



KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI

CPE 376 Intelligent Robot Programming

Engineering Students

Please design a fuzzy control system in detail this system is used for controlling the movements of a mobile robot with three Omni wheels as shown in a picture below.

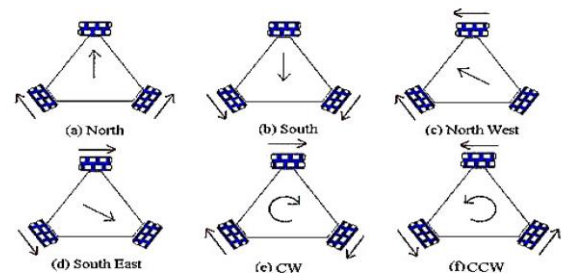
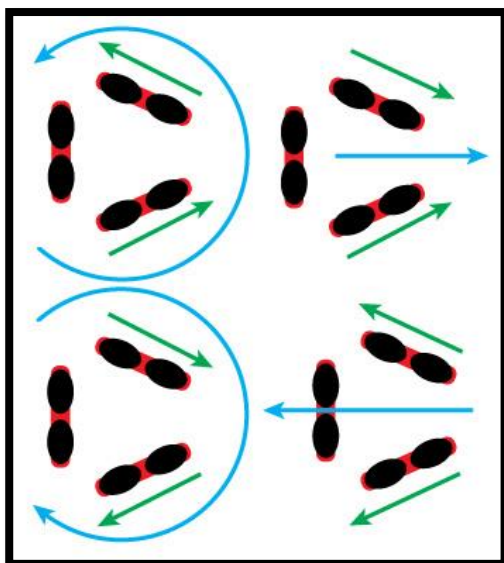
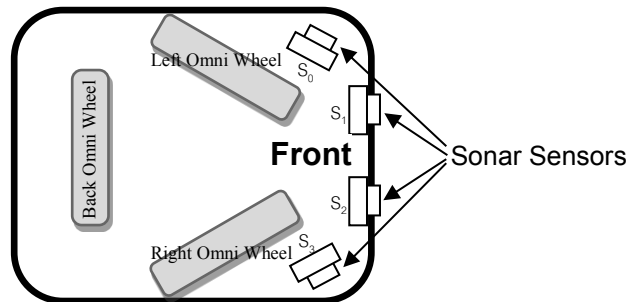


Fig.8 Driving directions of Omni-Wheel for triangular chassis.

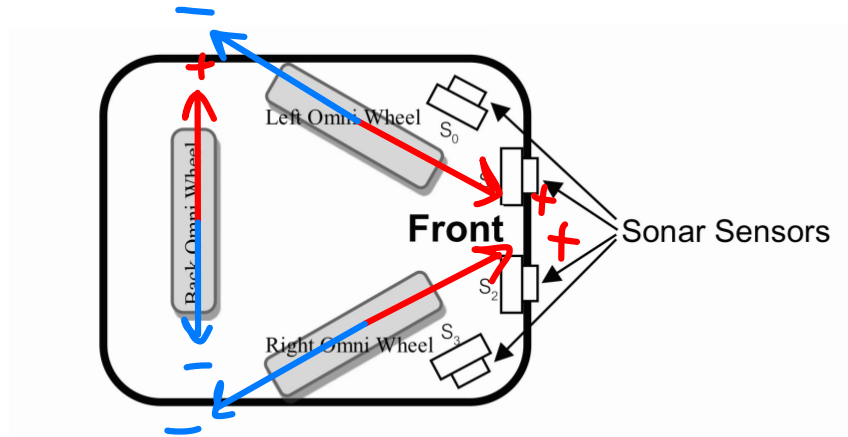
The figure shows three Omni wheels mounted over a triangular shaped chassis. The axes are inclined at 120deg to each other. This is the advantage of Omni direction wheels where without implementing steering mechanism, it is possible to turn and move the body in multi directions. These wheels work on the principal of the parallelogram law. Two forces act at an angle to each other, and the output motion is in the direction of the resultant vector calculated using parallelogram law. Omni-wheeled robots can move in any angle and in any direction, without rotating beforehand. This enables the wheels to move holonomically, which means it can instantaneously move in any direction

