

# Computer On Wheels

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Implemented Requirements  
**<In Part 1>**

## ***Vehicle control***

**Autonomous navigation:** The system shall be capable of autonomously navigating from a starting point to a destination.

**Throttle control:** The system shall control the throttle for regulation of vehicle speed.

**Steering control:** The system shall control the vehicle's steering to follow the planned trajectory accurately.

## ***Path Planning***

**Route Calculation:** The system shall calculate the most efficient (shortest) route from the vehicle's current location to the driver-specified destination.

**Lane Assignment:** The system shall assign appropriate lanes for the vehicle to travel in along the calculated route.

**Waypoint Generation:** The system shall generate waypoints along the calculated route to guide the vehicle towards the destination.

## ***Trajectory Planning***

**Trajectory Generation:** The system shall plan an optimal trajectory for the vehicle to follow based on the calculated route.

## ***Sensor Integration***

**Inertial Measurement Unit Utilization:** The system shall use IMU to provide orientation and acceleration data at some frequency.

**Global Positioning System Utilization:** The system shall use GPS to determine the vehicle's position.

## ***Path Following***

**Path smoothing:** The system shall apply path smoothing techniques to reduce jerkiness and ensure passenger comfort.

**Lateral Control:** The system shall minimize the lateral deviation from the path.

**Longitudinal Control:** The system shall minimize the lateral deviation from the path.

**Speed Control:** The system shall control the speed to reach the destination

**Waypoint Following:** The system shall follow waypoints along the calculated waypoints to guide the vehicle towards the destination

## ***Destination Arrival***

**Destination Approach:** The system shall approach the driver-specified destination by following the calculated trajectory and waypoints.

**Stop at Destination:** The system shall bring the vehicle to a complete stop upon reaching the designated destination, ensuring a smooth and safe arrival.

## ***User Input***

**Destination Setting:** The driver shall be able to input the desired destination, triggering the route planning process

## ***System Integration***

**ROS Integration:** The system shall utilize the Robot Operating System (ROS) to facilitate communication and data exchange between different software components.

**Simulation Environment:** Development and testing of the system shall be conducted in a simulated environment (e.g., CARLA simulator) for thorough validation before real-world deployment.