

AfroSafe 2026 Presentation

Developing an Integrated Real-Time Road
Network System and Framework Anchored in
Safety, Community Empowerment and
Ownership in Africa

Lubinda Lubinda

INTRODUCTION

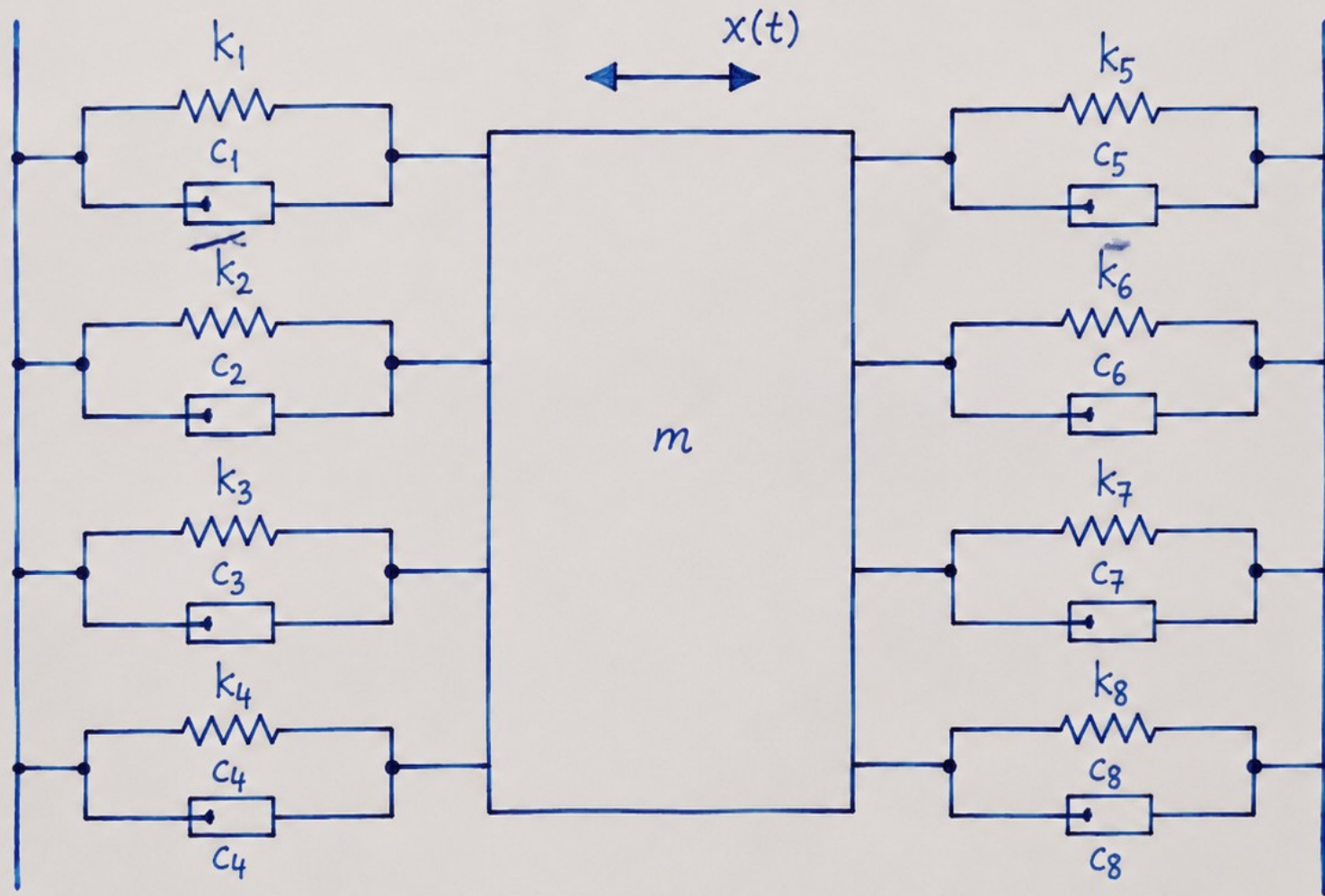
- Africa faces growing road safety challenges, and rising emissions.

