

ROBMAT: Teleoperation of a Modular Robot for Collaborative Manipulation

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Abstract. The present paper describes the architecture of a modular robot called RobMAT. A module description which includes both hardware and software features are shown. The module has 3 DoF which gives great functionality to the module. The connection between modules forms molecules. The simplest molecule is called base with 5 DoF. Channels of communication between modules (CAN bus) and molecules (Bluetooth) are also described. A method in representing molecule configurations based on Graph Theory is explained. This method allows developing algorithm for dynamically changing-robots such as modular robots. It also explains how the molecule is allowed to act as a whole synchronization algorithm. Finally a collaborative manipulation task, which is teleoperated, is shown. Elements involve in teleoperation are also described.

Keywords: Modular, robot, self-configurable, teleoperation, human-interface.

1 Introduction

Research on modularity and re-configurability in robotics is currently on the rise. These features add three important qualities in the field of robotics: fault tolerance, flexibility and low cost. Modular robots can be thought as sets of simple elements that can be joined together to form a complex structure. The performance of the whole is greater than the sum of each module's performance. A primary objective in the design of a reconfigurable modular robot is to allow the robot to assume any geometric shape. The robot as explained has been considered to build systems that are adaptable to a number of tasks and unknown environments. Such interest is focused on modular robots because they allow making a wide variety of specialized robots from a set of standard components. This aim is different from other types of shape-changing robots that are capable of forming limited number of shapes. Developing functional reconfigurable robots poses a significant challenge. Hardware must be designed and built in a manner that the robot will be capable of reconfiguration, perform autonomous operation and handle algorithms that can confer the robot the ability to change shape.