

# **Mastering Embedded System Diploma**

**Report name:** Collision Avoidance Lab

(Unit 4, Lesson 2)

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## 1) Case study

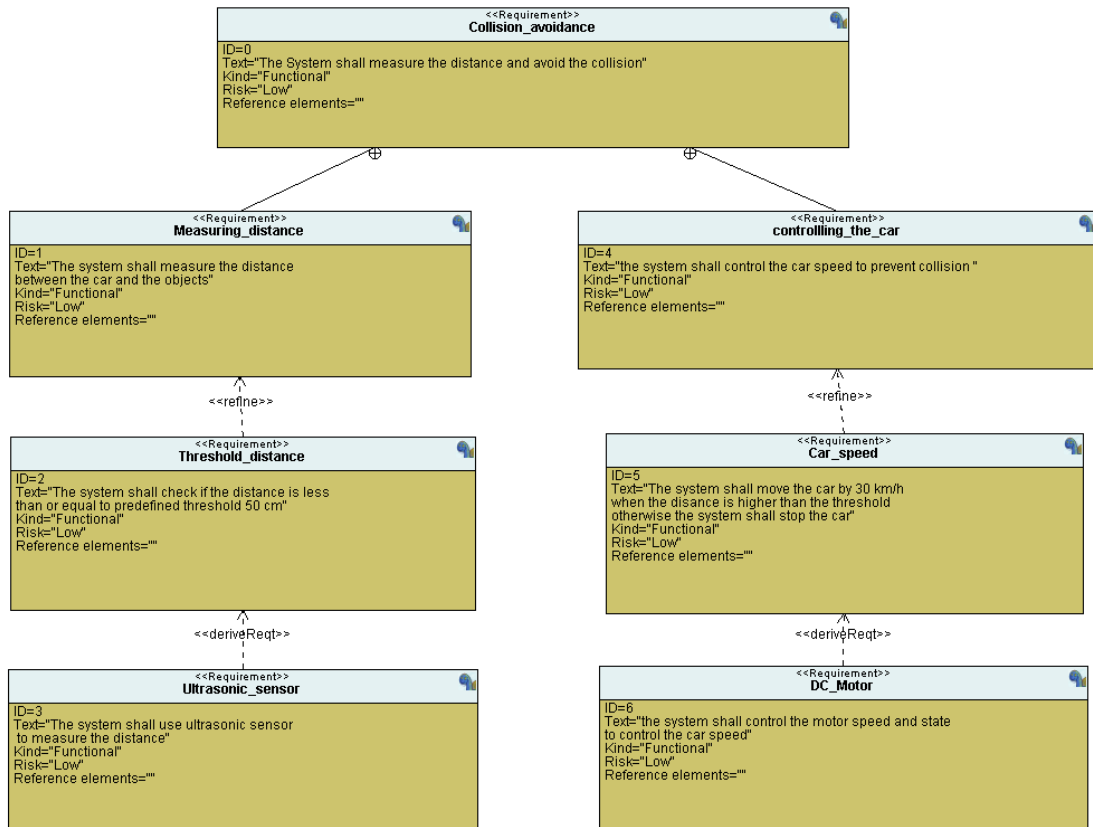
### 1) Description:

- The car avoids collision, if the distance between the car and the object is greater than 50 cm the car moves with a constant speed of 30 km/h otherwise the car stops
- Distance is measured by the ultrasonic sensor
- Car moves with DC motor