PROBLEM STATEMENT:

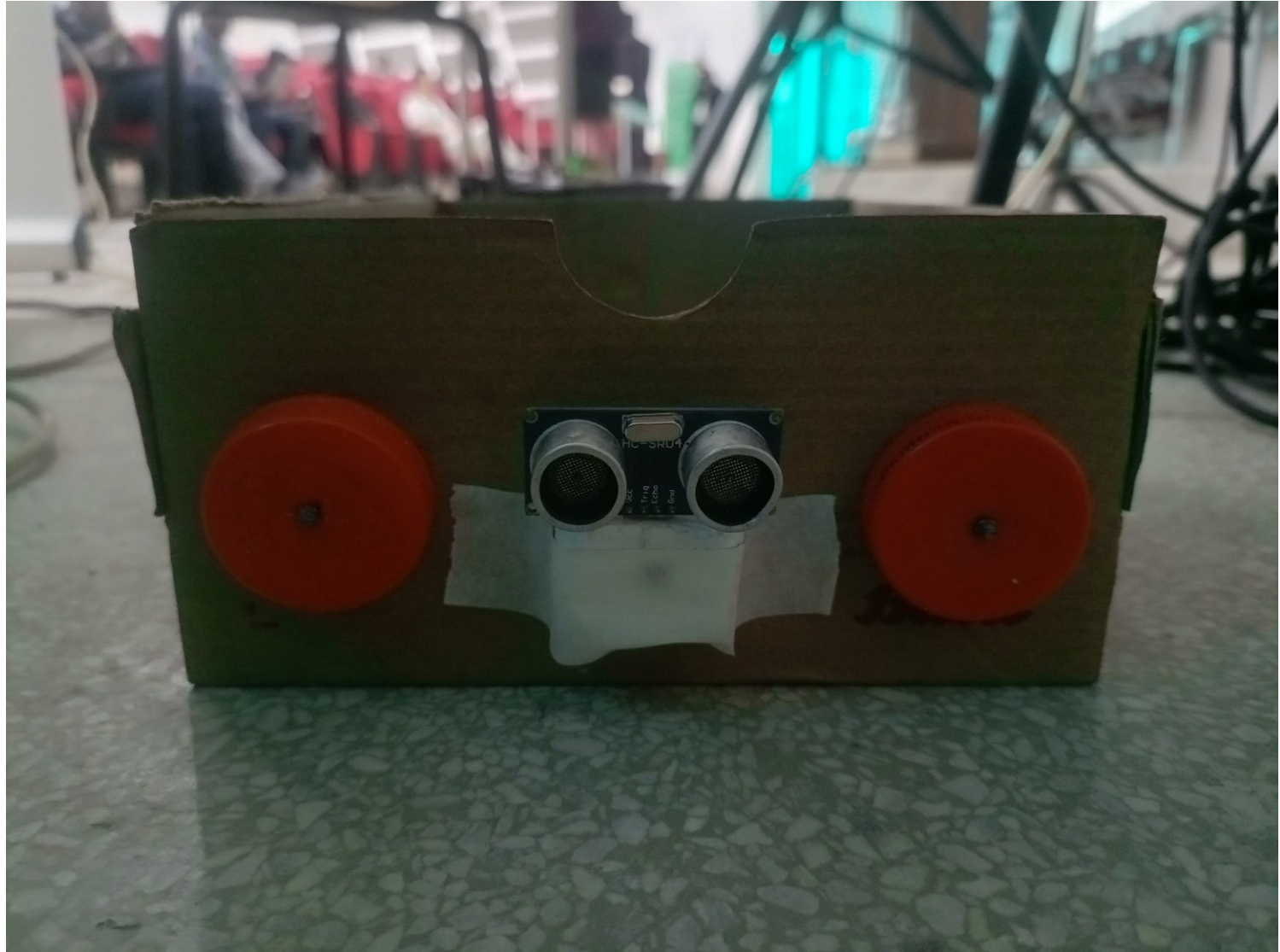
- Road accidents, limited hazard awareness, speed violations, and lack of real-time information.

