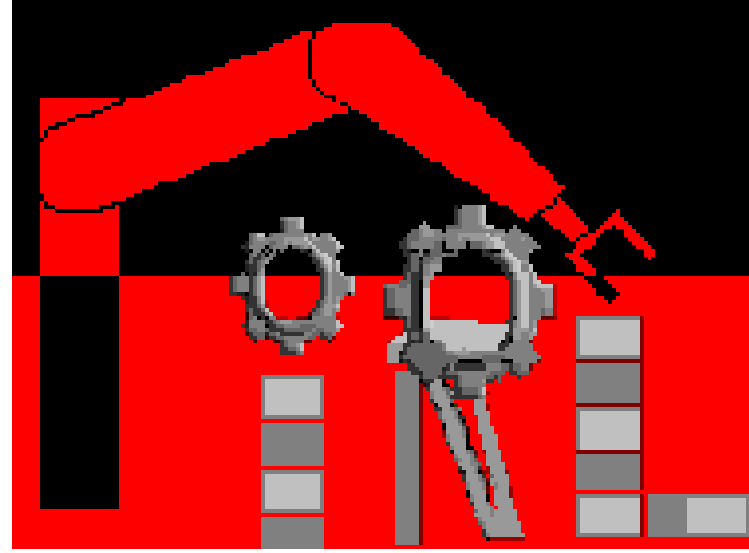# Implementation of Nearness Diagram (ND) Navigation

## Abstract

Nearness Diagram addresses the reactive collision avoidance for vehicles that move in a very dense, cluttered, and complex scenario. A divide and conquer strategy is used to simplify navigation. It performs a high level information extraction and interpretation of the environment. This information is used to generate the motion commands. This approach is well suited for unstructured and dynamic environments where other approaches are avoided

