Collision Avoidance Report
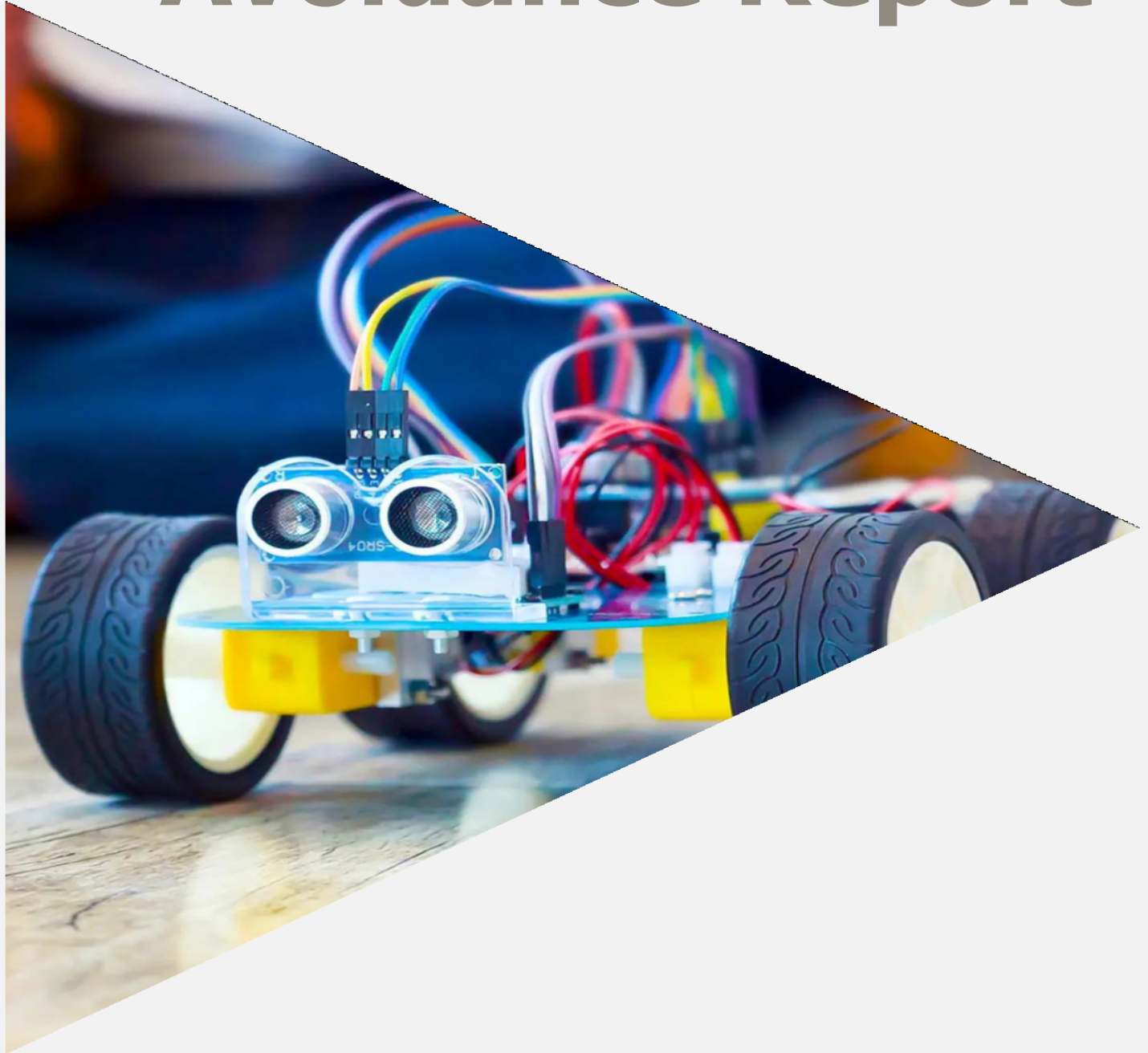
Prepared For : Learn In Depth

Prepared By : Sherif Ashraf Khedr

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Description

Collision_Avoidance is a smart system that helps robots and self-driving vehicles avoid crashes. It uses advanced ultrasonic sensors to quickly spot obstacles and navigate around them, making it a crucial tool for safe and precise movement in various applications.

