MDR Presentation
SmartWheel

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Department of Electrical and Computer Engineering
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Team Members

Advisor
Lixin
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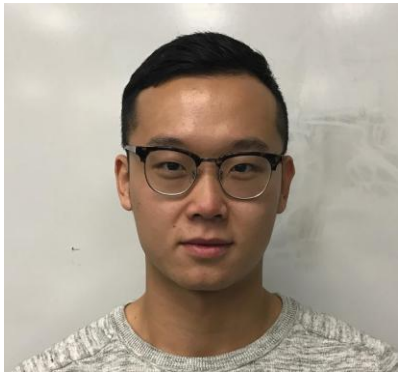

Bingze
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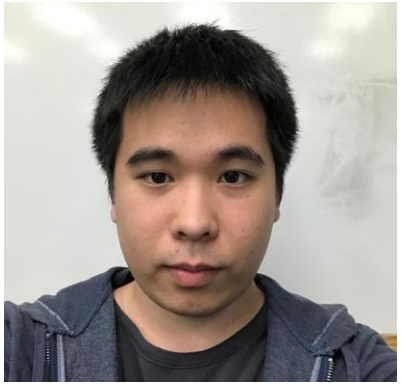

Jack
Tam
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SmartWheel: New Approach

PDR:

- Anti-Tow System
- Diagnostic System

MDR:

- Parent Alert System
- Driving History

What is SmartWheel?

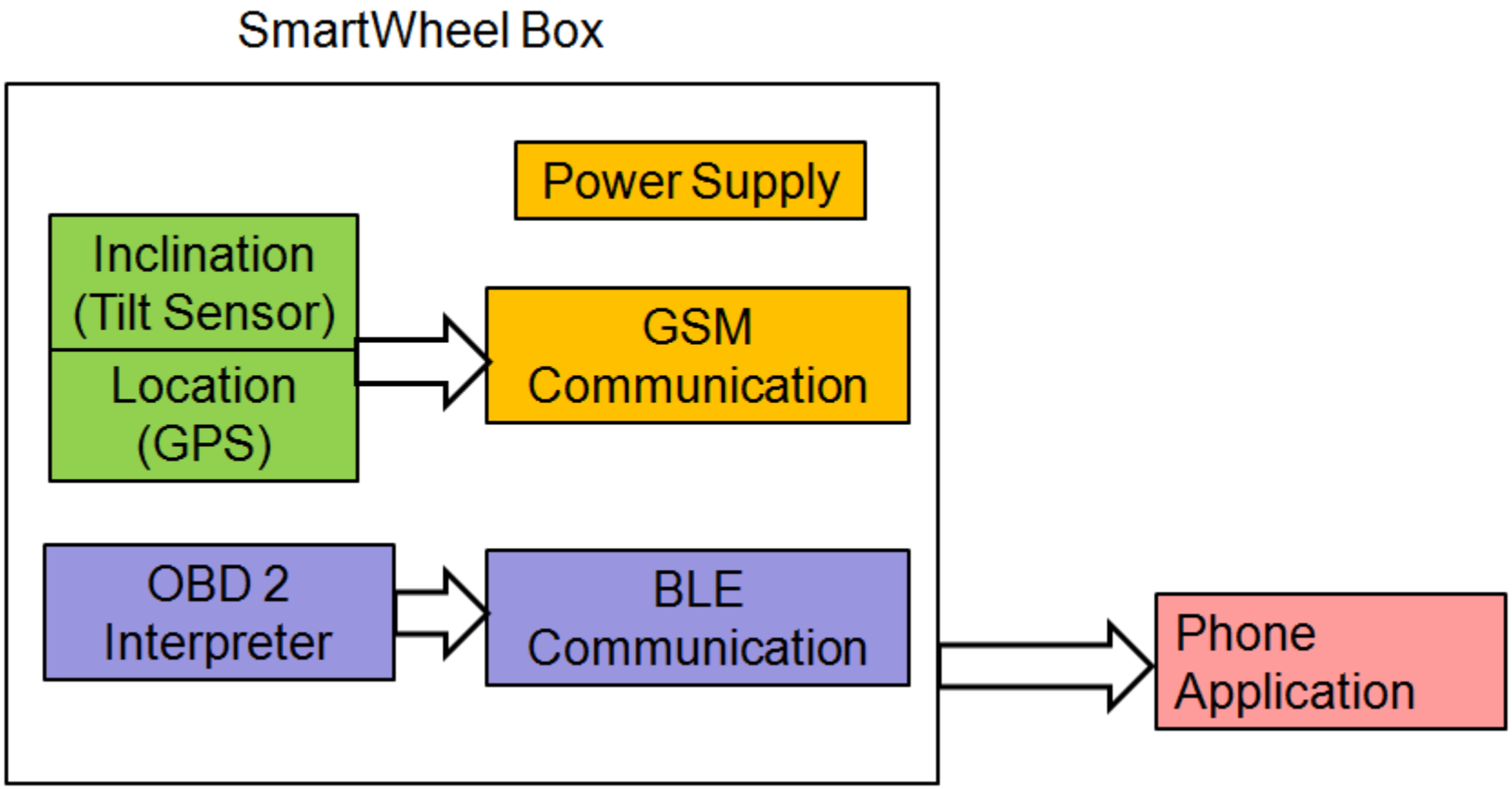
SmartWheel Functionality?