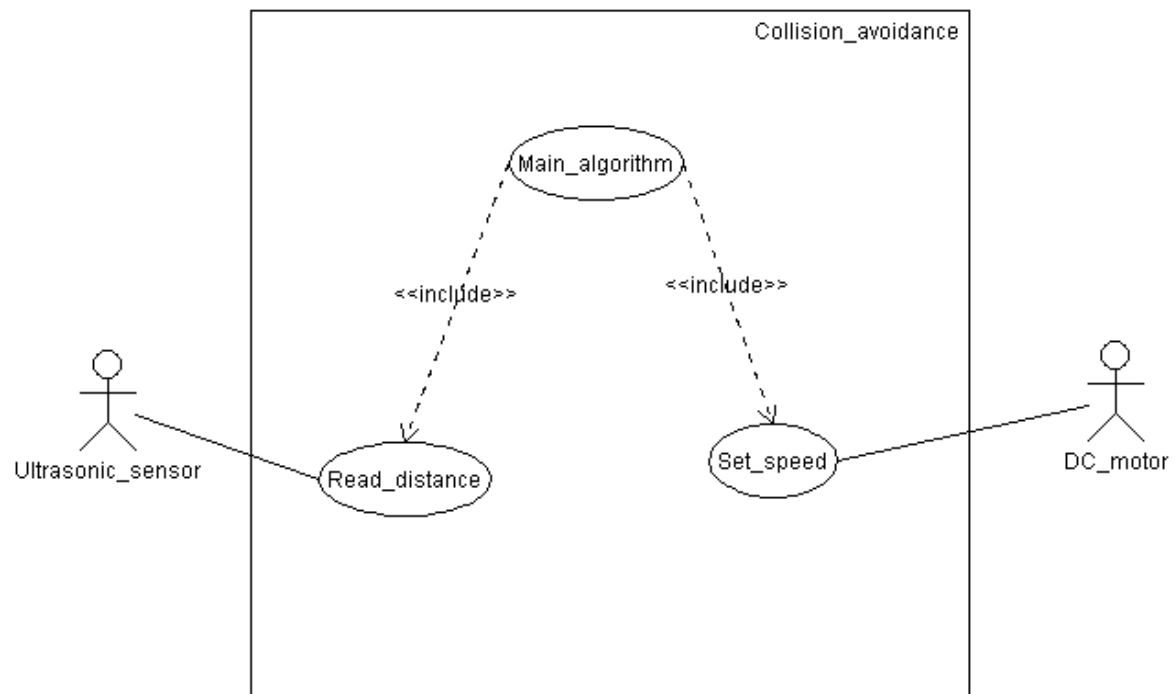
### 2) Assumptions:

- System setup and shutdown is not modeled
- The system maintenance is not modeled
- The controller power is never cut
- The ultrasonic sensor never fails
- The DC motor never fails
- The distance is measured continuously without a time delay (time delay is code execution time)