HEAD ON COLLISION





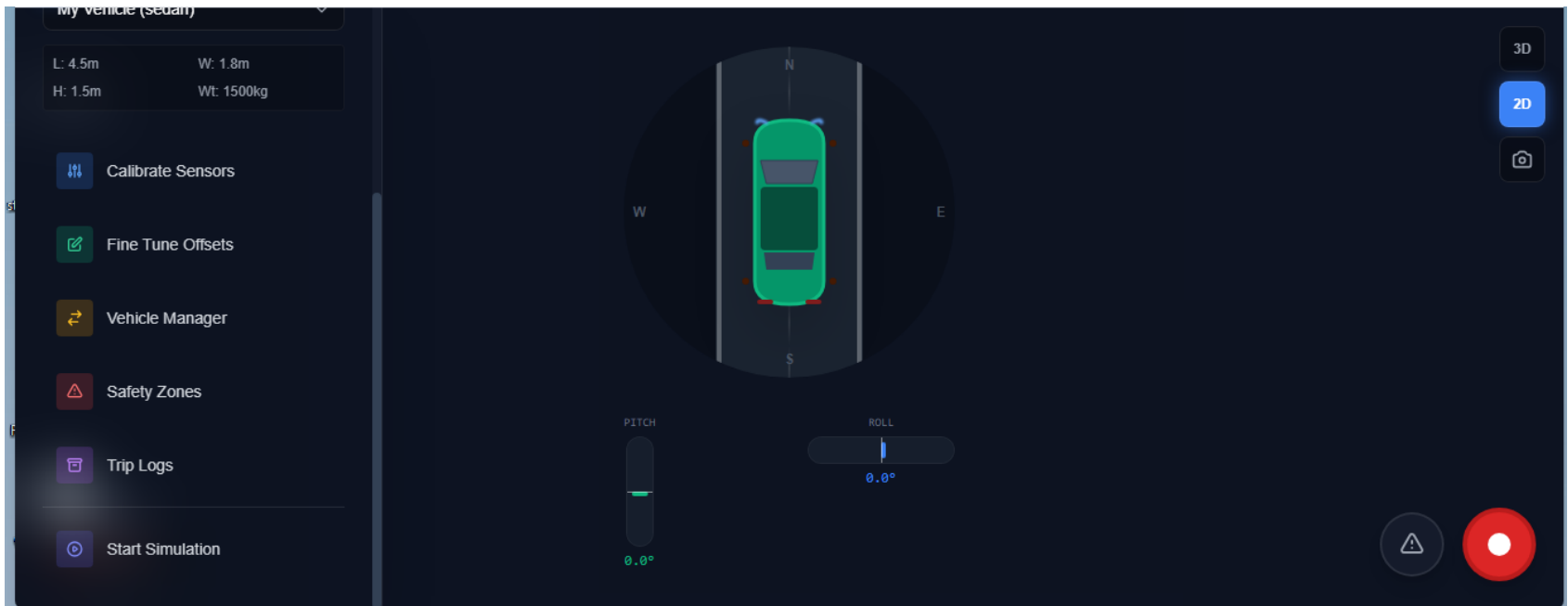
VEHICLE BODY



Sliding mechanism



APPLICATIONS INITIAL POSITION



VEHICLE FINAL

The screenshot displays a vehicle simulation interface. On the left, a sidebar contains a dropdown menu labeled "my vehicle (sebat)" and a table of specifications:

L: 4.5m	W: 1.8m
H: 1.5m	Wt: 1500kg

Below the table are several menu items: "Calibrate Sensors", "Fine Tune Offsets", "Vehicle Manager", "Safety Zones", "Trip Logs", and "Start Simulation".


The main area shows a top-down view of a teal car on a road with cardinal directions (N, S, E, W) marked. Below the car, there are two sliders: "PITCH" set to 0.0° and "ROLL" set to 4.8°.

On the right side, there are three buttons: "3D", "2D", and a home icon. At the bottom right, there is a warning icon and a red circular button.

The time "7:25 PM" is displayed in the bottom right corner.