- Monitor car acceleration. (accomplished)
- Send message to registered phone with coordinates when acceleration reaches certain level. (accomplished)
- The app could extract the coordinates from message and show it on map. (accomplished)
- A home-box could gather and sort the driving history. (CDR)

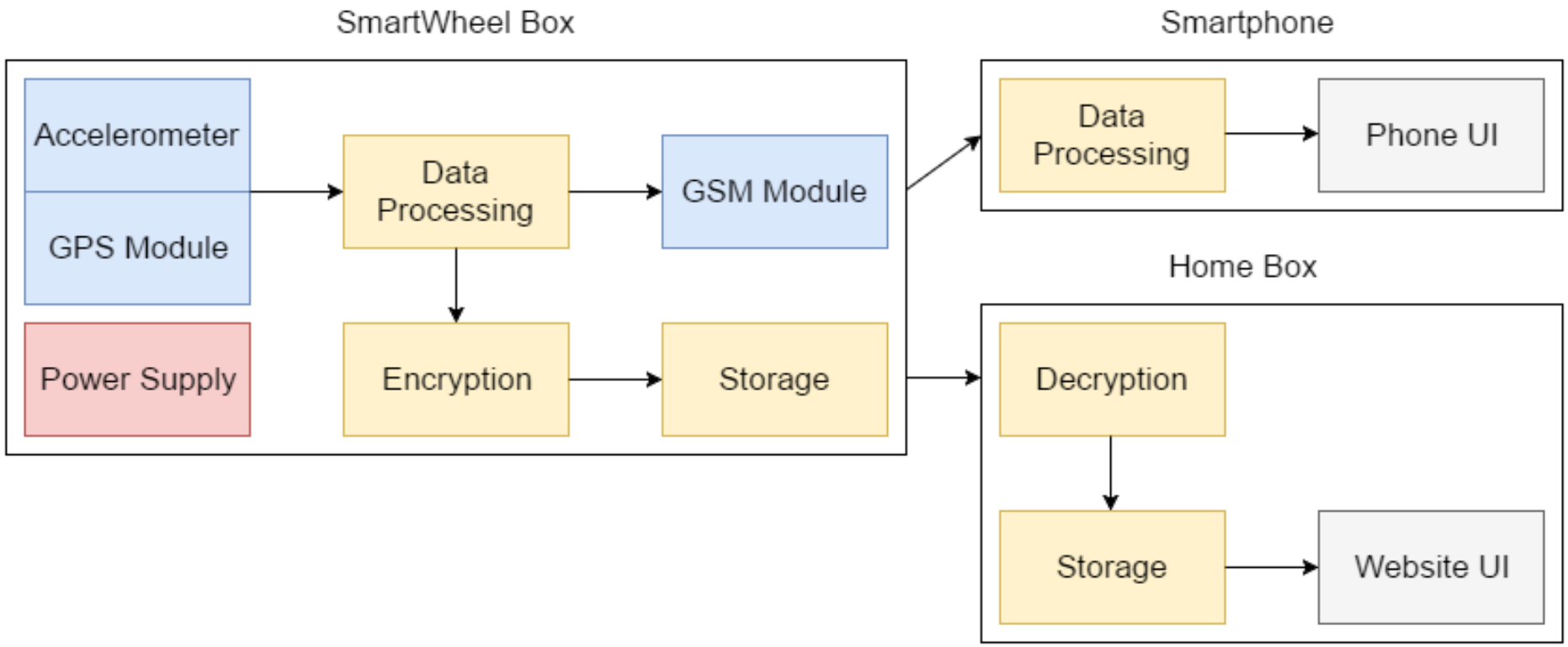
For whom the SmartWheel is designed?