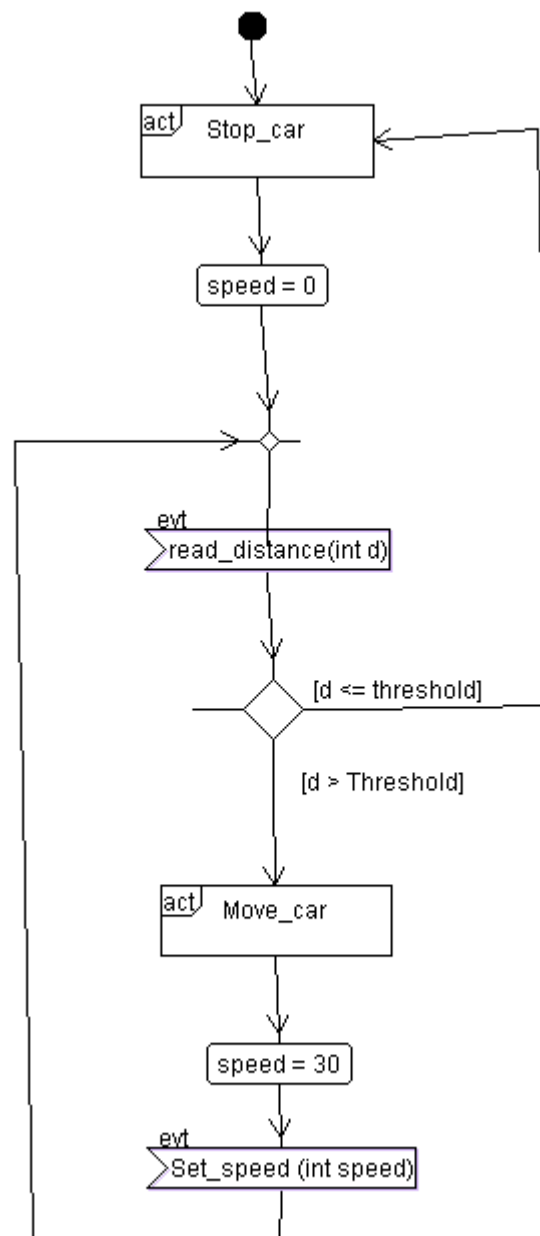
## 2) Requirement diagram



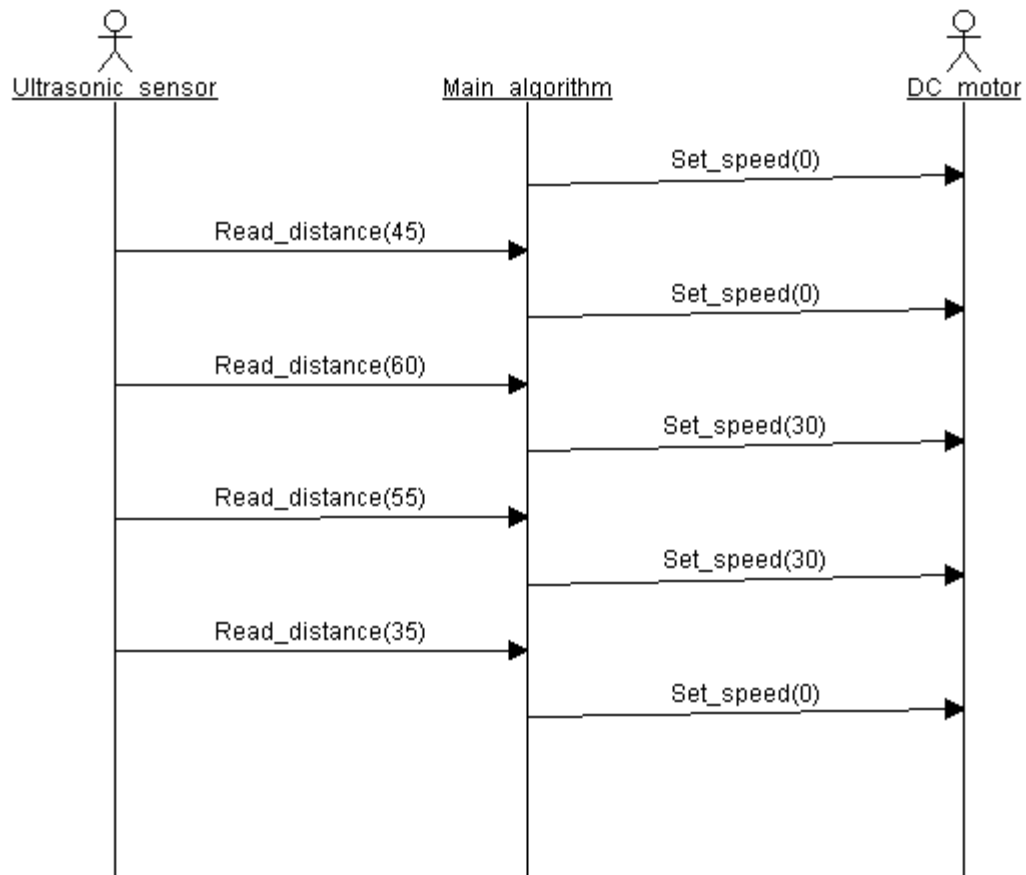
### 3) Use case diagram



#### 4) Activity diagram

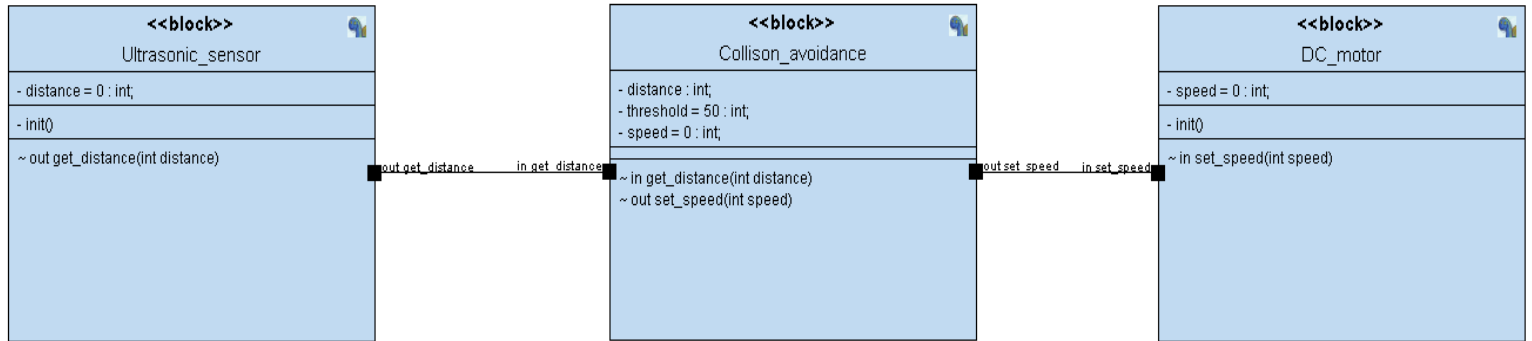


## 5) Sequence diagram



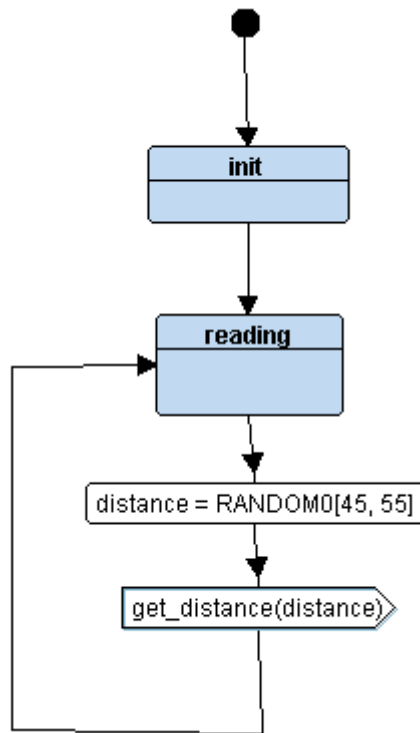
## 6) Design diagram

### 6.1. Block diagram

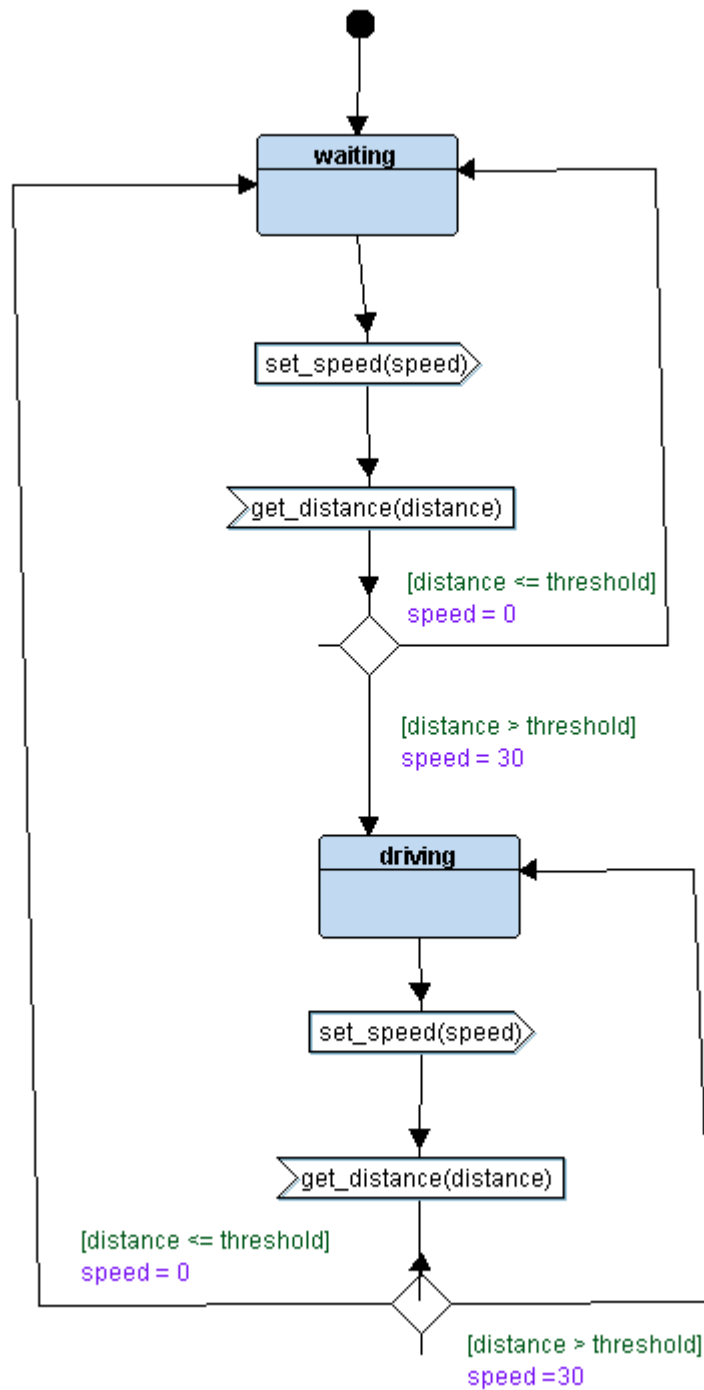




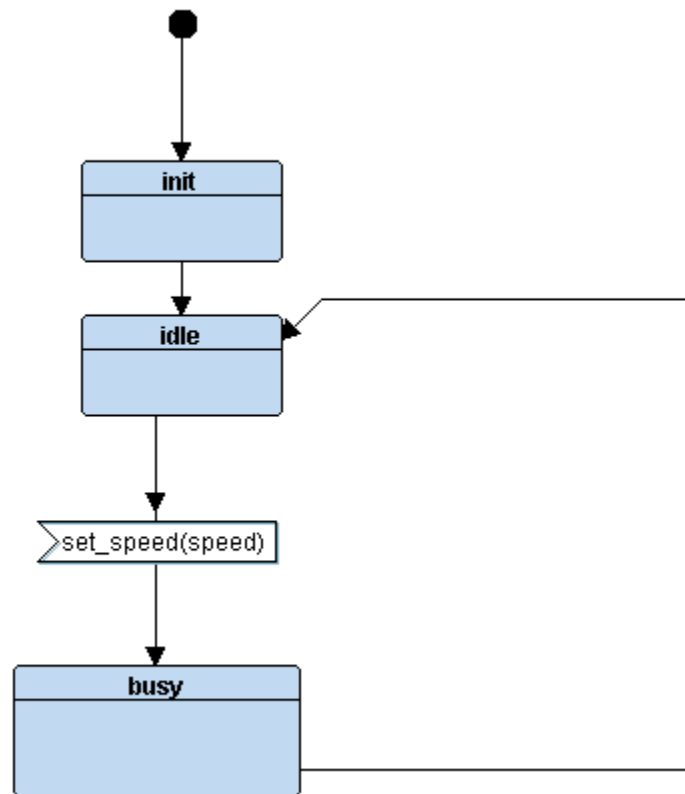
## 6.2. Ultrasonic sensor state machine diagram



### 6.3. Collision avoidance state machine diagram



#### 6.4. DC motor state machine diagram



## 7) Running the Program

```
1  US_init
2  DC_init