หุ่นยนต์สำรวจ

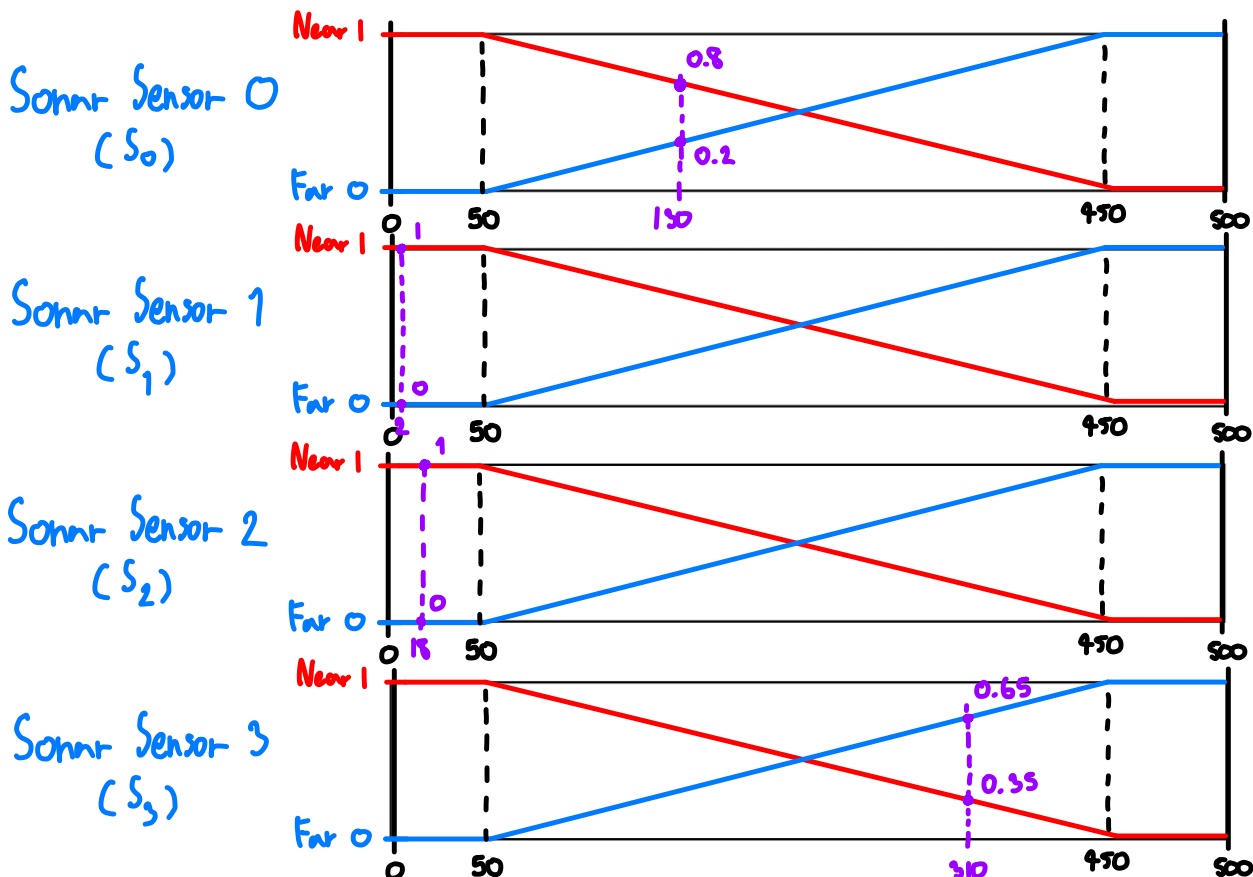
The main task is very simple.

“Let the robot explores its environment and does not allow the robot to hit any objects.”