- Parents
- Insurance companies

Previous Solution: Block Diagram



Redesigned Solution: Block Diagram



Accelerometer

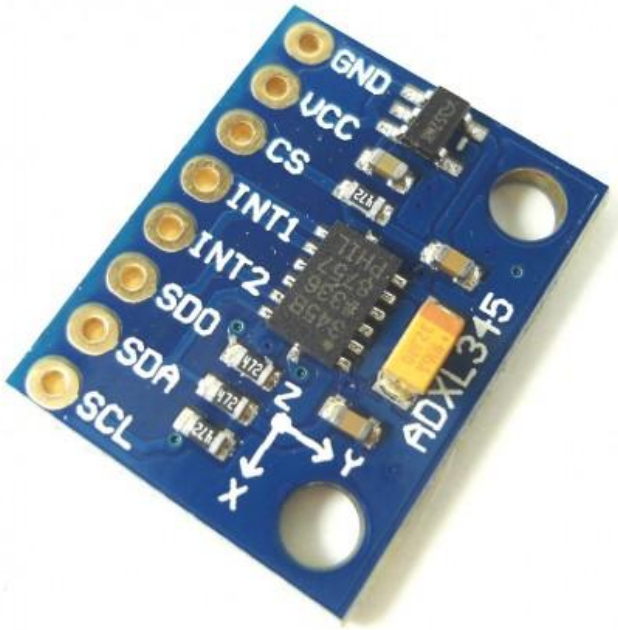
ADXL 345

Requirements

- Detect XYZ gravitational forces
- Take into account earth gravity
- Properly react on different gravitational forces

Challenges

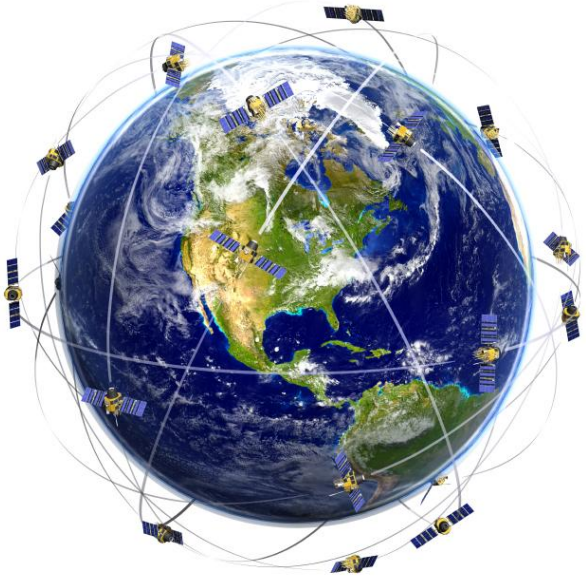
- Encryption
- Storage



GPS sensor

Adafruit GPS breakout V3

- 10 Hz updates
- 5V, 20mA (0.1W)



GPS

Requirements

- GPS module could get coordinates and speed.
- GPS module could extract the coordinates and speed information in python.
- module should write the coordinates with corresponding speed and save it into txt file for data server.

Accomplished

- GPS module could get coordinates and speed (err: ± 0.25m/s).
- Developed python code that extract coordinates and speed data.
- The coordinates and speed data could continuously write into a text file for data server.

Data memory usage

- 1 sec: 41B
- 1 minute: 2.4KB
- 1 hour: 144KB
- 1 day : 3.4MB
- 1 month: 103MB

Communication

Requirements

- Reliable data sent to cell phone from SmartWheel
- Communication Between SmartWheel and cell phone
- Private communication