BRIDGE BETWEEN THE PHONE AND INFRASTRUCTURE


SMARTPHONE LINK AWAITING



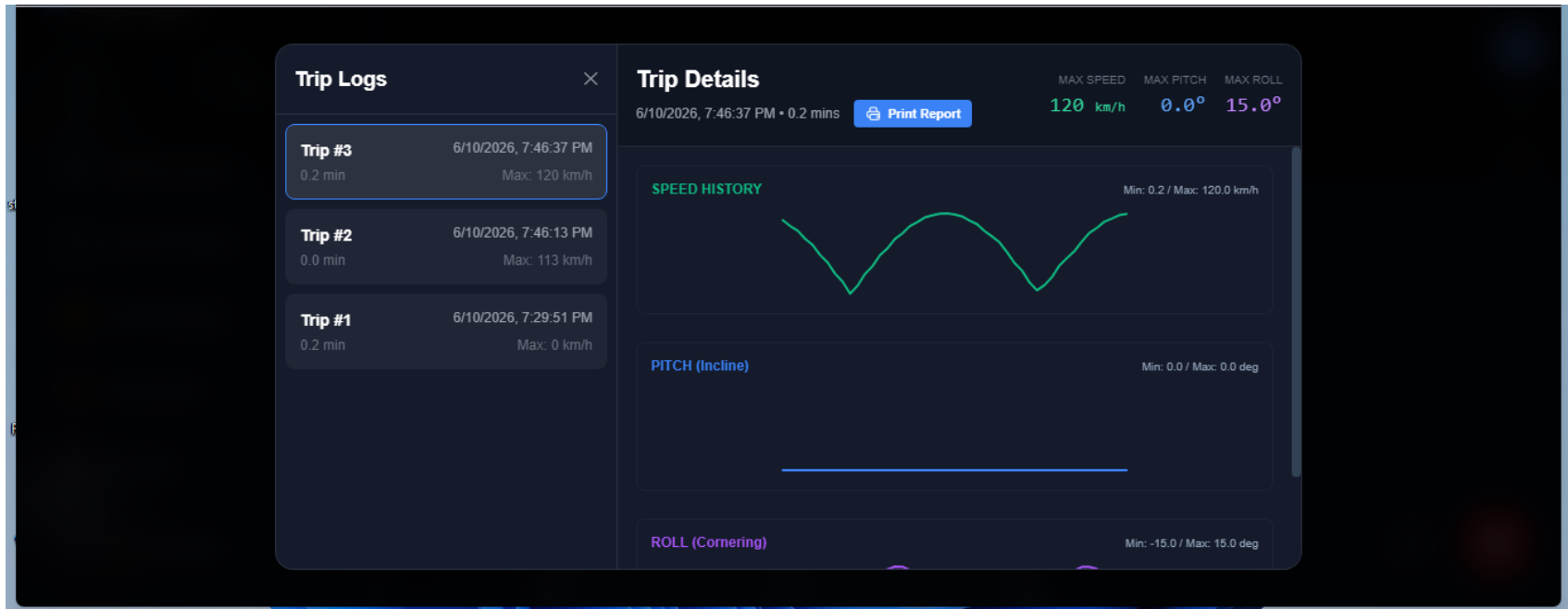
SCAN WITH YOUR ANDROID DEVICE TO UTILIZE ITS PHYSICAL INFRASTRUCTURE (GPS/MEMS).

