System

+ d0_status: int
+ d1_status: int
+ d2_status: int
+ d3_status: int
+ s1_status: int
+ s2_status: int
+ sem_D: sem_t
+ sem_S1: sem_t
+ sem_S2: sem_t
+ wheel_direction_initial: int

+ main(): void

SymptomAnalysis

- d0: int
- d1: int
- d2: int
- d3: int
- s1: int
- s2: int

+ symptom_function(): void

parts
: SensorLight
: SensorServo

properties
(s1 && s2) && d0 Condition
(s1 || s2) && d0 Condition
(s1 || s2) && d1 Condition
(s1 || s2) && d2 Condition
D0
D1
D2
D3
D3 Condition
S1
S2

owned behaviors
«stateMachine» SymptomAnalysis ()

Function in charge of analysing all the
global variables and activating the
sensors according to the different states
below:
- when (S1 or S2) and D0: turn on Light
1
- when (S1 and S2) and D0: turn on
Light 2
- when (S1 or S2) and D1: turn on Light
1 and Light 2, activate brake level 1
- when (S1 or S2) and D2: turn on Light
1 and Light 2, activate brake level 2
- when D3: activate brake level 3

SteeringAnalysis

- Diff: int
- Speed: int
- wheel_direction: int

+ steering_wheel_turns(): void

parts
: SensorUltrasoundDistance

properties
diff
(diff >= 20 || diff <=-20) && Speed >=40 Condition
else
Speed
wheel_direction
wheel_direction_previous

The position of the steering wheel shall be read every
350 ms. If there are
sharp turns between two readings (there is a
difference higher than 20° between two consecutive
values) and the vehicle speed is higher than 40 km/h,
it is interpreted that the driver is making
short and anomalous corrections, and therefore the
symptom is considered to be "SHARP TURN"
(S2).

SensorUltrasoundDistance

+ getDistance(): float

Sensor to calculate distance

SensorAnalogChannel

+ read_all_ADC_sensors(Array_Of_Int): int
+ read_single_ADC_sensor(int): int

Sensor to read analog channel

SensorServo

+ moveServo(int): void

Sensor to move
servomotor

SensorLight

+ set_led_1(int): int
+ set_led_2(int): int

Sensor to turn ON/OFF
leds

SensorGiroscope

+ Read_Giroscope_X(): int
+ Read_Giroscope_Y(): int

Sensor to read Giroscope

SafetyAnalysis

- Dist: int
- SafetyDist: int
- Speed: int

+ safety_distance(): void

parts
: SensorAnalogChannel
: SensorUltrasoundDistance

properties
dist
else
else if (dist < safetydist / 2) Condition
else if (dist < safetydist) Condition
if (dist < safetydist / 3) Condition
safetydist
Speed

Every 300 ms the system shall measure the distance between you and the vehicle in front. If the distance is less than the recommended safety distance, being equal to
(Speed / 10)2, the symptom is considered as "INSECURE DISTANCE" (D1). If the distance is less
than half of the recommended safe distance, it shall be interpreted as "IMPRUDENT DISTANCE"
(D2) for not keeping the safe distance. If the distance is less than one third of the recommended
safety distance, it will be interpreted as "DANGER COLLISION" (D3). The symptom disappears
when the described situation is no longer fulfilled, going back to the state "CORRECT DISTANCE"
(D0).

Read the analog channel 3.

HeadAnalysis

- x_default: int
- x_previous: int
- y_default: int
- y_previous: int

+ head_tilt(): void

parts
: SensorGiroscope
: SensorAnalogChannel

properties
dif_x_a
dif_x_p
dif_y_a
dif_y_p
head_tilt
head_turning
s1_status output
turn_left
turn_right
wheel_direction
wheel_direction_initial
x_actual
x_default
x_previous
y_actual
y_default
y_previous

The Gyro shall be read every 400 ms. If the tilt in the X-axis is greater than 30 degrees
in at least two consecutive readings, the driver shall be interpreted as having "HEAD TILT" (S1)
Forward (+30°) or Back (-30°) and may be exhibiting symptoms of drowsiness or distraction. In
the case of the two consecutive Y-axis tilts to the left (-30°) or to the right (+30°), if the driver is
turning the steering wheel in the same direction as the head tilt, this will not be interpreted as
drowsiness. In this case, it is assumed that when a driver is turning the steering wheel, he/she
instinctively follows the trajectory of the vehicle with a head movement. However, if the driver
tilts his head laterally by more than 30° and is not turning the steering wheel, this is interpreted
as a possible symptom of drowsiness. The "HEAD TILT" condition is no longer true when the head
position is corrected.

Read analog channel 2.