Active Object Search Exploiting Probabilistic Object–Object Relations

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Abstract. This paper proposes a probabilistic object-object relation based approach for an active object search. An important role of mobile robots will be to perform object-related tasks and active object search strategies deal with the non-trivial task of finding an object in unstructured and dynamically changing environments. This work builds further upon an existing approach exploiting probabilistic object-room relations for selecting the room in which an object is expected to be. Learnt object-object relations allow to search for objects inside a room via a chain of intermediate objects. Simulations have been performed to investigate the effect of the camera quality on path length and failure rate. Furthermore, a comparison is made with a benchmark algorithm based the same prior knowledge but without using a chain of intermediate objects. An experiment shows the potential of the proposed approach on the AMIGO robot.

1 INTRODUCTION

Domestic robots are expected to operate in human populated environments. In order to successfully complete tasks, *e.g.*, delivering objects or safe navigation, accurate descriptions of such environments are required. However, due to the limited sensing range of robots and the fact that many of the objects involved get moved regularly, a complete description will never be available.

In this work the focus will be on active object search. More specifically, a robot will be given a task such as 'Find the book "Little Red Riding Hood"'. The robot then needs a strategy to find this object. A very naive approach would be to start an exhaustive search for the book through all the rooms. Even though the robot might very well succeed, this approach is not desired since many human users will have lost their patience long before the robot finishes its task. Two different situations can be distinguished. Firstly, the position of the target object can be known in advance. The search task then simplifies to a navigation task. Secondly, in the more challenging and realistic scenario, the location of the target object is not known in advance. In this second case humans have a high success rate and the search is efficient. Most probably this is due to

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