Autonomous Mobile Platforms for Industrial Robots

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Abstract— **A proposal for a cooperation project between two universities. The objective is to design and evaluate the performance of various solutions for mobile industrial robots.**

INTRODUCTION

A robot is sometimes referred to as an autonomous vehicle, with sensors that can by itself know its position, and it also has some AI system that can, depending on the situation, make decisions where to go and/or what other actions to perform. Most often for people in industry a robot is an arm with let say six axis. This arm most often do not have more sensors, than those in each joint, that keeps track of the robots individual positions of the axis. There is no AI, but a controlling program that repetitively controls the robot arm. There can of course be different pre-conditions and hence the robot can do different things, but all of it is very well controlled.

PURPOSE

The proposed project is to merge the functionality of a robot arm with an autonomous platform, on which the robot arm is mounted. As a first step an ABB robot has been placed on a platform with an omindirectional drive system, and this platform can move the robot from one position to two or more others docking stations. So far this system does not operate the robot arm when the vehicle is 'on-the-move', but rather when it is docked. Compare this to a human worker, having two arms (c.f. the robot from Motoman, which also has two arms) and is fully movable.

The purpose of this project is to use knowledge from current research about autonomous robots and enhance this with a six axis industrial robot, such that it can perform limited moves of the arm at the same time as the platform is moving.

PROJECT IDEA

Start a cooperative research project where the VSLAM system described elsewhere can be used to not only position the platform itself but more to position the platform and the arm. For instance the robot arm should for instance be able to paint an object standing on the floor. If the object is too big, the arm cannot reach all points of the object. The object can of course be placed on a rotational holder, but this is always possible. With the movable platform this can move around the object and thereby enable the robot arm to reach all points of the object.

PROBLEMS TO SOLVE

The current platform, which has been build at MDH, consists of the following subsystems:

- Motor drivers
- Motion / Path planner
- Robot Controller (ABB)
- Navigation system

This requires suitable and reliable communications regarding correctness, speed and predictability. There is a structural question of handling the various subsystem. Although the Robot Controller can calculate the position of the platform it it may not be the optimal solution. Some higher level of control is required. The predictability and safety of the complete system is an important factor, since this system is allowed to move in a way freely, and this requires of course that all aspects of a safety critical system is handled.