

Random Explorer

Introduction

The Random Explorer is a navigator for the robot that exists to prove the function of the image processing and thus show the use of the camera sensor. Though it lacks systematic exploring, the navigator shows that the robot detects obstacles in its path and can take steps to avoid them.

Methodology

The Random explorer maintains a reference to the robot's current pose and to the continually updated map of obstacles. The navigator is continually queried for its next move at a pace dictated by the processing speed of the robot.

On each query, the robot looks ahead using an altered form of Bresenham's line algorithm and determines if there is an obstacle in the next 15cm of it. This checks a straight line ahead of the robot from its current pose and therefore does not take into account thin gaps that the robot may be poised directly facing.

To determine if an obstacle is in the path, the value of each entry in the matrix is checked, this is a value between 0 and 255. A value of 0 means nothing was ever found at this location, whilst a value of 1 means that something was detected for a single frame. Additional frames of detection over that location result in the values being multiplied by 10, quickly increasing the confidence in an object's location. If a pixel value above 1 is found, then it is treated as though an obstacle is found.

Should the navigator believe an obstacle is in the path, forward movement is ceased and a decision between left and right movement is randomly made with equal probability. This is then transmitted to the robot, such that the robot will turn away from the object in its way.

If no obstacles are found to be in the way, then the robot is instructed to cease angular change and to just move forwards.

Given enough time, the robot will successfully navigate its environment. Though it is notable that the algorithm for obstacle detection fails poorly on walls and as such, there is a reasonably high possibility of the robot pushing the bounds of its environment before having mapped the entirety of the objects in its environment.

Experiments

Conclusion