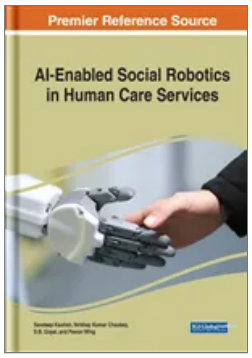


# Cloud Computing Principles for Optimizing Robot Task Offloading Processes

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Source Title: AI-Enabled Social Robotics in Human Care Services (/book/enabled-social-robotics-human-care/311840)



Pages: 24

DOI: 10.4018/978-1-6684-8171-4.ch007



## Abstract

In this chapter, the integration of two rapidly evolving concepts for integration of robotics and cloud computing has been illustrated. Intelligent robots should be preferred over low-cost conventional robots for dynamic and sophisticated applications, the internet, cloud computing, and artificial intelligence principles. “Task offloading” is one of the popular cloud computing techniques for extending the constrained capabilities of robots. The various task features of cloud robotics have also been explained. Literature on various optimization techniques used for task offloading (task offloading, path planning, and access points) in cloud-enhanced robots has been included. The data handling framework and genetic algorithm-based task offloading mechanism of cloud robotic systems have been illustrated. The system architecture and task-flow chart for smart city and manufacturing control applications have been graphically illustrated.

Chapter Preview

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## Introduction

The capacity to incorporate self-governing robotic intelligence has increased thanks to the introduction and rapid development of cloud innovation and the Internet of Things. More study has recently been concentrated on creating collective robots for certain task-based applications in order to make up for the significant testing and changing demands of these applications. Any device that depends on a system for support is regarded as a part of organized robotics. The purpose of characterizing this in this way is to include both existing and potential frameworks, such as UAVs and warehouse robots (Kumar & Michael, 2012). The impressive chores of detecting, instigating, imparting, and reasoning are distributed among a group of robots in network improved robotics. Such frameworks can be used for a wide range of jobs, including mechanical assistance, planetary meanderer control, clinical medical treatments, administrative-based duties, and so on. Even with all the advancements, designing autonomous robots with limitless capabilities is still not conceivable. Whether a framework is based on hardware or software, all automated systems have their own set of restrictions(Samikannu et al., 2022; Vanitha et al., 2023; Vennila et al., 2022). These include asset restrictions, communication constraints, educational standards, and so forth. Robot design and development still have a lot of room for improvement. Expanding the battery's capacity could increase power usage (by an octuplet). The method of task-offloading involves moving a mechanical task to a distant asset in order to conserve energy, speed up response, and prolong the battery life of the robot. The concept of “cloud enhanced robotics” perfectly combines mechanical autonomy with additional support from the cloud foundation.

**Cloud Enhanced Robotics (CER):** CER is a distinct area that has combined the two rapidly evolving concepts of robotics and cloud computing. It initially advises turning more heavily to the omnipresent virtual resources of the cloud and less to human information. However, networked robots have a variety of requirements, such as assets, learning capacities, and communication. The ubiquitous and on-demand benefits provided by “the cloud” enable the robots to maximize their potential and identify resources in order to overcome their own obstacles. Through virtualization, the robot offloads work by utilizing these cloud benefits (Mell & Grance, 2011). The creation of dynamic and sophisticated applications now has a greater capacity for coordinating self-governing detection and incitation due to the growth of CER and the Internet of Things (IoT). For the combination of mechanical advancements, particularly in robotizing applications, CER is thought to be a significant enabling agent. In essence, CER represents the standard for system assets that have increased operational capabilities and mechanical assets that are combined with lower registration costs. The various applications of CER is illustrated in Figure 1.

The main guideline for the sequencing of exams is dependent on the components of the problem. These highlights have led to several recent readings on resource administration and distribution for cloud computing. Sending computationally expensive jobs to the repeated, affordable, and adaptive cloud servers is known as “task offloading,” and it has become a popular technique for extending the constrained capabilities of robots. Task offloading and the variables (such as cost, and trade-off) associated with its dynamic decisions need to be better understood.

*Figure 1. Multiple domains of cloud enhanced robotics*

*978-1-6684-8171-4.ch007.f01(https://igiprodst.blob.core.windows.net:443/source-content/9781668481714_311840/978-1-6684-8171-4.ch007.f01.png?sv=2015-12-11&sr=c&sig=8YHkPQeiTk%2Bb2UQ16Yd%2BFenFUZgVm81NqgcW7ClfLbs%3D&se=2023-05-28T07%3A09%3A04Z&sp=r)*