Point Stabilization Scheme for the Car-Like Type Wheeled Mobile Robot

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Abstract

In wheeled mobile robot (WMR) research, point stabilization is one of the basic research issue. Point stabilization is to set mobile robot in desired position regardless of its orientation. In this paper, we propose a point stabilization scheme for car-like type WMR. We will define a new error states named as *tangential error* and *normal error*. Then a heuristic control scheme will be suggested. The performance of these approach is verified via *POSTUR-II*.

Fig. 1: Car-like type WMR POSTUR-II

1 Introduction

As the task of robots becomes complex, the limitation of work space became a serious problem. From these needs, the mobile robot was proposed instead of fixed manipulator.

The mobile robot can be categorized into two types. These are wheeled mobile robot and legged mobile robot. Wheeled mobile robot(WMR) can be divided into car-like type and differential drive type. Legged mobile robot also can be divided into biped and multi legged type.

The research interests of mobile robot are localization, map generation, motion planning and motion control. Here we will show our result on car-like type WMR's motion control scheme, especially in point stabilization which stabilize the mobile's position regardless of it orientation.

L.Dubins[1] found a set of optimal path for car-like type WMR. His research, however, is concerned only in forward moving only. J.A.Reeds[2] found a shortest path in the plane with specified initial and final points and directions in both forward and backward moving for car-like type WMR. What Dubins and Reeds achieved is optimal path planning for *posture stabilization* of car-like type WMR.
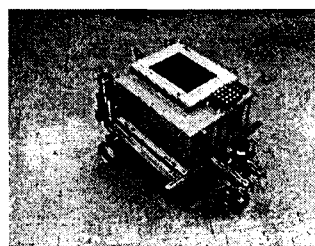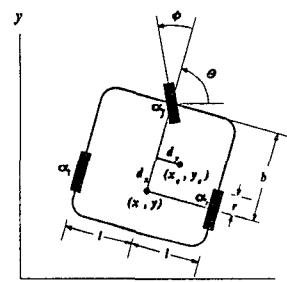

Fig. 2: Kinematic diagram of car-like type WMR

The optimal trajectory of differential drive type WMR was investigated by Reister[3], Mukherjee[4], Zheng[5] and so on. Reister suggested time-optimal trajectory for differential drive type WMR and Mukherjee proposed jacobian elliptic function for optimal path planning. Zheng presented switching bang-bang controller for optimal navigation. They did researches on *differential drive type WMR* not on *car-like type WMR*.

In this paper, we will deal with *point stabilization* scheme for the *car-like type* WMR. In section 2, we will introduce car-like type WMR, POSTUR-II. Section 3 will be dedicated for controller explanation and section 4 will present experimental results. Then conclusion follows.