Requirement

1. Objective: The system must utilise an ultrasonic sensor to detect obstacles at a distance of 50 cm or less.

2. Speed Control Condition: When the ultrasonic sensor detects an obstacle at a distance below or equal to 50 cm, the vehicle speed must be set to 0.

3. Normal Operation Speed: In the absence of obstacles, the default speed of the vehicle should be 30.
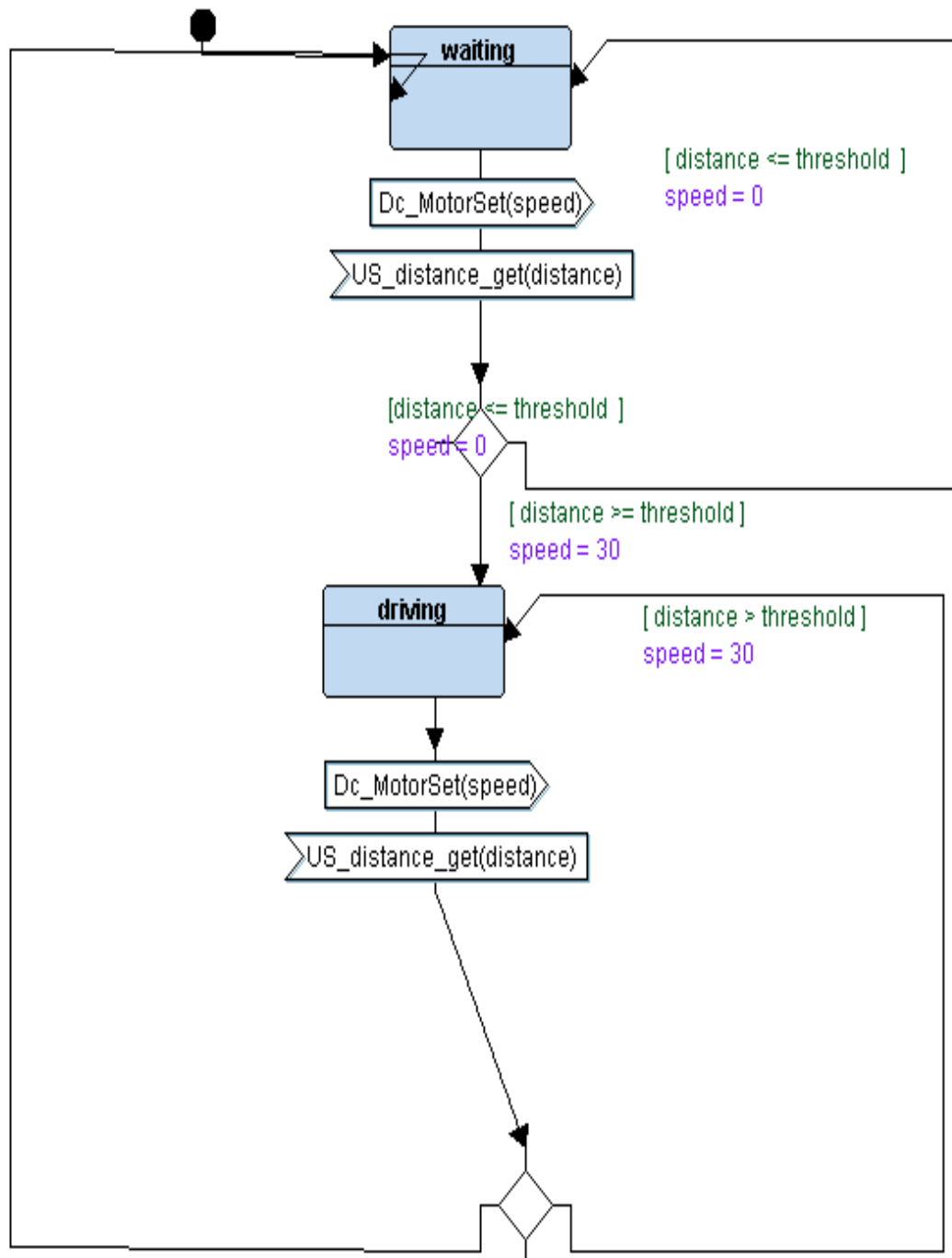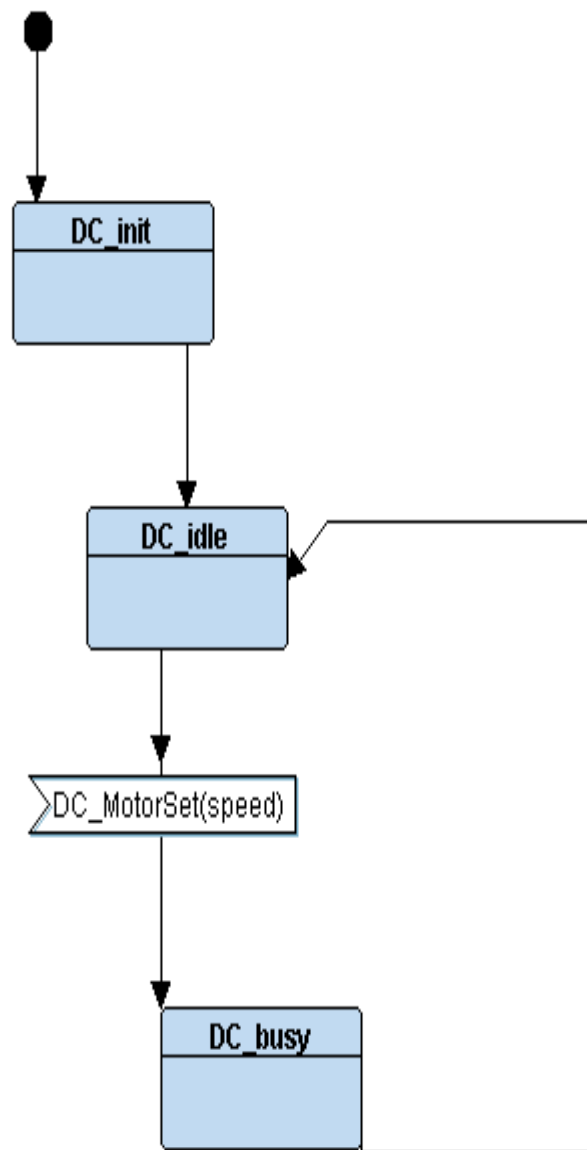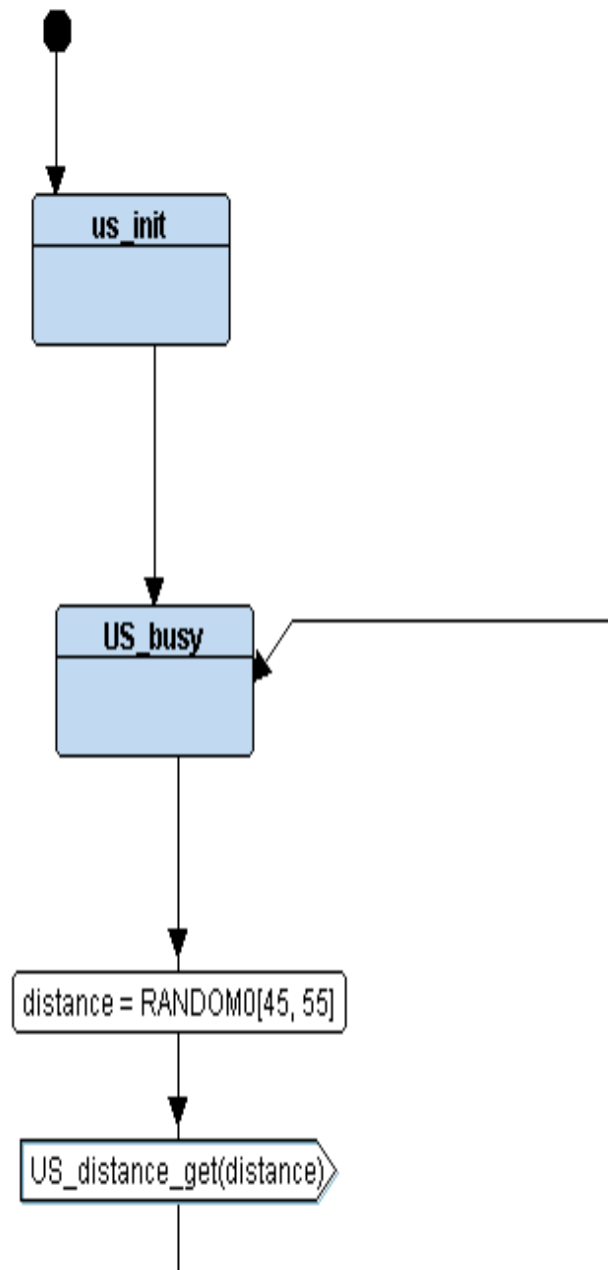
Requirement Diagram
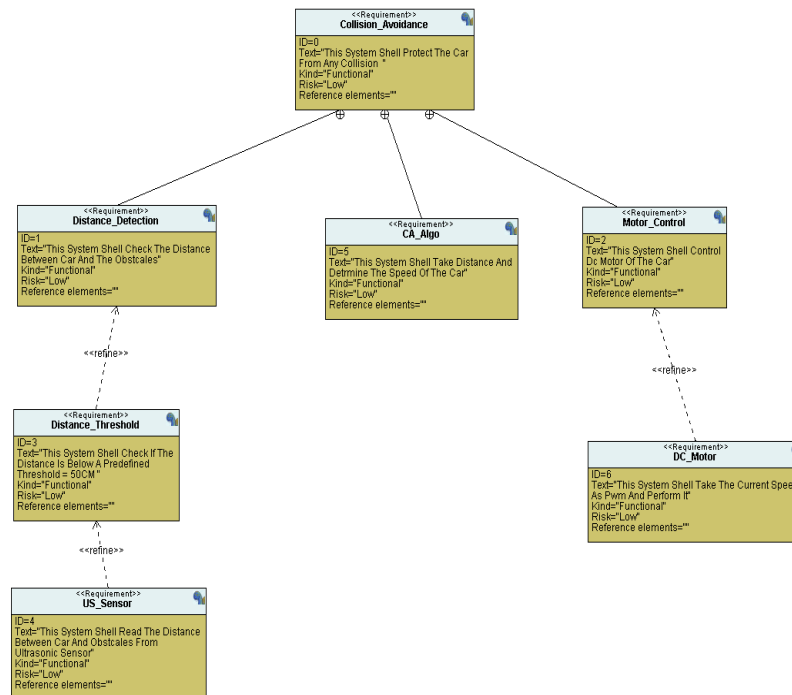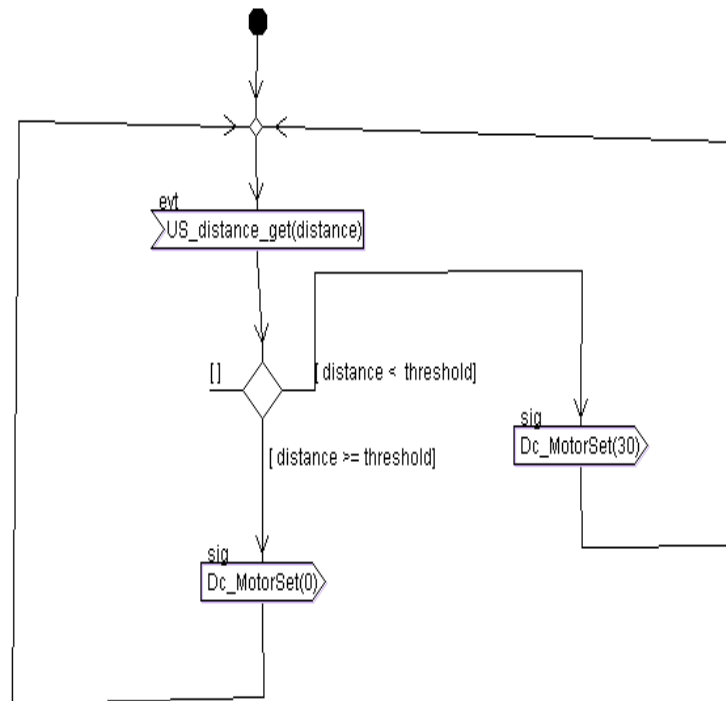

