

CS 684 Embedded System

Lab 1: Statechart for the Line Following Robot

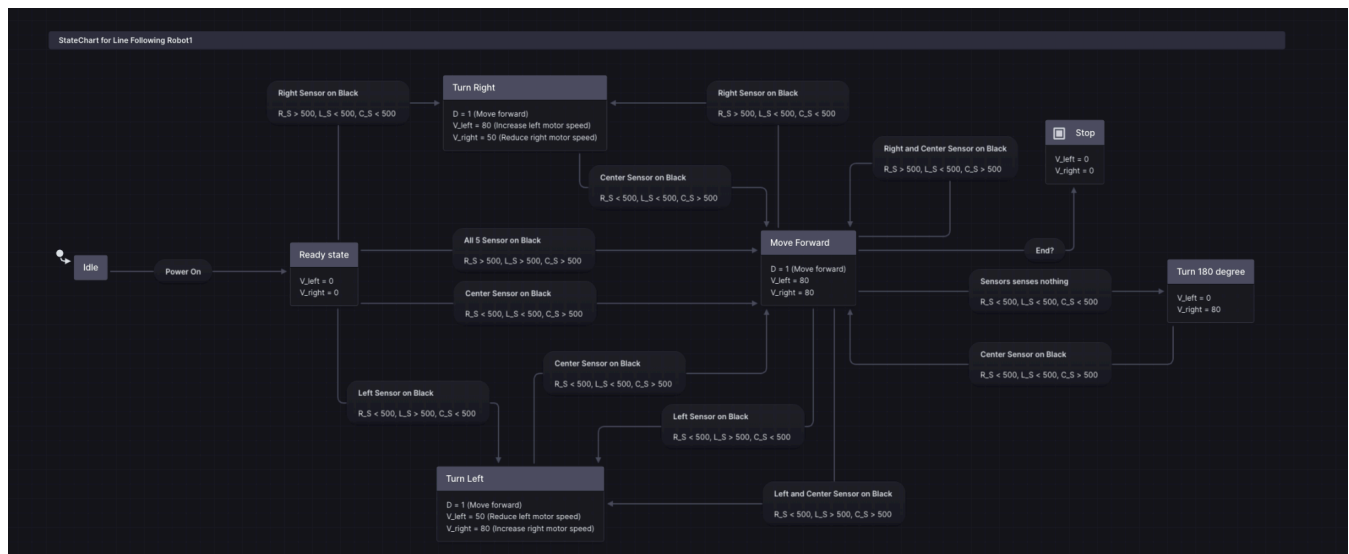
Group: CodeOnBoard

Utkarsh (24M2122)

Ritika (24M0855)

Jayesh (23M0805)

Atul (23M0764)



1. Statechart Link: [statechart link](#)

2. YouTube Link: [youtube link](#)

3. Strategy:

- Five sensors are integrated into the robot to detect the path and take appropriate actions, the end goal is to reach the end mark.
- Since sensor values range from 0-1023, we have considered any readings below 500 to represent white surface and readings above and including 500 as black surface.

- We have assigned priorities to different sensors in order to make a decision in case multiple sensors show reading.
- Our statechart has the following states:
 - **Idle State:** The robot is powered off in this state.
 - **Ready State:** This is the initial state of the robot after it is powered on.
 - **Stop State:** When we reach the end line, we go to the stop state.
 - **Move Forward:** In this state, our robot moves forward, until the sensor readings change.
 - **Turn Left:** In this state, our robot takes a left turn, whenever our readings change and we decide to take the path on the robot's left.
 - **Turn Right:** In this state, our robot takes a left right, whenever our readings change and we decide to take the path on the robot's right.

4. Assumption & Description:

- We have assumed that the position of the sensors is such that:
 - The two sensors to the extreme left will show values greater than or equal to 500 when there is a black surface to the left.
 - The two sensors to the extreme right will show values greater than or equal to 500 when there is a black surface to the right.
 - The central sensor will show a value greater than or equal to 500 when there is black surface ahead.
- We have also assigned priority to the different sensors, the left sensor has greater priority than the central sensor and the central sensor has greater priority than the right sensor. This priority helps us decide when there are multiple options to choose from, to finally reach the end goal. For instance, let's say at a juncture both the two left sensors and the central sensor shows reading greater than or equal to 500, then our robot will take a left turn since the priority of the left sensors is the highest.

5. Transitions in the statechart:

The following table shows the transitions in the statechart based on sensor readings

0 represents sensor values lesser than 500

1 represents sensor values greater than or equal to 500

Left Sensor	Center Sensor	Right Sensor	Description
0	0	0	No line detected
0	0	1	Right sensor shows reading, robot turns right
0	1	0	Central sensor shows reading, move forward
0	1	1	Central & right sensors show reading, move forward
1	0	0	Left sensor shows reading, robot turns left
1	0	1	Left and right sensors show reading, robot turns left
1	1	0	Left and Central sensors show readings, robot turns left
1	1	1	Left, Central and Right sensors show readings, robot turns left.

6. Contribution

Every team member contributed equally while making the statechart. We regularly engaged in meetings to plan and improvise the flow of our robot and finally came up with a final statechart diagram for our robot. Two of our team members were given the task of recording and editing the youtube video, while the other two team members worked on the document.