Define the wheel direction

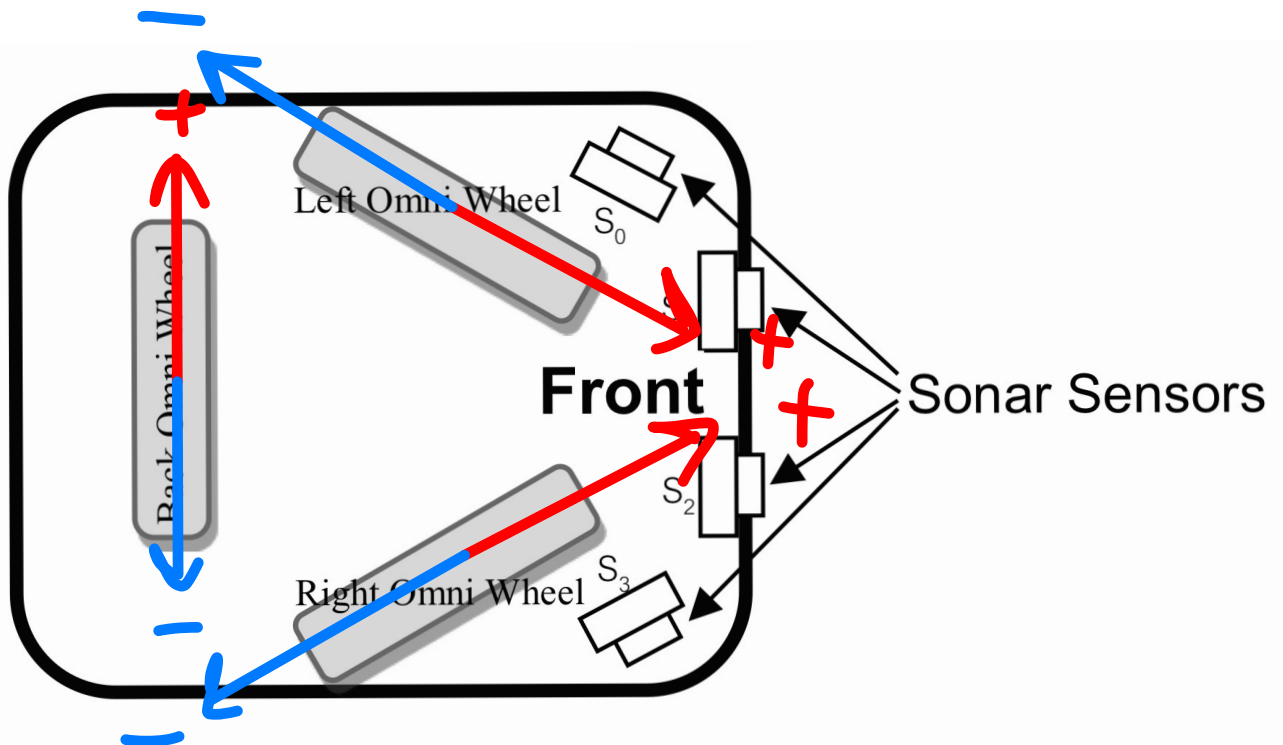


Define the membership function



Define the rules

	Sonar Sensor 0 (S_0)	Sonar Sensor 1 (S_1)	Sonar Sensor 2 (S_2)	Sonar Sensor 3 (S_3)	Left Omni Wheel	Back Omni Wheel	Right Omni Wheel
1.	-	Far	Far	-	6	0	6
2.	Near	Far	Far	Near	4	0	4
3.	Near	Near	Near	Near	-5	0	-5
4.	Near	Near	Near	-	3	3	-3
5.	-	Near	Near	Near	-3	-3	3
6.	Near	Near	-	-	4	2	2
7.	-	-	Near	Near	2	-2	4
8.	Far	-	-	Far	1	0	1



What will happen when the 4 Sonar sensors gets these value;
 $(S_0, S_1, S_2, S_3) : (130 \text{ cm}, 2 \text{ cm}, 18 \text{ cm}, 310 \text{ cm})$

	Left Omni Wheel	Back Omni Wheel	Right Omni Wheel
1.) $0 \times 0 = 0$	0	0	0
2.) $0.8 \times 0 \times 0 \times 0.35 = 0$	0	0	0
3.) $0.8 \times 1 \times 1 \times 0.35 = 0.28$	-1.4	0	-1.4
4.) $0.8 \times 1 \times 1 = 0.8$	2.4	2.4	-2.4
5.) $1 \times 1 \times 0.35 = 0.35$	-1.05	-1.05	1.05
6.) $0.8 \times 1 = 0.8$	3.2	1.6	1.6
7.) $1 \times 0.35 = 0.35$	0.7	-0.7	1.4
8.) $0.2 \times 0.65 = 0.13$	0.13	0	0.13
Total =	3.98	2.25	0.38

Ans Left Omni Wheel = 3.98 rotation per second
 Back Omni Wheel = 2.25 rotation per second
 Right Omni Wheel = 0.38 rotation per second