## Methodology

In this method we divide the surroundings into sectors and then find out the nearness of each of these sectors. Based on the information received a RND is constructed depicting the nearness factor of various obstacles. This diagram is used to find out the closest gap to goal and guide the robot towards the goal avoiding the obstacles.
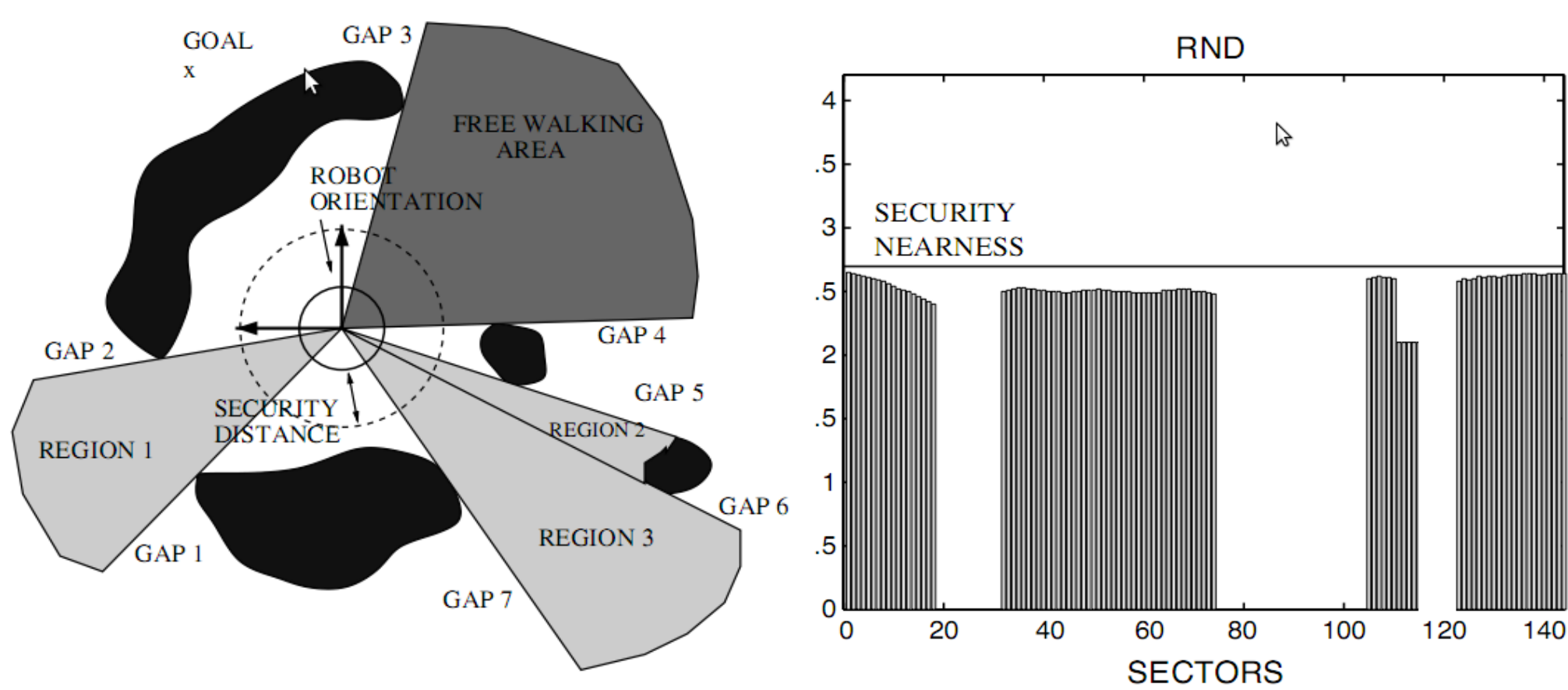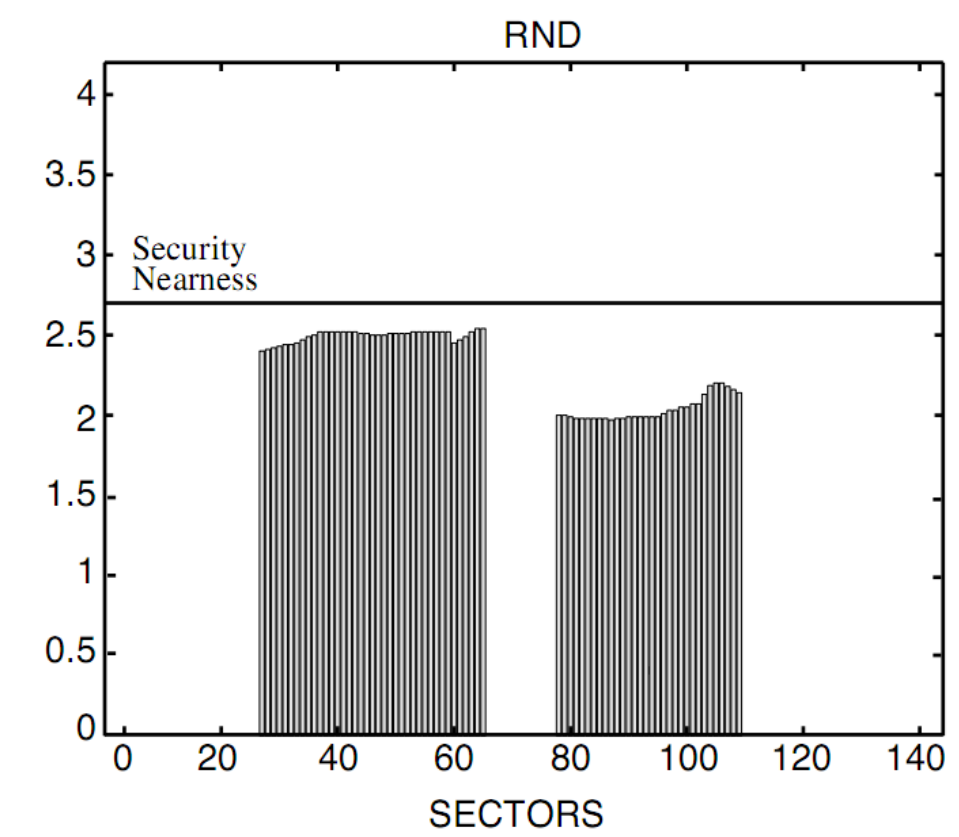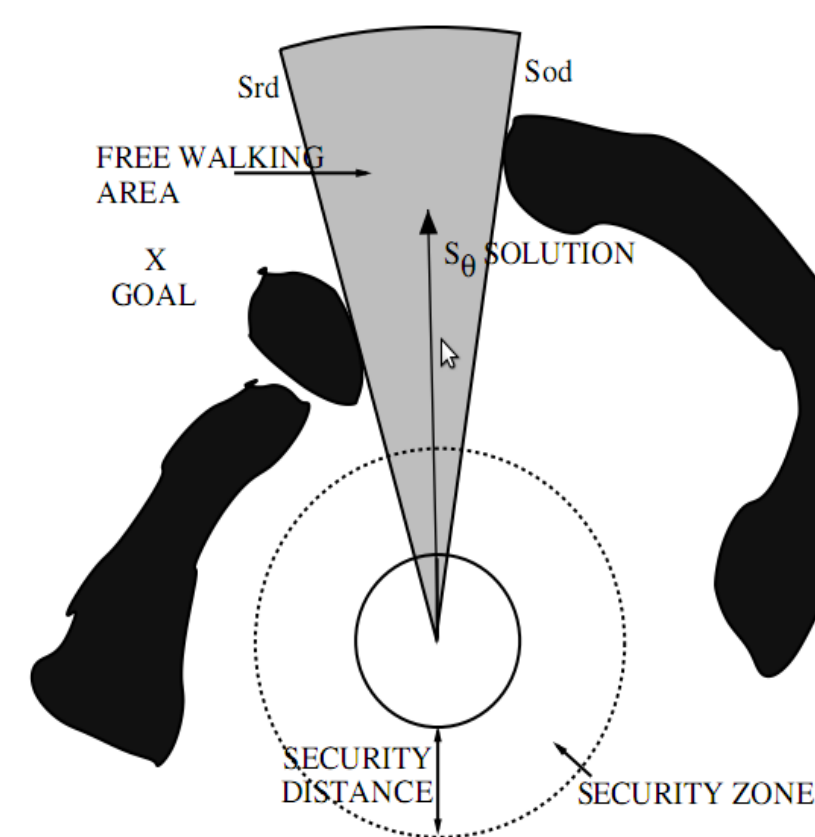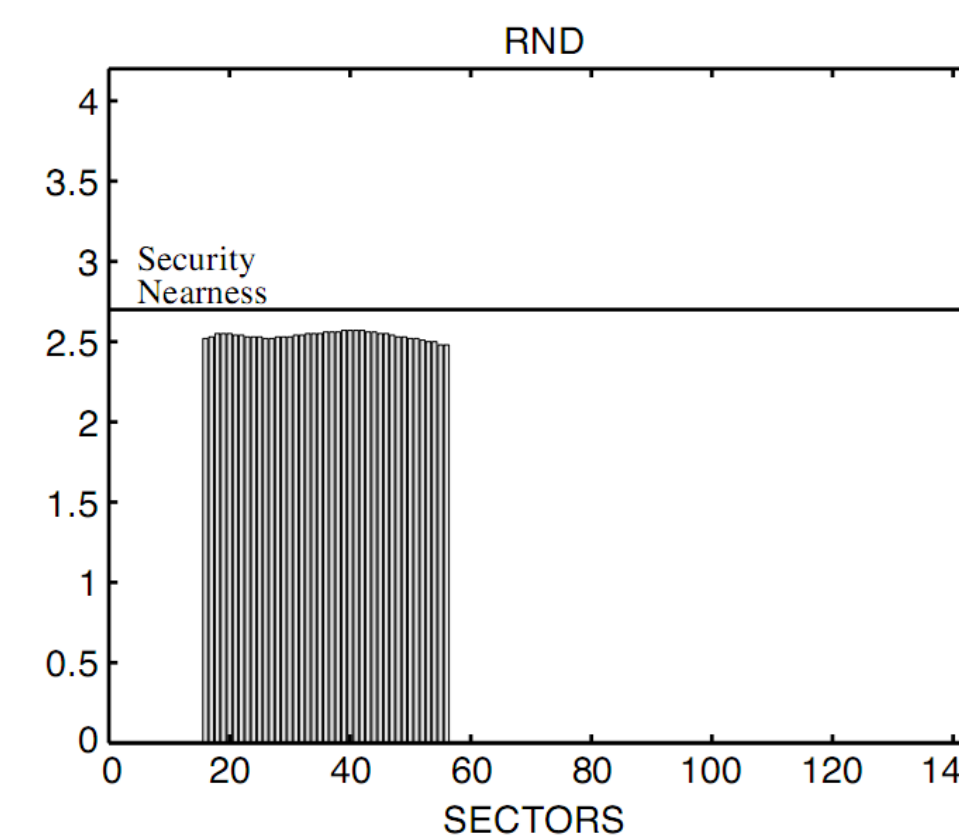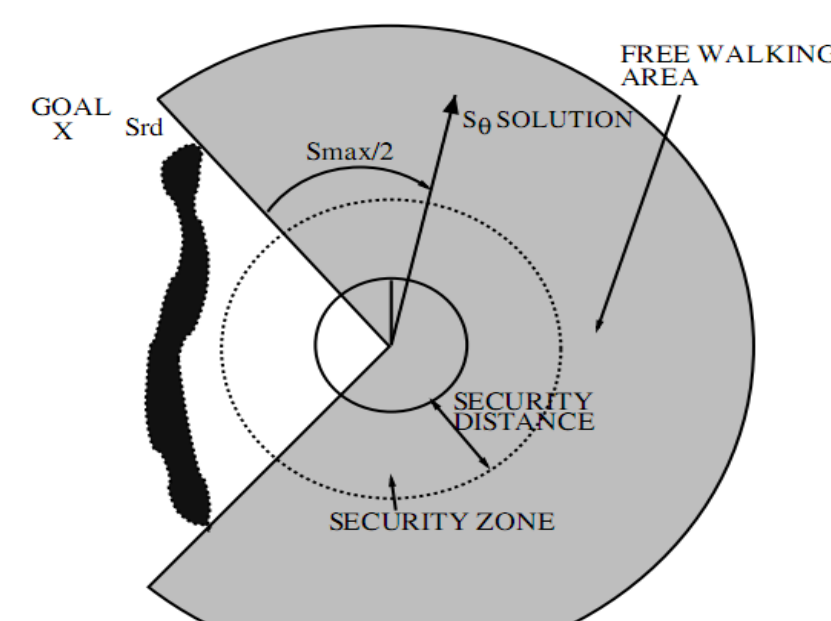


