Chapter 7
Zone-Aware Medical Robot Coordination System:
Concurrent Scheduling and Resource Control

Enlong Dong
http://orcid.org/0009-0007-0364-3916
The Hong Kong Polytechnic University, China

Huakun Huang
The Hong Kong Polytechnic University, China

Huakai Huang
The Hong Kong Polytechnic University, China

Ruize Liu
The Hong Kong Polytechnic University, China

Hengxian Li
The Hong Kong Polytechnic University, China

ABSTRACT

Hospital service robots face challenges because they need to compete for limited resources while their work schedules remain unproductive. The robot coordination system which we created solves this issue through its design for medical operations. The core idea needs to merge regional resource limitations together with a simple system that handles multiple tasks simultaneously. Our solution includes a zone-

DOI: 10.4018/979-8-2600-1101-0.ch007

aware work-stealing strategy which enables robot threads to focus on local tasks while taking tasks from other threads only when essential. The system achieves total system responsiveness improvements through its ability to prevent unnecessary blocking. The system runs on a Rust implementation which provides a web-based interface for visualizing its functions. The system enables secure simultaneous operation of multiple tasks while it provides continuous operational status tracking. Our experiments demonstrate that our design establishes permanent and safe methods for distributing tasks.

1 INTRODUCTION

1.1 Problem Statement and Motivation

The research chapter studies how hospitals use service robots by analyzing their operating system functions instead of their robotics and motion-planning capabilities. Modern hospitals use robots for multiple purposes including delivering medicine and transporting samples and restocking supplies and assisting with hospital operations. The application scenario requires specialized knowledge but the software challenges case study research because multiple robots perform simultaneous tasks which require active monitoring through their shared task system of active missions.

Chapter B establishes three basic conditions to define the extent of its problem which require an operational task queue to operate safely and provide protection for shared areas and implement heartbeat-based health assessment systems. Our system meets all three requirements and extends into a complete testing framework. The chapter design allows development of a real-world system which enables simultaneous task execution and functions as a research platform.

The main challenge for the system requires protection of safety and system integrity while the system executes multiple tasks at the same time. Task queue systems without proper synchronization allow robots to obtain the same tasks and miss the signals which activate their operations. The absence of proper zone entry controls enables robots to access forbidden areas which leads to dangerous situations and safety breakdowns. The monitoring API will provide outdated or inconsistent data when robot data exists in multiple locations throughout the system. Liveness monitoring needs to function because unresponsive robots and failed robots will remain invisible to the system. The chapter requires a balance between system precision and system visibility.

The system software development team added comparative execution modes as an important system extension. The system supports a Zone-Aware Work-Stealing

A Survey of Mobile Ticketing Services in Urban Mobility Systems

Marta Campos Ferreira, Teresa Galvão Diasand João Falcão e Cunha (2020). *International Journal of Smart Sensor Technologies and Applications (pp. 17-35).*
www.irma-international.org/article/a-survey-of-mobile-ticketing-services-in-urban-mobility-systems/281601