자원 제약 환경에서 온디바이스 로봇지능 SW 플랫폼 실증을 위한 로봇 요구사항 연구

(A Study on Robot Requirements for On-Device Robotic Intelligence Software Platform Validation in Resource-Constrained Environments)

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Abstract : Robots, as mobile platforms, generate significant wireless communication traffic due to IoT devices requiring high-volume streaming data. As robots increasingly integrate into human environments, wireless control systems face challenges, such as difficulties in meeting real-time processing demands due to network latency and security concerns, all of which are compounded by resource limitations. As a result, the need for on-device robotic intelligence, capable of independently processing AI within the robot system, is becoming more critical. This study utilizes a ground-based multi-legged robot as a testbed to outline hardware architecture requirements for verifying and operating real robots based on an on-device robotic intelligence software platform. Furthermore, the study classifies the types of information that must be processed within the robot system when combined with various IoT devices and investigates data processing and transmission methods for robot control and remote operation. Building on this technical background, the research explores conceptual approaches and challenges to be considered when integrating ROS frameworks with on-device AI frameworks in ground-based robots. The proposed system aims to utilize on-device robotic intelligence to ensure safe operation and achieve real-time performance across diverse testing environments.

Keywords : On-device artificial intelligence, Robot Operating System, IoT integration, Data processing and communication

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