



Exercise

VITMMA09 – SmartCity MSc specialization

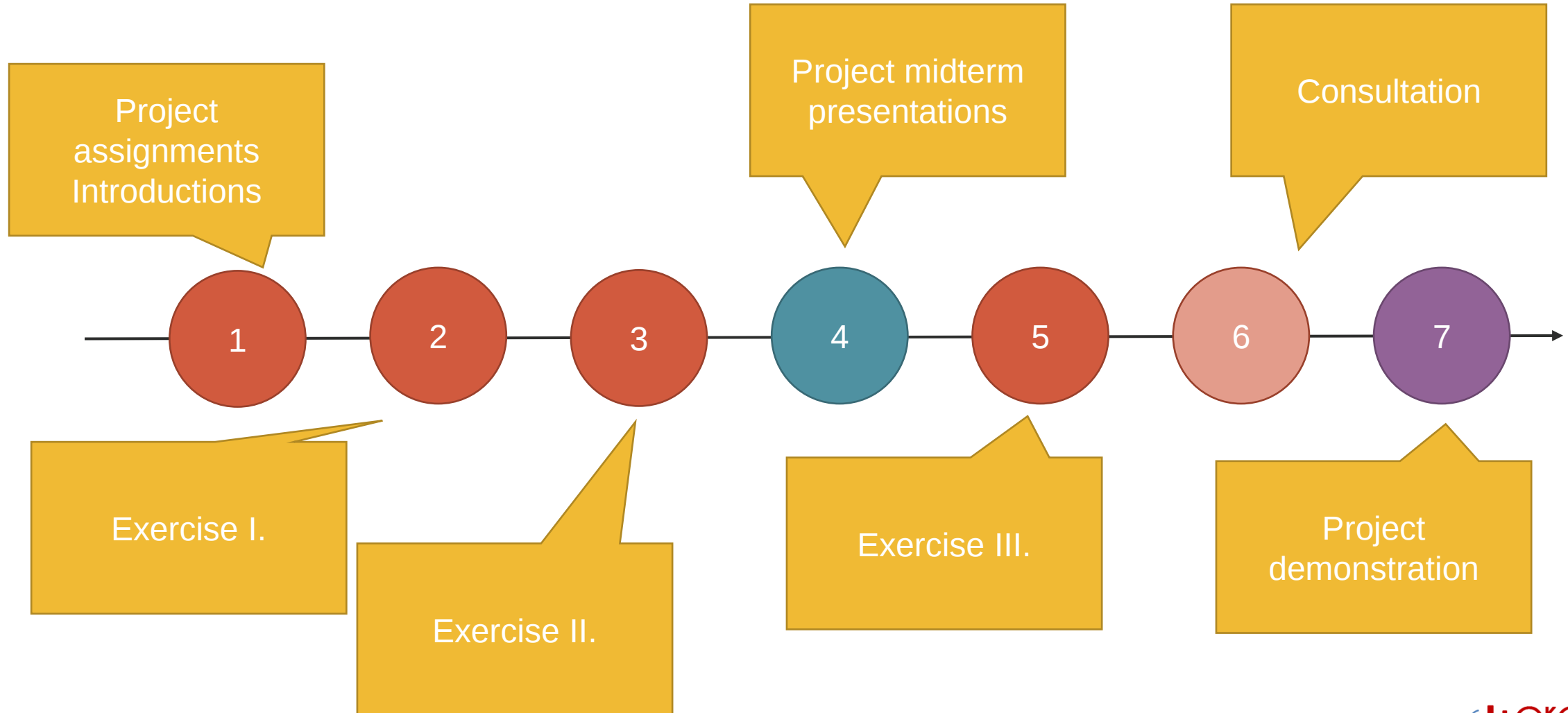
SmartCity exercise

- Targets
 - Hands on experiences to extend theoretical studies
 - Real world examples in a small but realistic environment
 - Design, implementation, test
 - Useful knowledge
- Method
 - Project work with small groups (3-4 students/group)
 - Homework projects with demonstrations
 - Exercises for preparations, but additional studies also required
 - Consultations
- Exercises at the University
 - **Participation is required for the signature! Min 70%**



