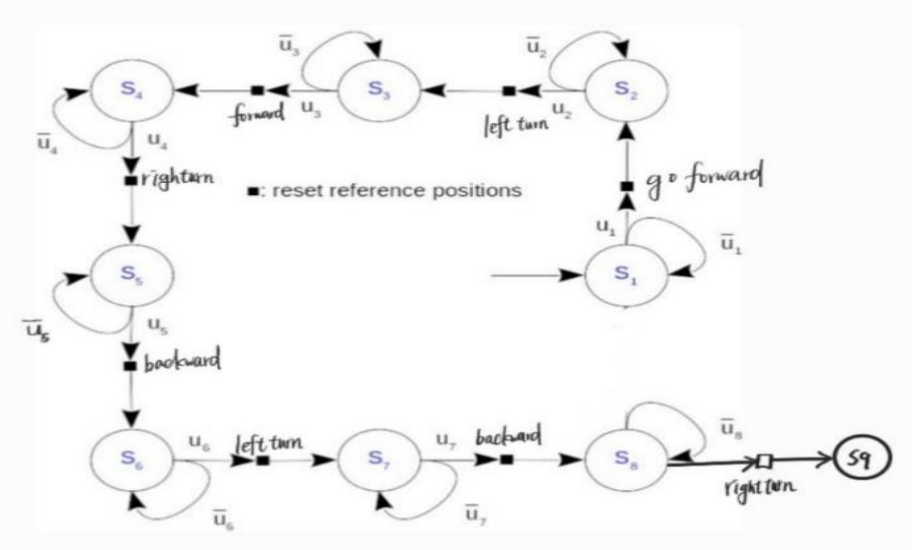
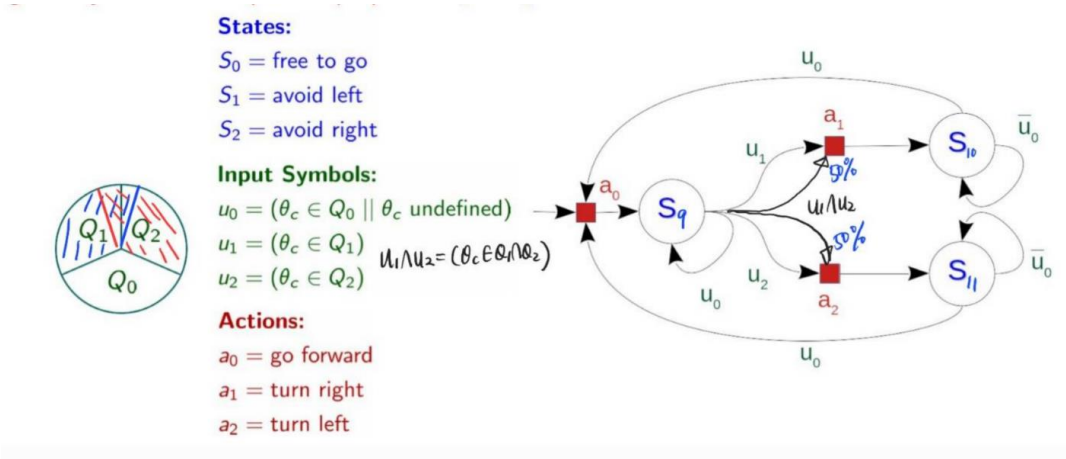
Mid-Term Project

To achieve this report, the centroid method and finite state machine are utilized. S1-S8 represent the states for executing square walking, and upon completion of the square, the system will transition to S9-S12 for obstacle avoidance



Each u_i is a **reach condition** (boolean) associated with state S_i, whereas $\bar{u}_i$ stands for the complement (Not) of u_i.



Upon entering the obstacle avoidance state, the system's behavior is determined by the location of the centroid. If the centroid is situated in both Q1 and Q2, the system will choose a random direction to turn in, which could be either right or left. However, if the centroid is in Q1 and an obstacle is detected on the left side, the

system will turn right until there are no more obstacles blocking its path. Similarly, if the centroid is located in Q2 and an obstacle is detected on the right side, the system will turn left until there are no more obstacles blocking its path. This cyclical process continues until the system either successfully avoids all obstacles or becomes trapped in a dead-end.

Despite the system's ability to partially explore its surroundings, it struggles with collision avoidance. As such, there is ample room for improvement in its obstacle detection and avoidance strategies. Future iterations of the system may incorporate more advanced algorithms or additional sensors to improve its performance and minimize the risk of collisions.