is on a light rail or driving respectively
- **Evaluation Metrics:** Magnitude (dB), Phase (degrees)
- **Performance Comparisons:**



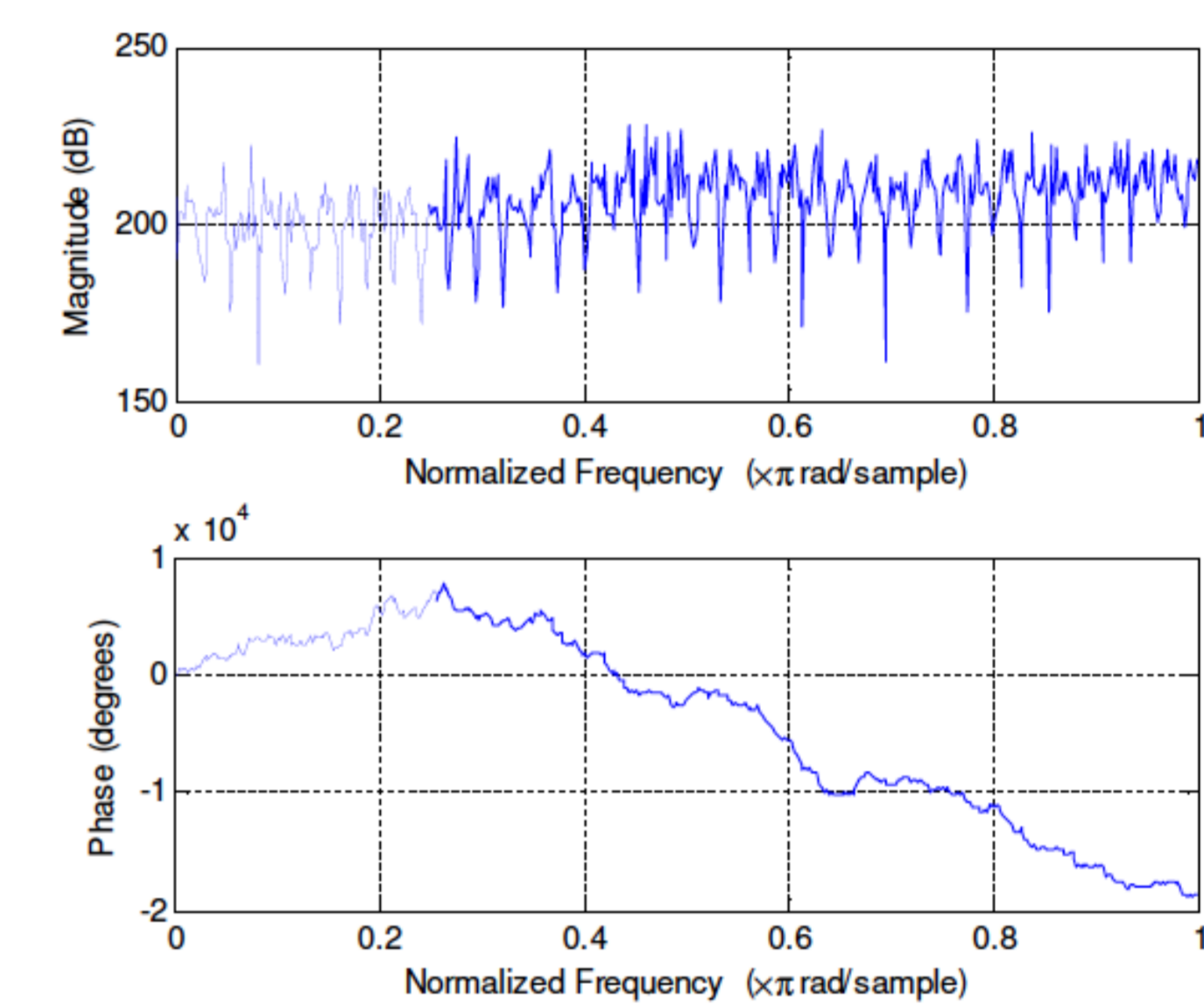
(a) Accelerometer, Driving in a Car



(b) Accelerometer, in Light Rail

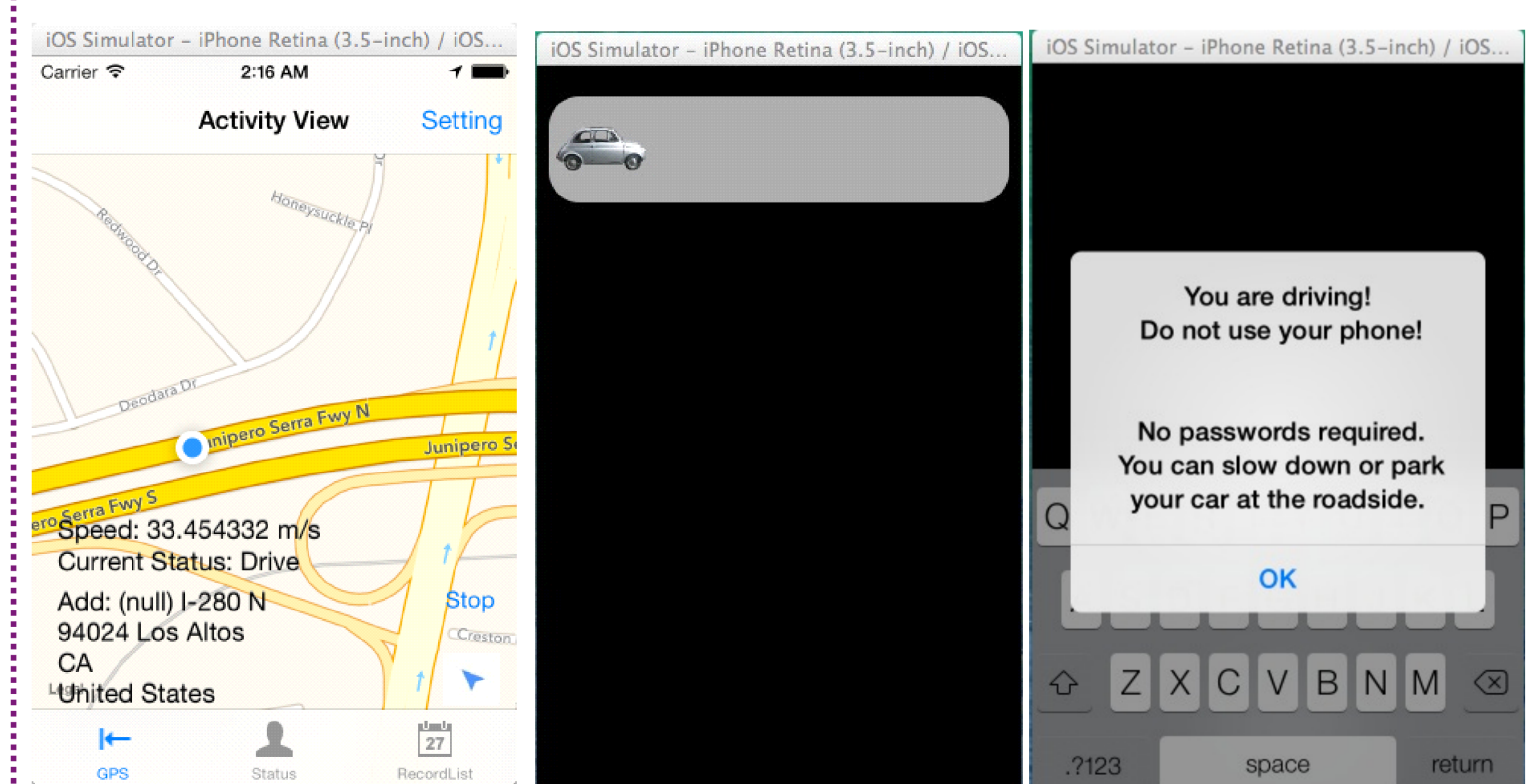


(a) Magnetometer, Driving in a Car



(b) Magnetometer, in Light Rail

## User Interface



## Conclusions and Future Works

- **Design a driving detection system and describe a DTM algorithm to detect different transportation modes based on smartphones for reducing distracted driving**
- **Future works:**
  - Use NFC technology to distinguish between a driver and a passenger
  - Find out advanced trace comparison model collaborated with both public transit station information and user's each stop information