IMU SYNC
Pitch / Roll / Yaw LOCKED

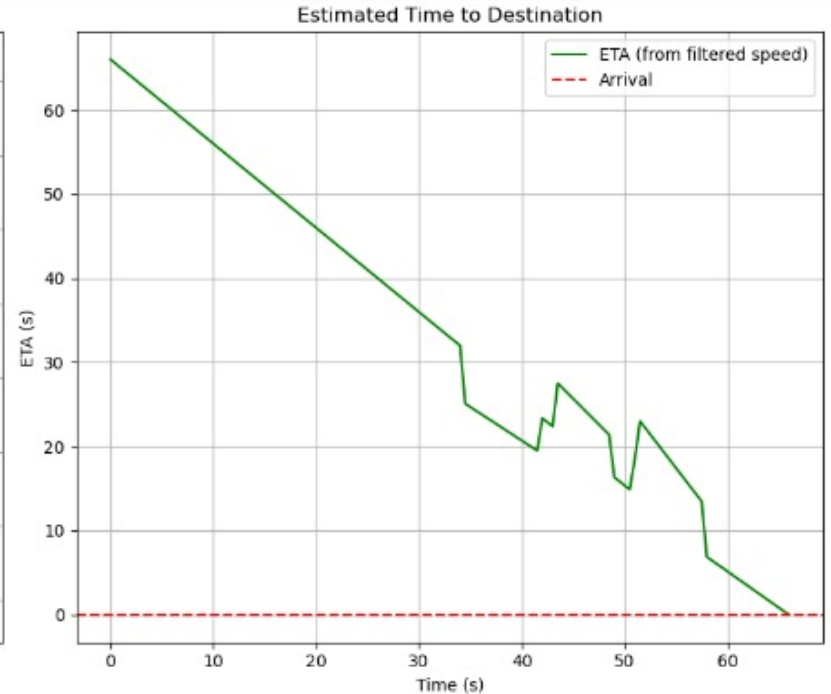
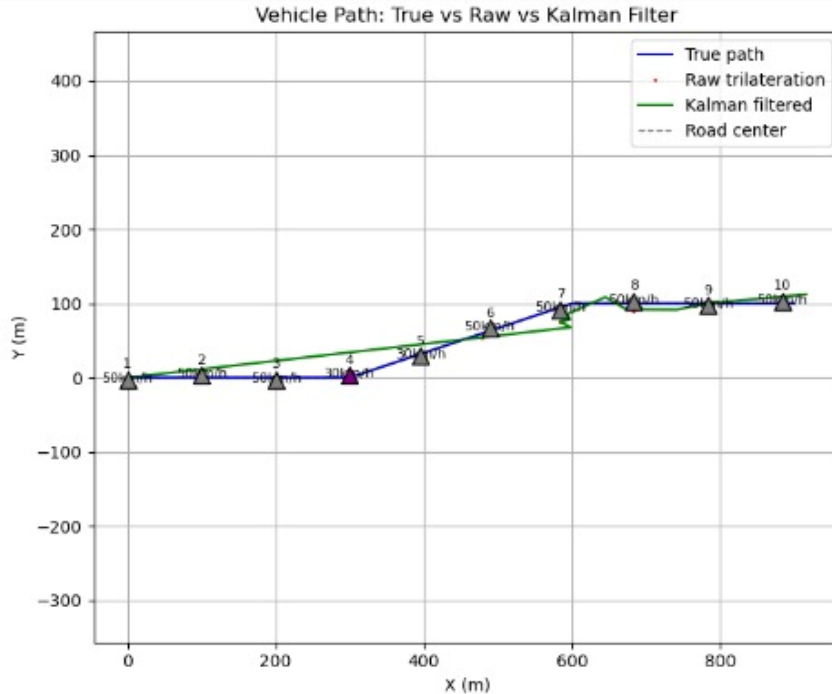
GNSS BRIDGE
High-Accuracy GPS ACTIVE



VEHICLE TRIP LOGS



CURVED ROADS



Raw trilateration error (when ≥ 3 beacons):
Mean: 11.0 m, Std: 6.9 m, 95%: 20.1 m

