Research on RFID and wireless sensing technology

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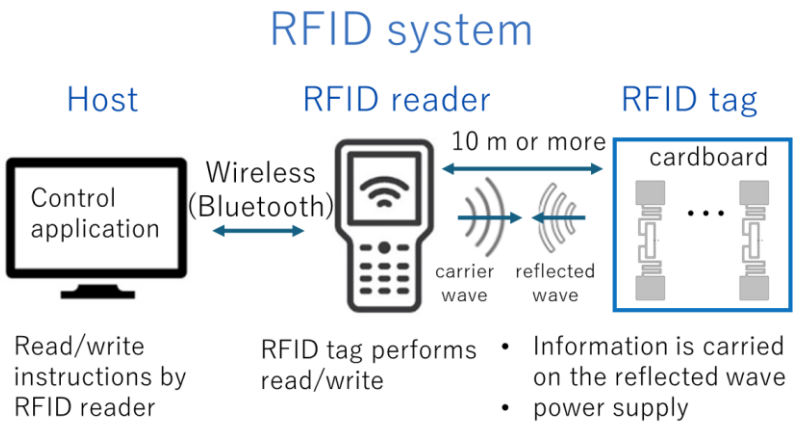
INTRODUCTION		

1. RFID sensing

This article presents energy-efficient edge processing for an ultrahigh-frequency (UHF) band radio- frequency identification (RFID)-based vibration frequency/ physical shock sensing system. This system is especially useful for long-term measurements. In this edge processing system, an RFID reader has a standby mode operating at a low duty cycle and an active mode operating at a high duty cycle. With these modes, an RFID reader achieves both energy- efficient operations and accurate sensing performance. The standby mode is useful for reducing energy consumption, preventing overheating, and reducing greenhouse gas emissions because a low duty cycle leads to a short radio wave irradiation time. Reducing the heat generation of the RFID reader, especially for long-term measurements, the standby mode makes the RFID reader durable. If vibration/physical shocks are applied to the RFID sensor tag, then the standby mode triggers the active mode. The standby mode samples the presence of the RFID sensor tags within an experimentally determined sampling period to detect the beginning of vibration/physical shocks. A high-duty cycle in the active mode results in an increased number of RFID sensor tag readings.



2. Wireless sensing

Recent advances in Wi-Fi technologies, including Wi-Fi 6 and 7 further facilitate the development of RTLS technologies by utilizing signal processing and artificial intelligence/machine learning (AI/ML) technologies. These research and development activities also accelerate future wireless communication for achieving the integrated sensing and communication (ISAC) concept. The recent developments in Wi-Fi technologies have led to increased numbers of APs for gaining reliable wireless links. Therefore, we observe many APs in workplaces, office environments, and homes. These situations enable exploiting observe Wi-Fi information for localizations. This paper proposed an indoor localization method based on the analyses of surrounding Wi-Fi access points using ChatGPT. The experiments validated that ChatGPT could infer the corresponding room names to given unknown Wi-Fi logs based on analyzing known Wi-Fi logs observed in priori in individual rooms.