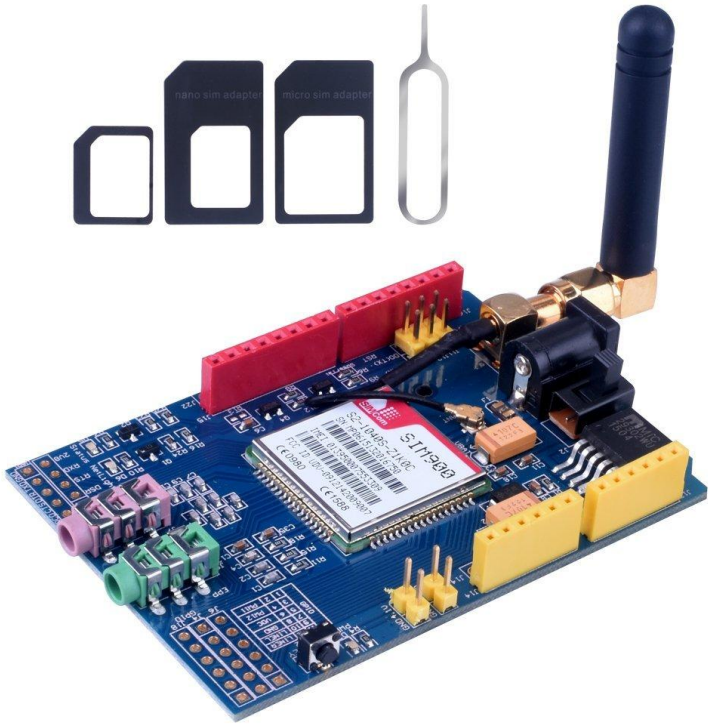
Accomplished

- Flash the firmware of GSM 900 model into Raspberry pi 3
- Created the Smartwheel code by using Python
- Merge code make the GSM model could get reliable data from others
- Only the certain cell phone number will have data

Communication experiment

SIM 900

- cost $36
- High Performance which satisfy distance requirement
- Stronger signal receiver (acceptable four different frequency)
- The profile to fit dimension requirement



SIM CARD

- cost $20
- 500texts
- 200MB data

Phone app

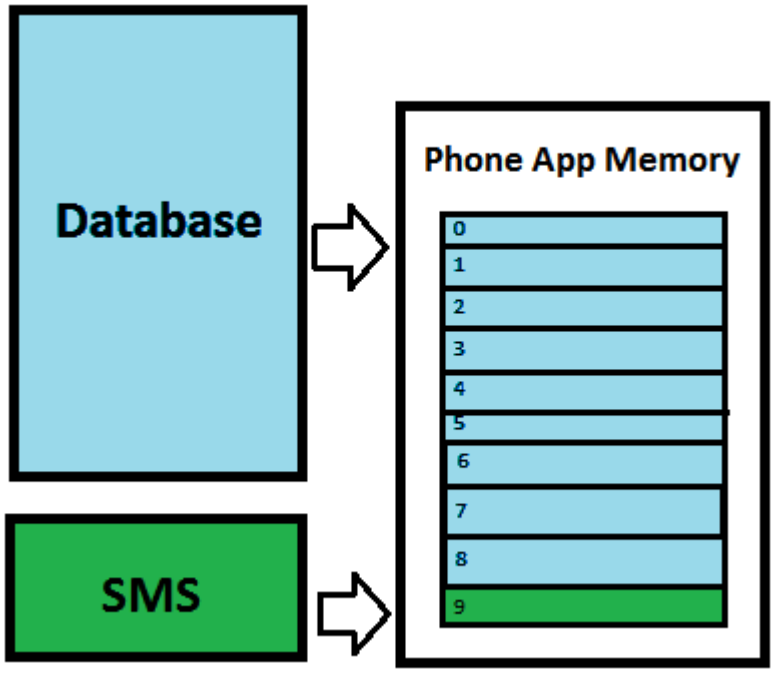
Requirements

- Runs on Android phones
- Read data from a list/webserver
- Read text messages from phone
- Use information to show points on map

Accomplished

- Works as expected on Android phones running API level 17-22
- Currently reads data from a text file
- Can read messages from a specified number
- Information is processed and used to plot points on the map and display corresponding acceleration

Phone App



- Programmed in java using Android SDK
- Uses the Google Maps API
- Plots the most recent 10 points in which a the acceleration went past a designate value.
- The 10 points are taken from both the list and from text messages