Kalman filtered error:
Mean: 130.2 m, Std: 147.5 m, 95%: 421.8 m

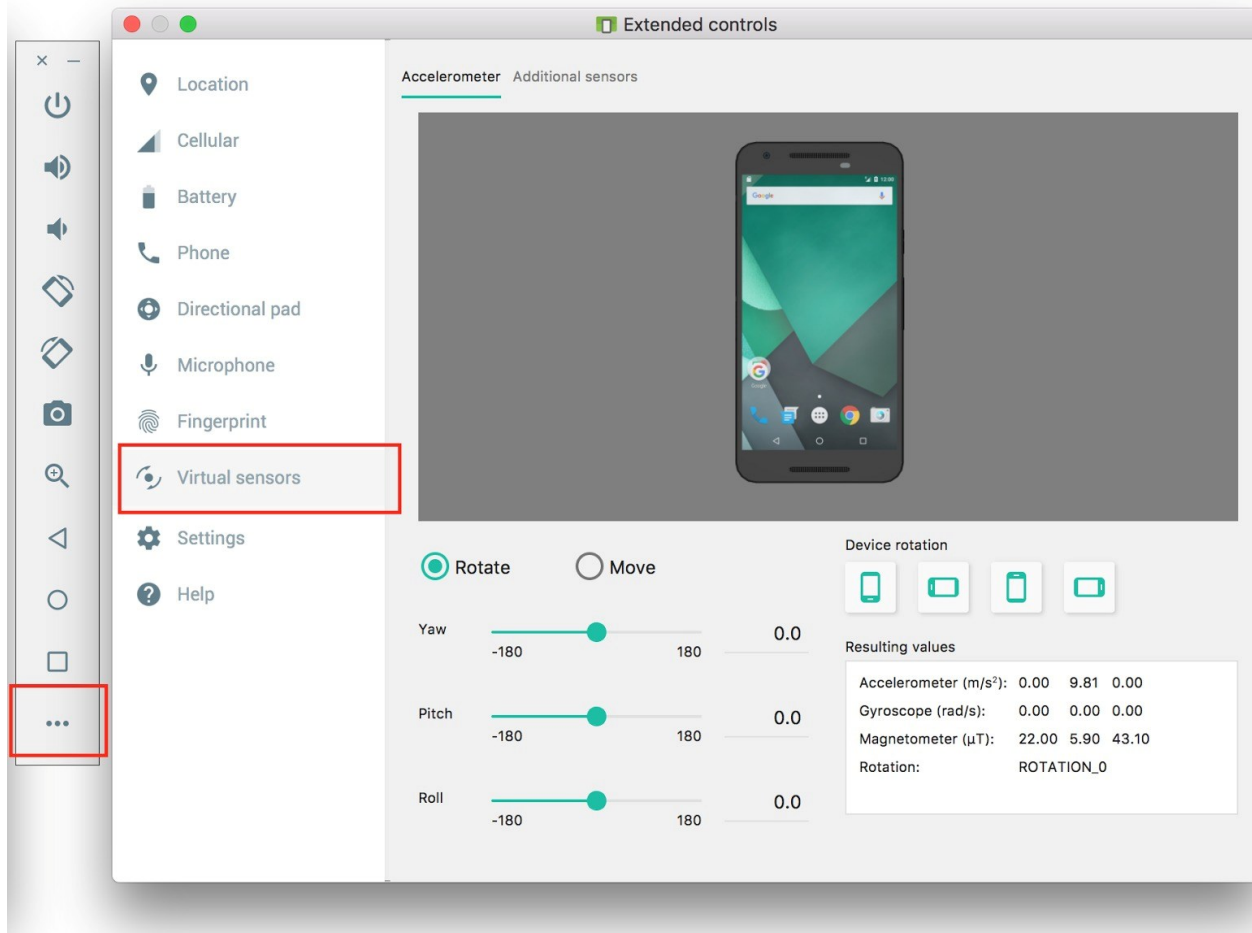
Activate Windows
Go to Settings to activate Windows.

DATA FROM THE ROAD

🚗 Simulation: road length = 916 m, speed = 50 km/h, beacons = 10
RSSI noise std = 1.0 dBm, fast mode with Kalman filter.

- ⚠️ ALERT at t=0.0s (dist=0m): Beacon 1 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=7.0s (dist=97m): Beacon 2 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=14.5s (dist=201m): Beacon 3 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=21.5s (dist=299m): Beacon 4 - Speed limit 30 km/h, Hazard: Pedestrians
- ⚠️ ALERT at t=29.0s (dist=403m): Beacon 5 - Speed limit 30 km/h, Hazard: None
- ⚠️ ALERT at t=36.0s (dist=500m): Beacon 6 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=43.0s (dist=597m): Beacon 7 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=50.5s (dist=701m): Beacon 8 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=57.5s (dist=799m): Beacon 9 - Speed limit 50 km/h, Hazard: None
- ⚠️ ALERT at t=65.0s (dist=903m): Beacon 10 - Speed limit 50 km/h, Hazard: None

ANDROIDS VIRTUAL SENSORS



DRIVERS TRIP LOG



cmd: Select C:\Windows\System32\cmd.exe - mpremove connect COM3 repl

```
VEHICLE=VEH001  
DRIVER=DRV001  
NAME=RAPHAEL  
  
DRIVING_STATUS=DRIVING  
  
LAT=-15.406479  
LON=28.287322  
  
SPEED=74  
ALCOHOL=0.07  
STATUS=WARNING  
  
DISTANCE_KM=3.953  
  
TIME=01:01:58  
  
VEHICLE=VEH001  
DRIVER=DRV001  
NAME=RAPHAEL  
  
DRIVING_STATUS=DRIVING  
  
LAT=-15.406386  
LON=28.287378  
  
SPEED=102  
ALCOHOL=0.08  
STATUS=OVER_LIMIT  
  
DISTANCE_KM=3.965  
  
TIME=01:02:01  
  
VEHICLE=VEH001  
DRIVER=DRV001  
NAME=RAPHAEL  
  
DRIVING_STATUS=DRIVING
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DRIVER=DRV001
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DRIVING_STATUS=DRIVING
```

