**Avoid Obstacle:**

Diagram

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| States | Input | Output | Next State |
| Random Direction | N/A, No Obstacle | Direction | Go to Goal |
| Go to Goal | Direction | Power Motor | Obstacle |
| Obstacle | Sensor Data | Yes  No | Obstacle Direction  Random Direction |
| Obstacle Direction | Sensor Data & Obstacle | Front, Left, and Right  Front and Left, Left  Front, Right, Front and Right | Turn 180 Degrees and Go Forward  Go Back and Turn Right  Go Back and Turn Left |
| Turn 180 Degrees and Go Forward | Front, Left, and Right | Power Motor | Obstacle |
| Go Back and Turn Right | Front and Left, Left | Power Motor | Obstacle |
| Go Back and Turn Left | Front, Right, Front and Right | Power Motor | Obstacle |

**Smart Wander**

Diagram

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| States | Input | Output | Next State |
| Stop Moving | N/A, No Obstacle, All 4 Directions | Stop Motor | Obstacle |
| Obstacle | Sensor Data | Yes  No | Direction  Stop Moving |
| Direction | Sensor Data & Obstacle | Only 3 and less directions  All 4 Directions | Direction Vector  Distance  Stop Moving |
| Direction Vector | Only 3 and less directions | Calculate Obstacle Direction Vector | Go with speed and Opposite Direction |
| Distance | Only 3 and less directions | Calculate Obstacle Distance:  10<d<30  D<10 | Slow Speed  Fast Speed |
| Slow Speed | 10<d<30 | Set slow motor speed | Go with speed and Opposite Direction |
| Fast Speed | D<10 | Set fast motor speed | Go with speed and Opposite Direction |
| Go with speed and Opposite Direction | Obstacle Direction Vector and Speed | Power Motor | Obstacle |

**Smart Homing:**

Diagram

Description automatically generated

|  |  |  |  |
| --- | --- | --- | --- |
| States | Input | Output | Next State |
| Input Target Position | Target Position, Not Arrived | Save target position  Provide robot relative direction to target | Obstacle |
| Obstacle | Sensor Data | Yes  No | Obstacle Direction  Point to Target Position and Go 1 second |
| Obstacle Direction | Sensor Data & Obstacle | Front, Left, and Right  Front and Left, Left  Front, Right, Front and Right | Turn 180 Degrees and Go Forward  Go Back and Turn Right  Go Back and Turn Left |
| Turn 180 Degrees and Go Forward | Front, Left, and Right | Power Motor | Calculate and Save Direction and Distance to target |
| Go Back and Turn Right | Front and Left, Left | Power Motor | Calculate and Save Direction and Distance to target |
| Go Back and Turn Left | Front, Right, Front and Right | Power Motor | Calculate and Save Direction and Distance to target |
| Point to Target Position and Go | No Obstacle | Power Motor | Calculate and Save Direction and Distance to target |
| Calculate and Save Direction and Distance to target | Moving Direction and Distance | Calculate and Save Direction and Distance for comparison | Arrived |
| Arrived | Robot location and target position | Compare:  Yes  No | Stop  Input Target Position |