An universal sensor-based navigation algorithm

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A brief abstract: In the last decade, many sensor-based navigation algorithms have been proposed. In the sensor-based navigation, a mobile robot arrives at its goal globally while avoiding neighbor obstacles locally by using sensor information. Each algorithm ensures convergence of a mobile robot to its goal by its own mechanism. However the robot sometimes selects a longer path to the goal because of no information of an environment. To overcome this drawback, we propose an universal sensor-based navigation algorithm in this paper. From the viewpoint of convergence mechanism, the author classified all the algorithms into three categories, metric, topologic, and geometric ones. A new algorithm for selecting a shorter path in an uncertain environment can be designed by mixing several consistent properties in three categories. For example, when a mobile robot joins two kinds of loops, which includes and excludes its goal, the robot generates a longer path to the goal in an uncertain environment. Therefore an universal algorithm includes some techniques to prevent a robot from joining such loops. Finally in this paper, the universal algorithm is compared with typical previous algorithms by their path lengths in graphics simulator which can construct 2-d complicated environment freely.