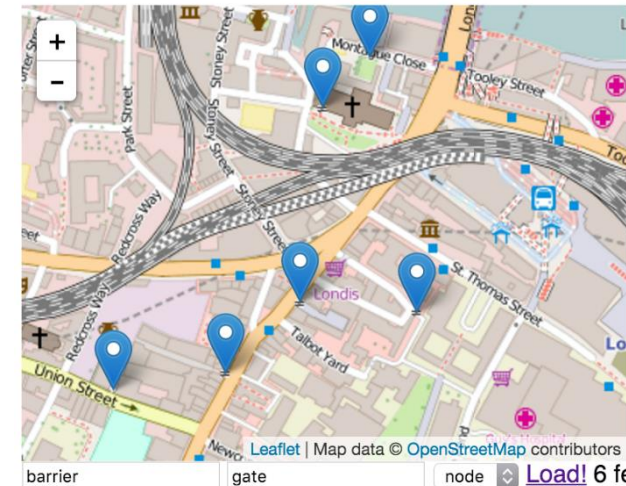
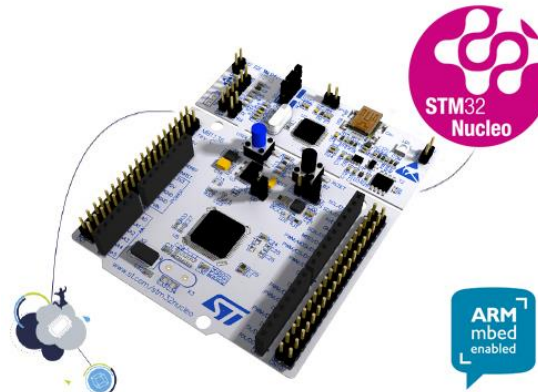
Project assignment, demonstrations

- Exercises



Project environment

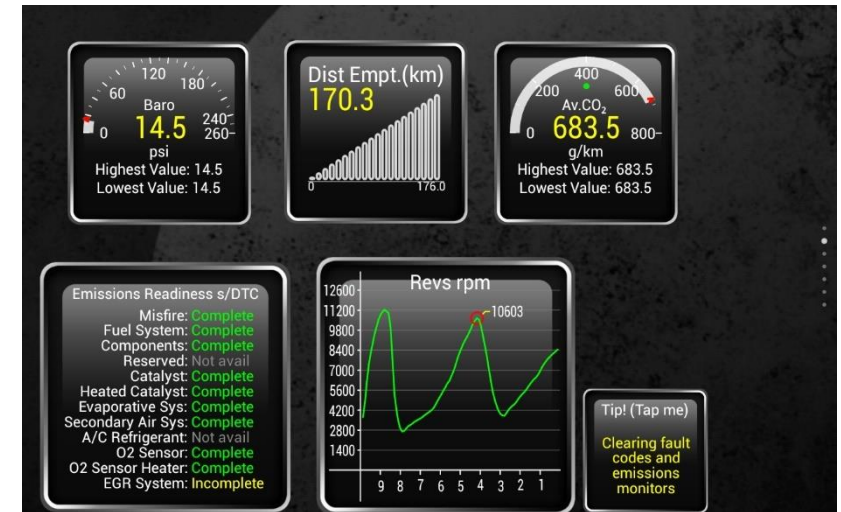
- Hardware work
 - Microcontrollers with communication
 - Arduino, Nucleo, ESP8266
 - WiFi, Bluetooth, CAN bus
 - Vehicles (toys)
 - Cars, drone
- Software work
 - Android apps
 - Android Studio
 - Web apps
 - Javascript, python, PHP
 - Web APIs
 - Simulation frameworks