System Class Diagram
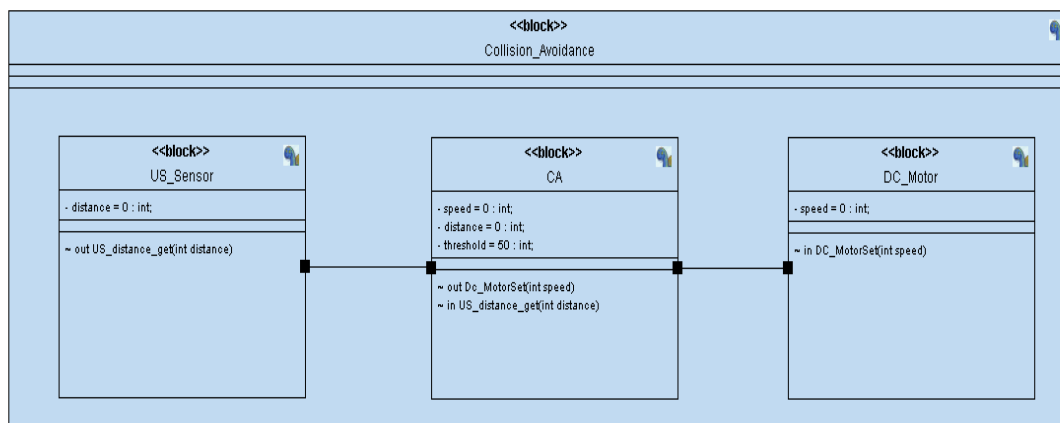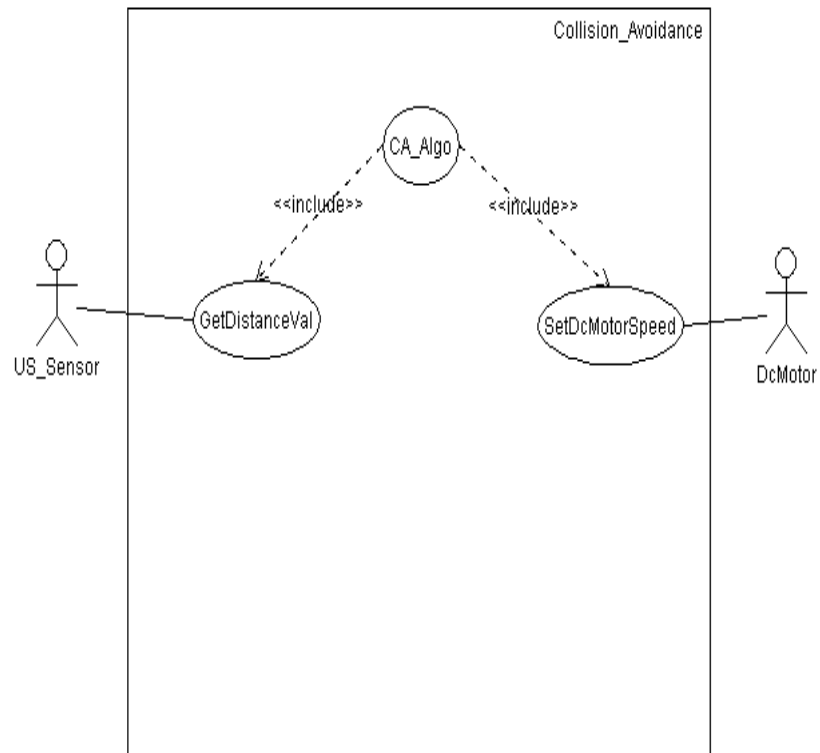
CA State Machine

