



# A comprehensive review of task understanding of command-triggered execution of tasks for service robots

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## Abstract

Robotics is a cross-disciplinary branch of science and technology, and lays foundation on mechanics, control, computer science, artificial intelligence, and so on. With the developments of both softwares and hardwares, especially in the artificial intelligence technologies, robots have been widely applied in multiple areas in the society, and become more and more interactive in our daily life, such as the service robots in the museums, shopping malls, restaurants, etc. Though the ultimate goal for a service robot to behave like a human is not easy to be achieved, significant processes have been made during the past decades. Considering that it is universal that service robots are triggered to execute tasks specified by human users via commands (Comm-TET), and it is essential to process and understand human users' commands correctly, we comprehensively overview the developments of the task understanding (TU) sub-process of Comm-TET for service robots. In order to organize the related literature in a reasonable manner, we abstracted the pipeline of Comm-TET and the generic framework of TU based on the existing researches. Following the abstracted framework, we present in-depth discussions on each of its building blocks over the past decades, and give some insights on the future research directions. Compared to other reviews on TU, this review emphasizes more on the technical developments and organizes the existing researches as an integrality.

**Keywords** Task understanding · Autonomous robots · Service robots · Command-triggered execution of tasks · Grounding · Human robot interaction

## 1 Introduction

As a cross-disciplinary branch of science and technology, robotics has attracted much attention during the past decades. On the one hand, some social problems, e.g., the aged population (Widayani et al. 2020) and the lack of work forces, urges the substitution of

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