**Vehicle simulation**

**On-state**

speed: 0 km/h

ignition: ON

temperature: NOMINAL

QoS: SPEED\_ERROR\_QOS

**Off-state**

speed: 0 km/h

ignition: OFF

temperature: NOMINAL

QoS: NORMAL\_QOS

**Normal Mode**

speed: 0-160 km/h

ignition: ON

temperature: BELOW HIGH LIMIT

QoS: SPEED\_ERROR\_QOS

**Error Mode (temperature)**

speed: 0-160 km/h

ignition: ON

temperature: ABOVE HIGH LIMIT

QoS: TEMP \_ERROR\_QOS

**Error Mode (Speed)**

speed: 160- km/h

ignition: ON

temperature: BELOW HIGH LIMIT

QoS: SPEED\_ERROR\_QOS

The states and the transitions of the states are visible in the block diagram above.

The faulty error states can be combined, with a new QoS (Quality of State) giving more detailed info about the cause of the error.

* Input:

A list, containing commands in order:

* Output:
  + **True** – if the set of commands mean correct operation
  + **False [error]** – if the set of commends lead to faulty operation
* A normal set of commends:

[turn\_ignition\_on(), set\_speed(100), set\_speed(0), turn\_ignition\_off()] -> True

* Set of commands which result in failure:

[turn\_ignition\_on(), set\_speed(50), set\_speed(200)] -> False (SPEED\_ERROR\_QOS)

[set\_speed(100), turn\_ignition\_on()] -> False (IGNITION\_OFF\_ERROR\_QOS)

[turn\_ignition\_on(), set\_speed(100), set\_temperature(120)] -> False (TEMP \_ERROR\_QOS)

[turn\_ignition\_on(), set\_speed(200), set\_temperature(120)] -> False (SPEED\_ERROR\_QOS)

(Here, the fault happens when speed is set, temperature is not set as the car is in error state)

* Testing can be done:

limits (can be set, possibility of configuring several vehicle models):

temperature: TEMP LIMIT = 100 \*C

speed: SPEED LIMIT = 200 km/h

Checking if state transitions above/below these limits are as expected.

Checking if ignition is on, before speed is set.

Checking if ignition is off in the end, so at the end of the simulation, the car is turned off.

Additional options to implement (goal: to make the simulation is more realistic):

* acceleration: ramp-up/ramp-down speed
* more set of parameters (more car models implemented)