Projects

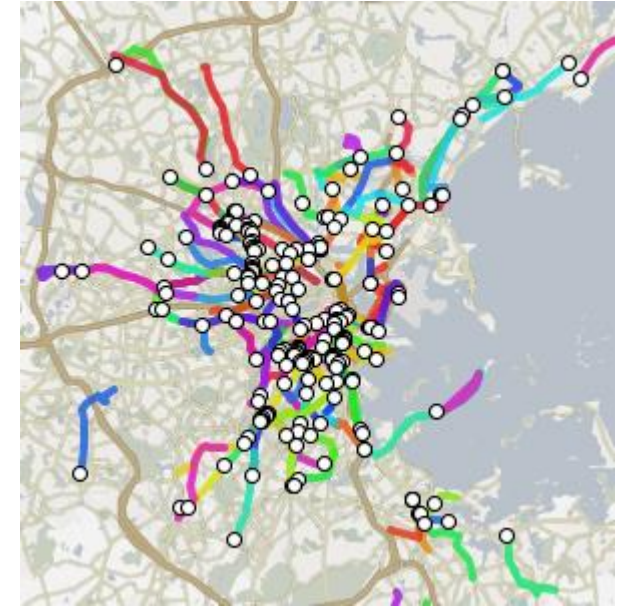
Project type A. – CAN bus

- CAN bus communication
 - Device to device communication
 - Standard and fault tolerant CAN
 - Controlling real instrument clusters
 - Car hacking
- OnBoardDiagnostics (OBD)
 - Communication, apps
- Max. 2 projects



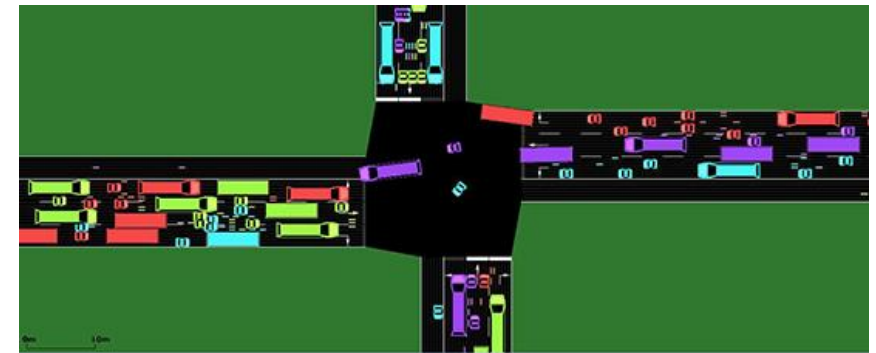
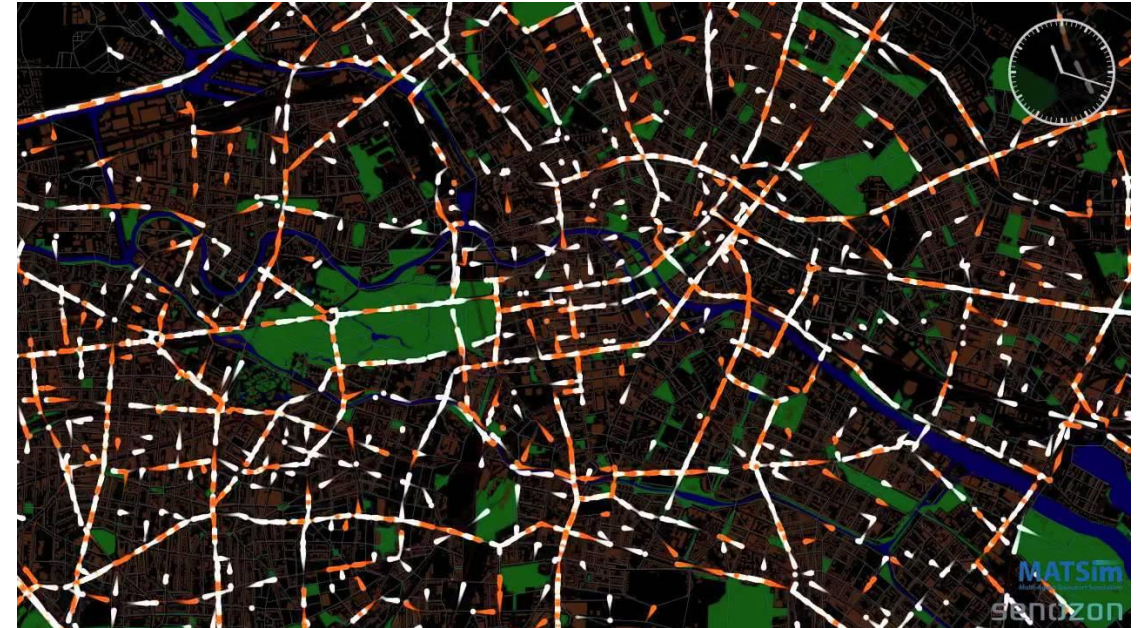
Project type B. – Mapping

