

# OOA - All kinds of Vehicles

## POSE2

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## Introduction

### Overview

The domain consists of various types of **vehicles**, each designed for either **passenger transport** or **material transport**. These vehicles differ in their propulsion methods, fuel requirements, and capabilities. Additionally, a separate system handles **refueling and recharging** to ensure that each vehicle type receives the appropriate energy source.

# Vehicle Types

## Passenger Transport

Vehicles primarily designed to transport people. Examples include:

- **Cars** – Personal and commercial passenger transport, typically powered by gasoline or electricity.
- **Electric Cars** – Battery-powered passenger vehicles.
- **Bicycles** – Human-powered transport, which does not require external fuel.

## Material Transport

Vehicles designed for moving goods and cargo. Examples include:

- **Trucks** – Heavy-duty transport vehicles powered by gasoline.
- **Electric Trucks** – Battery-powered trucks designed for cargo transport.

## Energy Sources and Refueling

Vehicles require different sources of energy:

- **Fuel-Based Vehicles** operate on gasoline or diesel and require refueling at a **fuel station**.
- **Electric Vehicles** run on batteries and require charging at an **electric charging station**.
- **Bicycles** do not require external energy sources.

## Driving Conditions

Vehicles travel under different conditions that affect their performance:

- **City Roads** – Frequent stops, lower speeds, and higher energy consumption.
- **Highways** – Higher speeds with relatively lower energy consumption per kilometer.
- **Backroads** – Moderate speeds with some variations in energy usage.
- **Offroad** – Difficult terrain leading to higher energy consumption and reduced speed.

## Fuel and Energy Consumption

Each vehicle consumes energy at a different rate, depending on its **type, fuel source, and driving conditions**. Some factors affecting consumption include:

- Engine efficiency (for fuel-based vehicles).
- Battery capacity and energy efficiency (for electric vehicles).
- Terrain and road type (affecting all vehicle types).

## Time and Speed Considerations

Different vehicles travel at different speeds, depending on their design and the road conditions. Factors affecting speed include:

- **Vehicle Type** – Passenger cars generally move faster than trucks.
- **Driving Mode** – Highway travel allows higher speeds, while offroad conditions slow vehicles down.
- **Energy Availability** – Running out of fuel or battery limits the distance a vehicle can travel.

## Detailed Information on Consumption

For each vehicle, an **average speed** and a base **consumption** is assumed as a base for calculations. These properties are multiplied with factors depending on the driving conditions as shown below:

- **City Roads** – 1.2 consumption, 0.6 speed.
- **Highways** – 0.8 consumption, 1.2 speed.
- **Backroads** – 1.1 consumption, 0.9 speed.
- **Offroad** – 1.5 consumption, 0.5 speed.

## Overall purpose of the system

The software to be developed shall

- provide a model of vehicles, summarizing common properties at the appropriate levels.

- allow the calculation of
  - consumption
  - timefor a given distance based on vehicle type and driving conditions.
- demonstrate the capabilities of the model with a small textual demo program.

# Task description

## 1 Object oriented analysis of the domain

Perform an object oriented **analysis** of the domain of vehicles and identify things and rules that apply in this domain.

Document your findings in a `vehicles-ooa.md` text file in MD format, covering the following aspects:

- Which things exist in the domain?
- An example of each kind of thing.
- List common properties.
- List actions that the things can perform and the resulting changes.

Use the idea of the **CRC**-approach, but think along the keywords **Object-Responsibility-Collaboration**.

If you add images, you need to ensure to hand these in as well.

Use either English or German in your analysis.

### 1.1 Work mode

- Work in groups of 3.
- Send me an email who belongs to which group (I'll model groups in Moodle).
- Hand-in the md file and images as a ZIP.
- **The md file MUST BE NAMED** `vehicles-ooa.md` !!! Anything else will be ignored and counted as no hand in!!!