3  Waiting state.....distance = 0, speed = 0
4  CA -----speed = 0-----> DC motor
5  DC_busy.....the current speed = 0
6  US reading.....distance = 53
7  US -----distance = 53-----> CA
8  Driving state.....distance = 53, speed = 0
9  CA -----speed = 30-----> DC motor
10 DC_busy.....the current speed = 30
11 US reading.....distance = 54
12 US -----distance = 54-----> CA
13 Driving state.....distance = 54, speed = 30
14 CA -----speed = 30-----> DC motor
15 DC_busy.....the current speed = 30
16 US reading.....distance = 54
17 US -----distance = 54-----> CA
18 Driving state.....distance = 54, speed = 30
19 CA -----speed = 30-----> DC motor
20 DC_busy.....the current speed = 30
21 US reading.....distance = 46
22 US -----distance = 46-----> CA
23 Waiting state.....distance = 46, speed = 30
24 CA -----speed = 0-----> DC motor
25 DC_busy.....the current speed = 0
26 US reading.....distance = 52
27 US -----distance = 52-----> CA
28 Driving state.....distance = 52, speed = 0
29 CA -----speed = 30-----> DC motor
30 DC_busy.....the current speed = 30
31 US reading.....distance = 50
32 US -----distance = 50-----> CA
33 Waiting state.....distance = 50, speed = 30
34 CA -----speed = 0-----> DC motor
35 DC_busy.....the current speed = 0
```