Completed MDR deliverables

- Jack Tam

  Phone app can read coordinates and acceleration from a list and text messages

  Phone app can plot the points and label it with corresponding acceleration

- Bingze Li

  Raspberry pi 3 recognized GSM model

  GSM model be able to sent message out individual

  GSM model could get reliable data from others then sent them out

- Bingjun Wang

  GPS module could extract the coordinate and speed and send it to GSM module

  GPS module could save data into text file

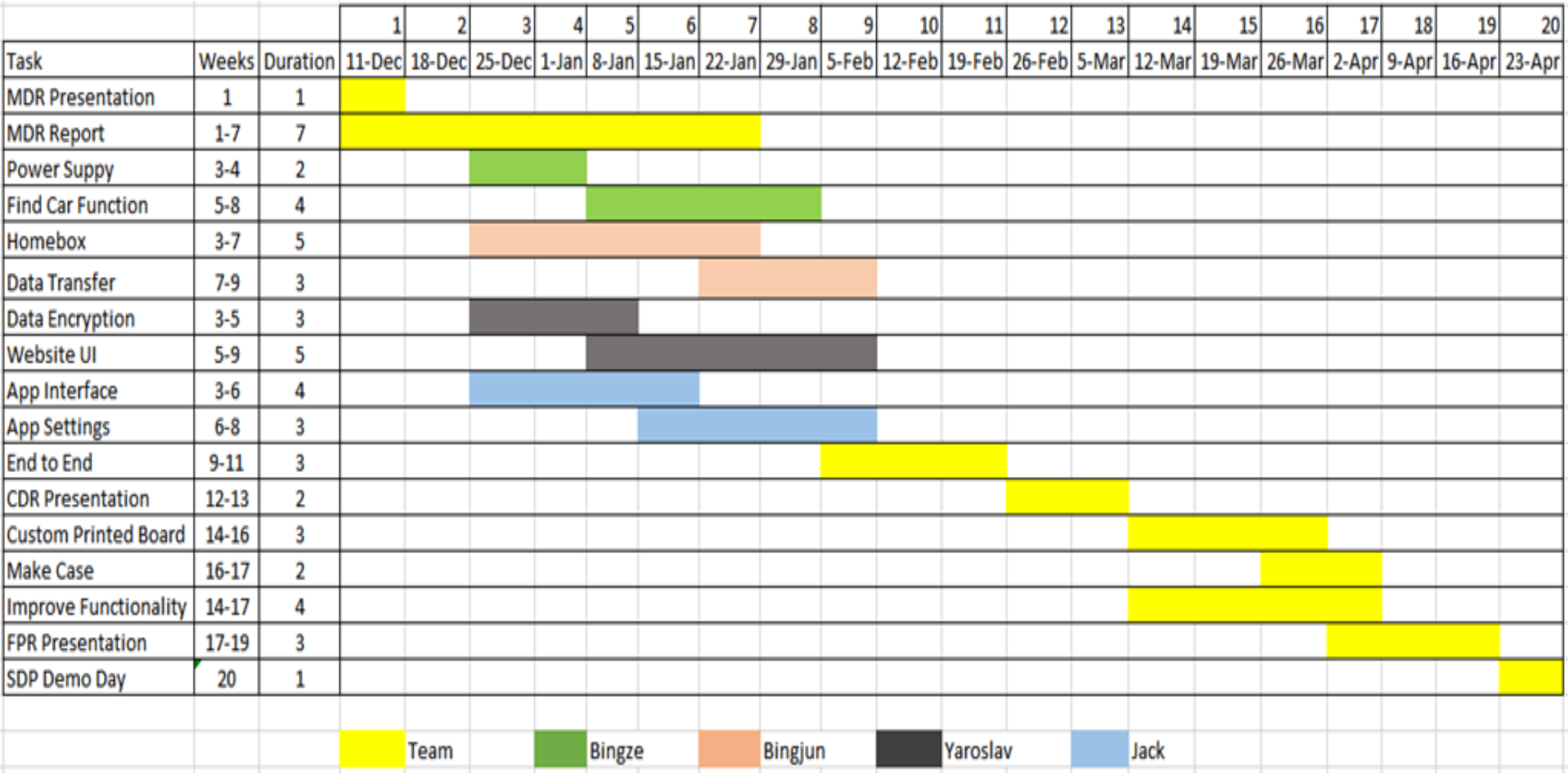
- Yaroslav Burdin

  Detect XYZ gravitational forces
  Proper reaction on different gravitational forces

Proposed CDR Deliverables

- Jack Tam
  - Smartphone UI
- Bingze Li
  - Power Supply
  - Find my car Function
- Bingjun Wang
  - Homebox set up
  - Data Transfer between SmartWheel and Homebox
- Yaroslav Burdin
  - Data Encryption/Decryption
  - Website UI

Gantt Chart



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Task	Weeks	Duration	11-Dec	18-Dec	25-Dec	1-Jan	8-Jan	15-Jan	22-Jan	29-Jan	5-Feb	12-Feb	19-Feb	26-Feb	5-Mar	12-Mar	19-Mar	26-Mar	2-Apr	9-Apr	16-Apr	23-Apr
MDR Presentation	1	1																				
MDR Report	1-7	7																				
Power Suppy	3-4	2																				
Find Car Function	5-8	4																				
Homebox	3-7	5																				
Data Transfer	7-9	3																				
Data Encryption	3-5	3																				
Website UI	5-9	5																				
App Interface	3-6	4																				
App Settings	6-8	3																				
End to End	9-11	3																				
CDR Presentation	12-13	2																				
Custom Printed Board	14-16	3																				
Make Case	16-17	2																				
Improve Functionality	14-17	4																				
FPR Presentation	17-19	3																				
SDP Demo Day	20	1																				

Team Bingze Bingjun Yaroslav Jack

DEMO