The first step is to define a distance beyond which an obstacle is not considered to be dangerous. Using the RND we find if any obstacles are there inside this secu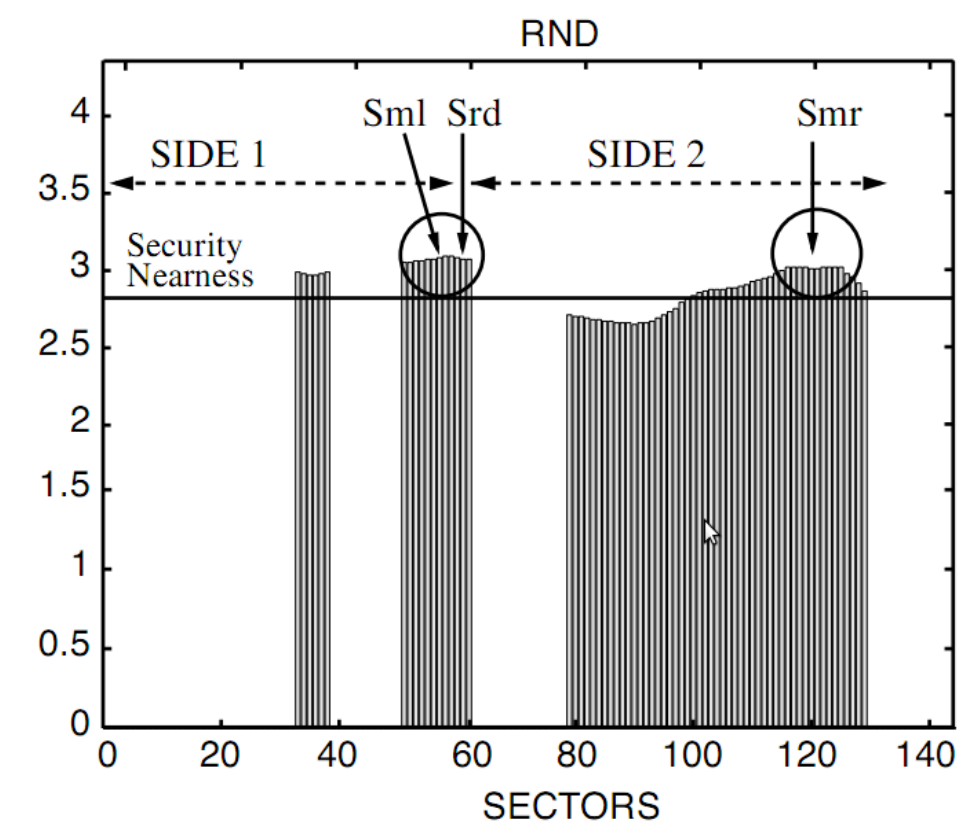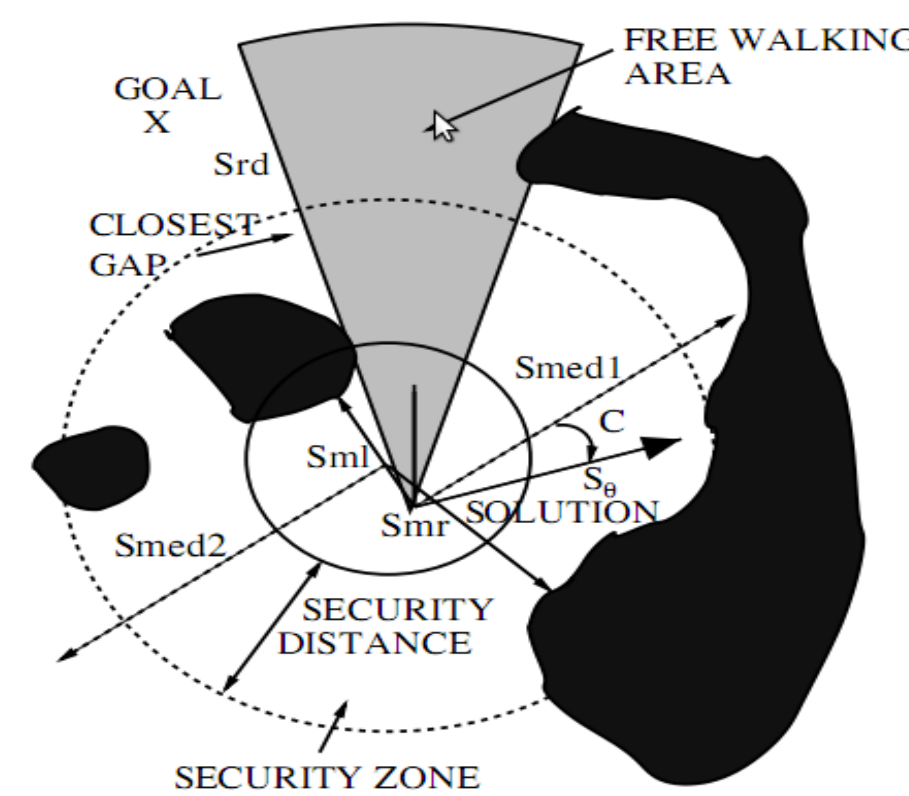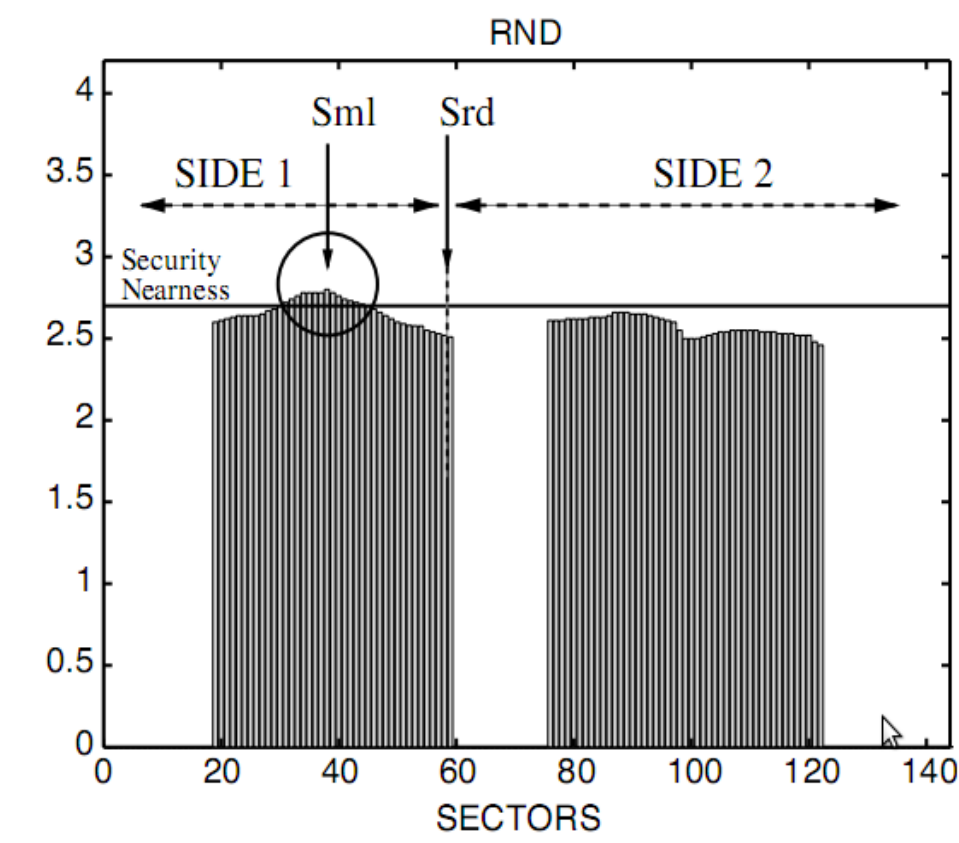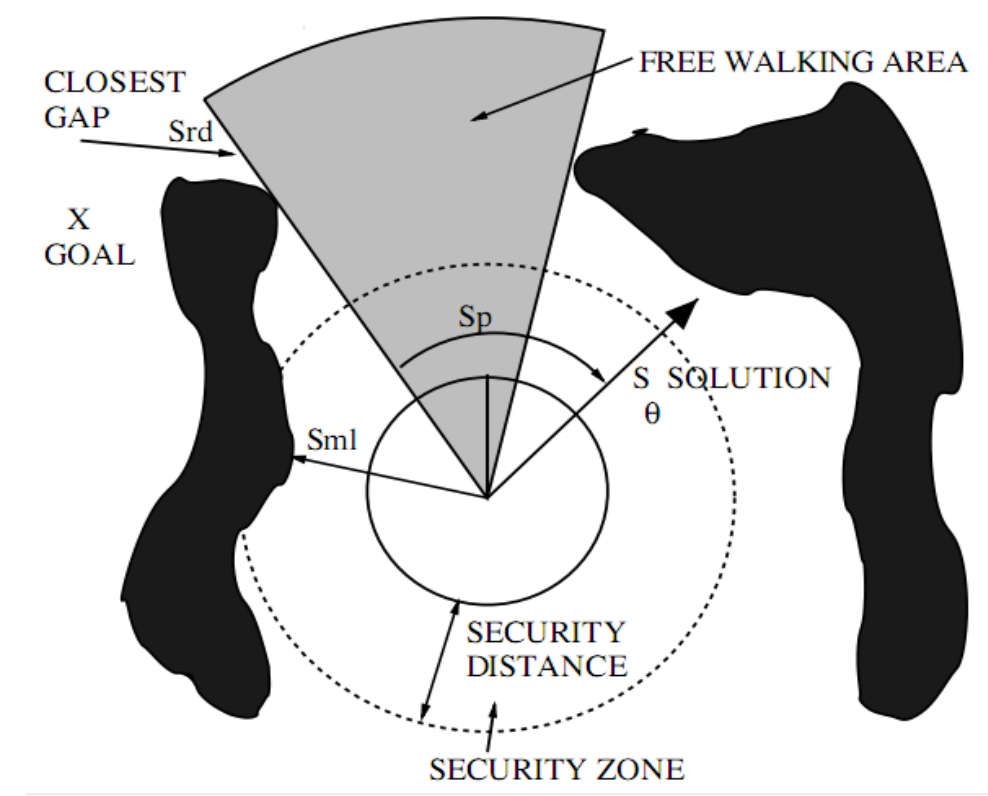rity distance. If yes the situation is called Low Safety (LS), and if no obstacles are there in the security distance the condition is High Safety (HS). Next we divide the situation into 5 step.

1. Low Safety (LS1): the obstacles in the security zone are only on one side of the gap (closest to the goal) of free walking area.

2. Low Safety (LS2): the obstacles are on both side of the gap (closest to the goal) of free walking area.

3. High Safety Goal in Region (HSGR): goal location is within the free walking area.

4. High Safety Wide Region (HSWR): the free walking area is wide.

5. High Safety Narrow Region (HSNR): free walking area is narrow.

## Algorithm

The action design is given below:

1. LS1: Move robot away from closest obstacle, towards the gap

2. LS2: Center the robot between the closest two obstacle and move towards chosen gap

3. HSGR: drive robot towards the goal

4. HSWR: Move robot alongside the obstacle

5. HSNR: Directs the robot through central zone of free walking area.

## Implementation