

# Dual-Robot Navigation System for Real-Time Sensing and Monitoring

Ahmad M. Derbas, Kasim M. Al-Aubidy, Mohammed M. Ali, and Abdallah W. Al-Mutairi

*Intelligent & Embedded Systems Research Group,  
Philadelphia University, Jordan  
kma@philadelphia.edu.jo*

## ***Abstract***

The main objective of this research is to design and realize a multi-robot system for real-time sensing and monitoring suitable for hazardous and/or unreachable environment. The proposed system has two mobile robots; rover and eye. Each mobile robot has its own embedded microcontroller and set of sensors. Wireless communications between local site and these mobile robots are achieved by WiFi, ZigBee and Bluetooth techniques, and can be accessed through the internet. Wireless teleoperation of these mobile robots is a challenging task that requires an efficient interface and a reliable real-time control algorithm to avoid obstacles. The proposed system enables the authorized operator to send commands to the mobile robots, and receive scanned data and images from the environment through the internet. The mechanical part of the remote station has been built after careful selection of the design parameters using CAD/CAM tools. While, the system hardware and software parts of the embedded controllers were implemented using PROTEUS development tool to obtain the suitable design parameters. Then, real experiments have been achieved to demonstrate the system performance including the wireless teleoperation of the two mobile robots, their navigation to avoid obstacles, and real-time sensing and monitoring.

***Index Terms***—*Mobile robot, Multi-robot system, Remote sensing and monitoring, Wireless sensor networks, Obstacles avoidance.*