

Essential technical and intellectual abilities for autonomous mobile service medical robots

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Abstract. Autonomous mobile service medical robots (AMSMRs) are one of the promising developments in contemporary medical robotics. In this study, we consider the essential technical and intellectual abilities needed by AMSMRs. Based on expert analysis of the behavior exhibited by AMSMRs in clinics under basic scenarios, these robots can be classified as intellectual dynamic systems acting according to a situation in a multi-object and multi-agent environment. An AMSMR should identify different objects that define the presented territory (rooms and paths), different objects between and inside rooms (doors, tables, and beds, among others), and other robots. They should also identify the means for interacting with these objects, people and their speech, different information for communication, and small objects for transportation. These are included in the minimum set required to form the internal world model in an AMSMR. Recognizing door handles and opening doors are some of the most difficult problems for contemporary AMSMRs. The ability to recognize the meaning of human speech and actions and to assist them effectively are other problems that need solutions. These unresolved issues indicate that AMSMRs will need to pass through some learning and training programs before starting real work in hospitals.

Keywords: medical robot; service; intellectual abilities; technical requirements; internal world model

1. Introduction

The field of medicine involves a considerable number of routine transportation, information, and other auxiliary service procedures. Therefore, autonomous mobile service medical robots (AMSMRs) are one of the most promising developments in contemporary medical robotics (Wang *et al.* 2006, Butter *et al.* 2008, Rogatkin *et al.* 2013, Ciupe *et al.* 2014). The first AMSMR, named "AMS-car" appeared in the mid-1970s at the Inova Fairfax Hospital, USA, and it was used to move containers with food trays to patients. At present, there are several articles in journals as well as on the Internet devoted to different AMSMRs in clinics including the robot "HelpMate"-the world's first powerful transport service robot for the delivery of different drugs, analyses,

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