



NATIONAL & KAPODISTRIAN UNIVERSITY OF ATHENS



Connected Cars 2022:

How important is 5G technology and IoT to connected mobility?”

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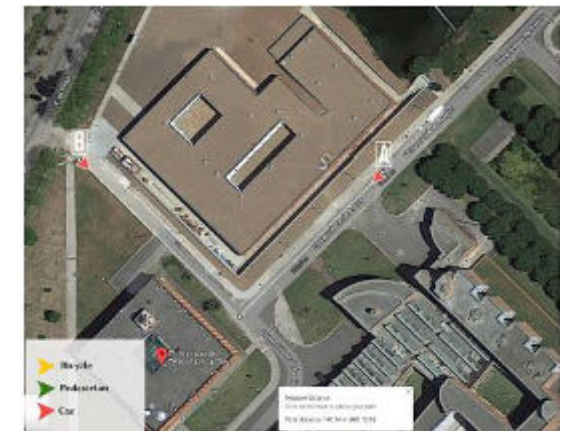


Importance of 5G in IoT

- Many scenarios that require either ultra low latency (URLLC) or bandwidth (eMBB) to transmit data or both
- Many devices now offer abundance of sensor data that are utilized in a plethora of use cases
 - Cameras
 - Proximity sensors
 - IR sensors
 - LIDAR sensors
 - Etc.
- By combining the above with the computational power that is available to the edge or cloud of the network and Machine Learning Techniques many new advancements in V2V and V2X are possible:
 - Tele-operated driving
 - Advanced Collision Avoidance systems
 - Prediction of Quality of Service (near real time on moving vehicles)
 - Network assisted Autonomous driving
 - etc

IoT enabled Scenarios – Collision Avoidance

- Advanced Collision Avoidance Notification System
 - By using the OBUs connected to an RSU and using trajectory prediction algorithms the cars are notified and depending on the car systems it can be stopped
 - GPS position, speed and trajectory
 - Compute node could be located in MEC-based nodes or the Cloud
- VRUs A and B moving in opposite directions
 - In this scenario the worst case is consider when 2 vehicles are on a collision course
- OBUs A and B approaching each other at T-junction
 - In this scenario when the visibility of the passengers is restricted the MEC-based system has all the necessary information needed for avoiding potential collision



IoT enabled Scenarios (1) cont.

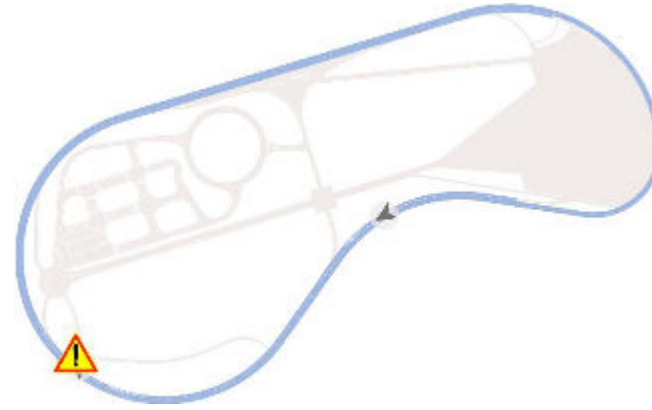
- Advanced Collision Avoidance Notification System
 - A bicycle is approaching the T-junction following a non-linear mobility pattern
 - By constantly predicting the trajectory of a UE any non-linear trajectories can be identified and used to provide the necessary notifications

- OBUs A and B approaching each other at T-junction
 - In this scenario the system shows that it can be used also to road-areas and be adapted to other use cases



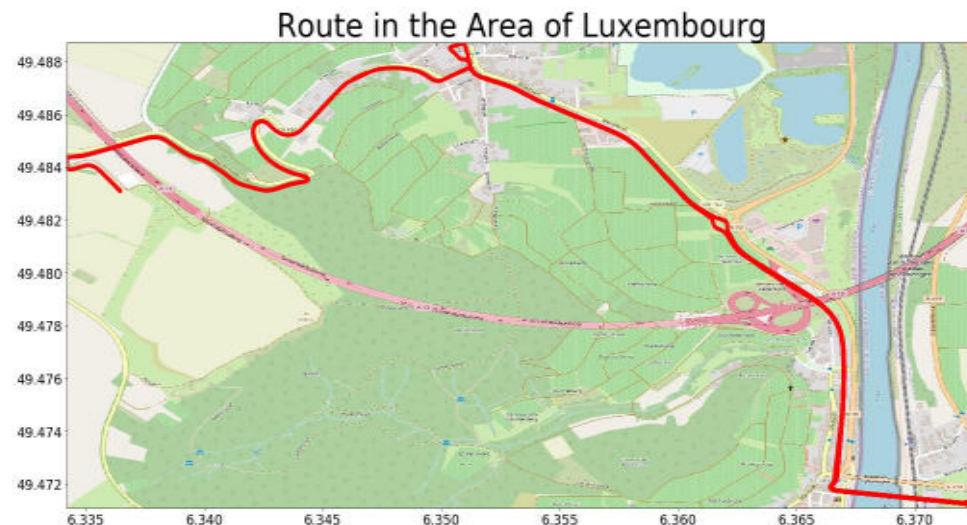
IoT enabled Scenarios (2)

- Advanced Collision Avoidance Notification System
 - Vehicle stationary on the road/track or Traffic jam detection
 - From the side of the passenger the information could be found useful in order to take proper action
 - But this information could be used by more automated systems (for example steering the traffic to another route to avoid the congestion point or clear path for emergency vehicle)
 - Also with V2X communication an ad-hoc network could be created and expand the connection of the 5G infrastructure so the service can continue to notify incoming vehicles for the road/track conditions



IoT enabled Scenarios (3)

- With the use of OBUs and the available 5G and beyond infrastructure many other use cases could be identified one of them is Quality of Service Prediction
- By utilizing the infrastructure available for ML Mechanisms a vehicle could have the information needed to adapt the services used depending on the conditions
- Some examples:
 - When a vehicle passes through a tunnel or bridge and the network conditions for providing avoidance collision notification are sub optimal then the vehicle speed and braking time could be adjusted to compensate the delays in signaling latency
 - When autonomous driving may fail due to lack of Road infrastructure then a tele-operated driving solution could be used, where the bitrate the cameras transmit is adjusted to provide continuous stream without gaps in video



Thank you!

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