- Map based apps and services
 - Route planning, rendezvous, mass transportation, info display, parking, ...
- Open Street Maps, Google maps
- General Transit Feed Specification (GTFS)
 - Live feeds, schedule
- Routing
 - Google, others...
- Mobile apps
 - Crowdsensing, crowdsourcing
 - Social apps based on mobile phone sensors, movement predictions, GPS, communications
 - Social apps based on route planning
- Max. 3 projects



Project type C – Traffic simulation

- Traffic simulation
 - Parking, Traffic jams, Mass transportation
 - Simulating events based on real data
- GTFS integration
- OSM integration
- Simulation tools
 - Multi-Agent Transport Simulation – MATSIM
 - Simulation of Urban MObility – SUMO
- Max. 1 project



Project D. – Autonomous Driving (kindof)

- Sensors

- Distance sensors
 - LIDAR (Light Detection and Ranging)
 - Ultrasonic distance sensor
 - Proximity sensor / bumper
- Camera
 - Raspberry Pi cameras

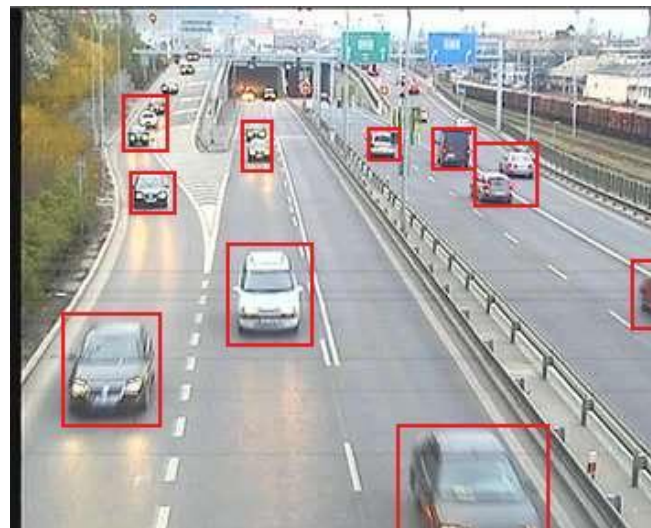
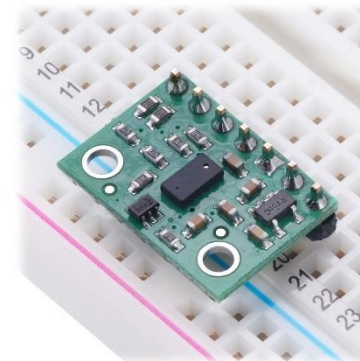
- Computer vision

- OpenCV

- Vehicles

- Parrot Air.Drone 2.0
- RC cars
- Cleaner robot

- Max. 2 projects



Project X. – Your idea

- Tell us your idea!



Skills required

- Project A.
 - Electrical: proto boards, soldering, handling oscilloscope
 - Knowledge: CAN bus theory, signals
 - Reverse engineering: Instrument clusters, BMW, Mazda protocols,
 - Programming: embedded coding, visualization
- Project B.
 - Knowledge: GTFS format and related protocols
 - Programming: APIs
- Project C.
 - Knowledge: GTFS format and related protocols
 - Programming: Simulators in C++, C, Java, ...
- Project D.
 - Electrical: proto boards, soldering, handling oscilloscope
 - Knowledge: Control protocols, APIs, computer vision
 - Programming: embedded coding, OpenCV, AI