Activate Windows
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11:09 PM
Wednesday
6/10/2026

Street Vending

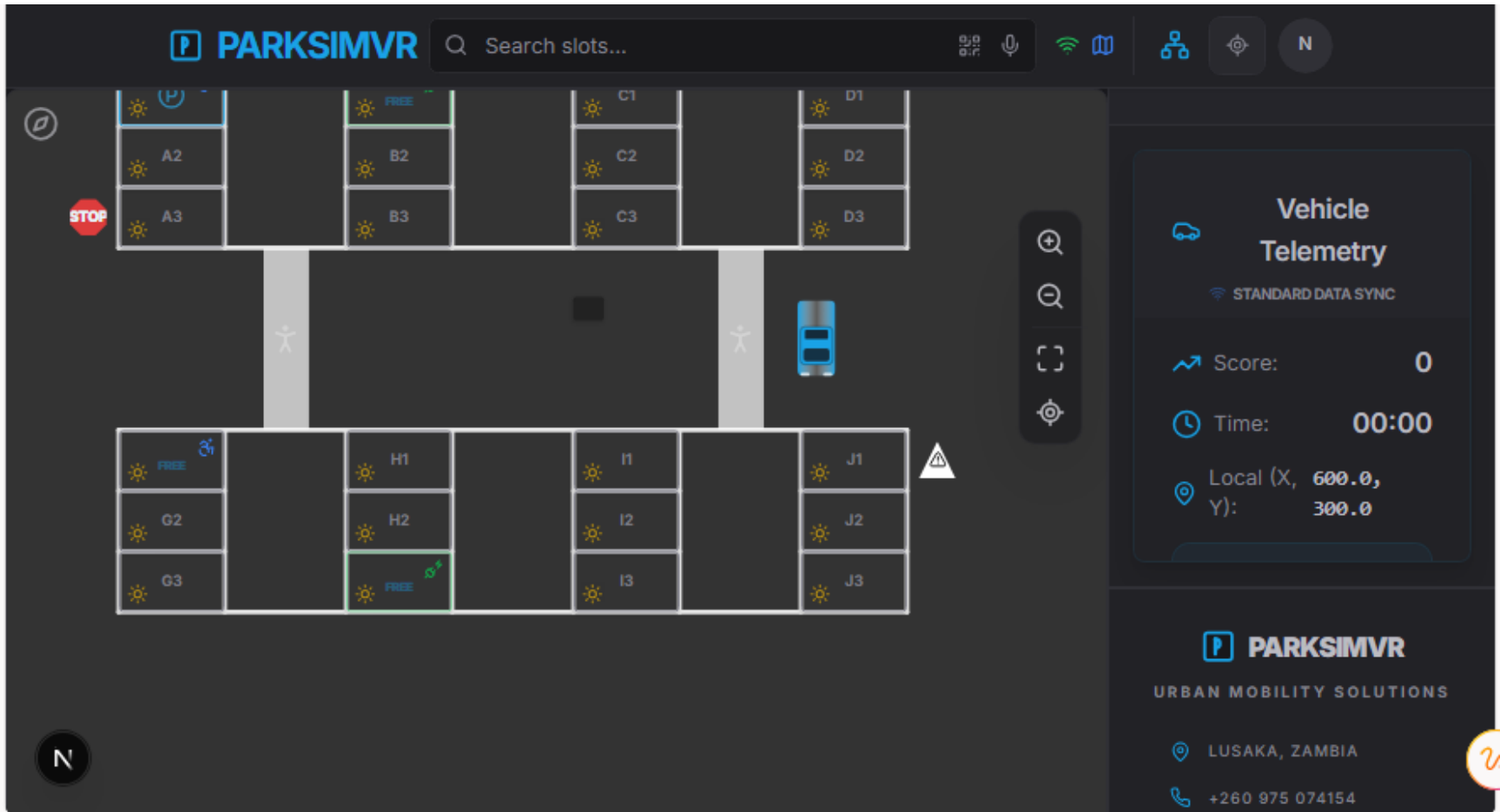


Diagrams illustrating street vending activities in Lusaka, ZD, July 2011

Wheel barrow pushers:



PADESTRIANS AND OTHER USERS



CONCLUSION:

- The framework demonstrates potential to improve road safety, community-driven and promotes integration of various road users.