DC Motor State Machine

Ultrasonic Sensor State Machine

```
    ●
    │
    ▼
┌─────────┐
│ us_init │
├─────────┤
│         │
└─────────┘
    │
    ▼
┌─────────┐◄──────────────────┐
│ US_busy │                   │
├─────────┤                   │
│         │                   │
└─────────┘                   │
    │                         │
    ▼                         │
┌──────────────────────────┐  │
│ distance = RANDOM0[45, 55]│  │
└──────────────────────────┘  │
    │                         │
    ▼                         │
┌───────────────────────┐     │
│ US_distance_get(distance)>───┘
└───────────────────────┘
```
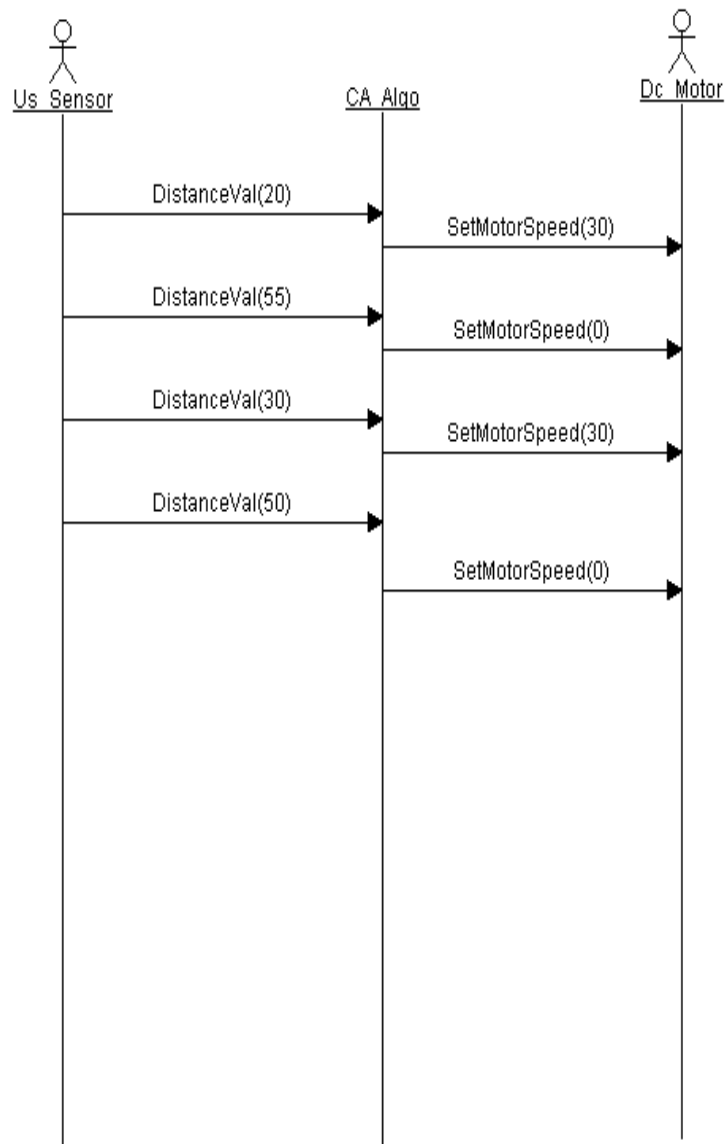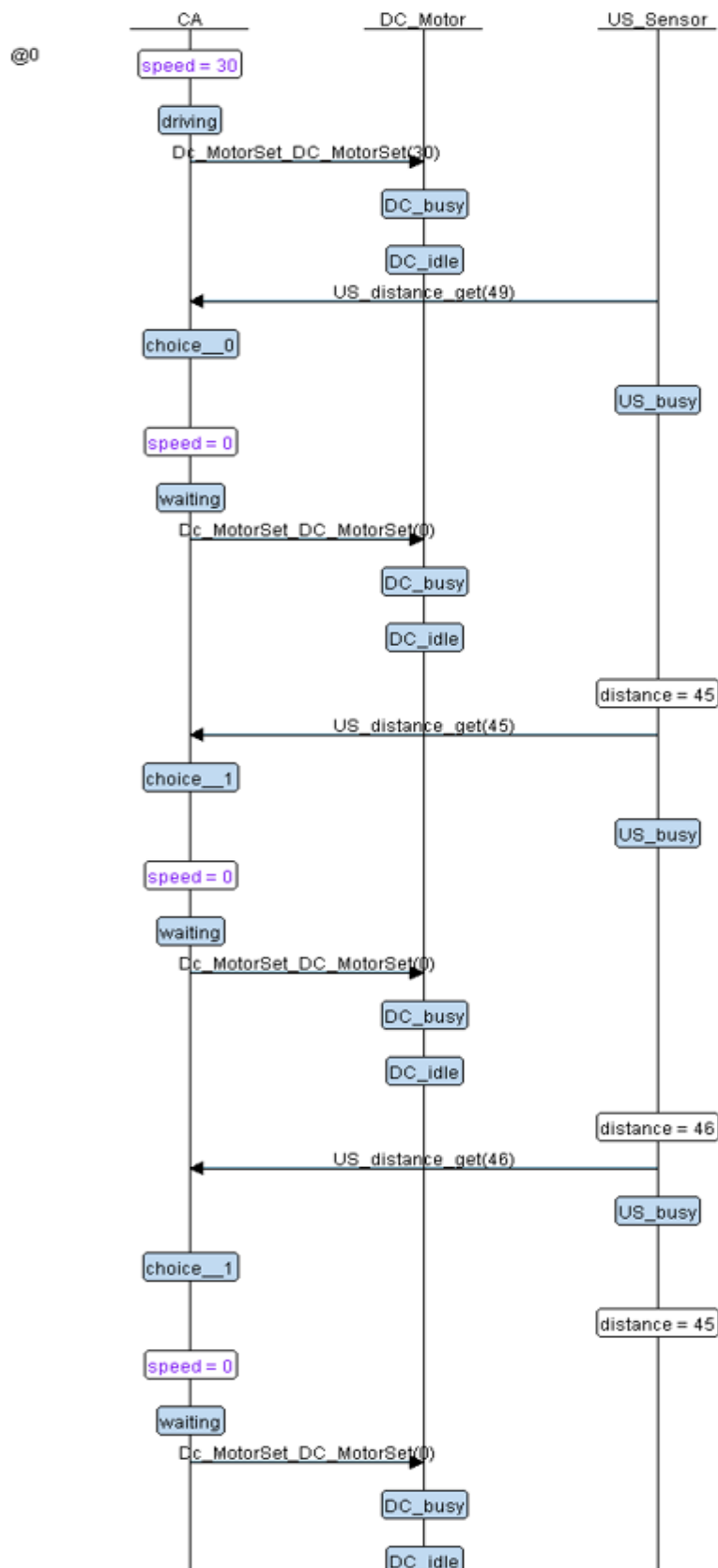
System Activity Diagram

System Use Case Diagram

System Sequence Diagram

Design Result In Simulation

Design Result In Code

```
DC_Init
DC_Init
CA_Waiting State: distance = 0 speed = 0
DC_IDLE State : Speed = 0
US_BUSY State : Distance = 53
US ------> CA: distance = 53 speed = 0
CA -> -> -> DC           DC_motor()
CA_Driving State: distance = 53 speed = 30
DC_Busy State :    speed = 30


US_BUSY State : Distance = 54
US ------> CA: distance = 54 speed = 30
CA -> -> -> DC           DC_motor()
CA_Driving State: distance = 54 speed = 30
DC_Busy State :    speed = 30


US_BUSY State : Distance = 54
US ------> CA: distance = 54 speed = 30
CA -> -> -> DC           DC_motor()
CA_Driving State: distance = 54 speed = 30
DC_Busy State :    speed = 30
```