

P10 Design and Implementation of Plantar Pressure Measurement and Collection System during Gait

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Introduction

- Plantar pressure data generated during walking plays an important role in the fields of biomechanics, rehabilitation, and sports science.
- Plantar pressure is measured for pathological diagnosis such as rheumatoid arthritis, diabetes, and Parkinson's disease that affect gait.
- In addition, it verifies the gait status of patients with central nervous system damage or patients undergoing rehabilitation after lower extremity injuries and provides quantitative data to evaluate the treatment effect.
- As such, plantar pressure generated during walking can qualitatively and quantitatively identify various aspects of human movement, gait analysis, and biomechanics.

Software Configuration

- The wireless network-based data collection system is designed to operate within the ROS (Robot Operating System) framework.
- The server acts as a master node to facilitate communication between nodes, to store data processed by sensor nodes in a rosbag form, and to ensure time synchronization between sensors.
- Software based on ROS_serial was developed to establish communication between the data collection device and the master node. Wireless communication is implemented to transmit data using TCP(Transmission Control Protocol).
- The developed system largely consists of a data collection device and a server, and is configured as shown in the software sequence diagram below (Fig. 1).
- The data collection device includes an ADC and a MCU that converts analog data into digital.
- The FSR sensor data is transmitted to the MCU via the ADC at 100Hz and to the server via Wi-Fi.

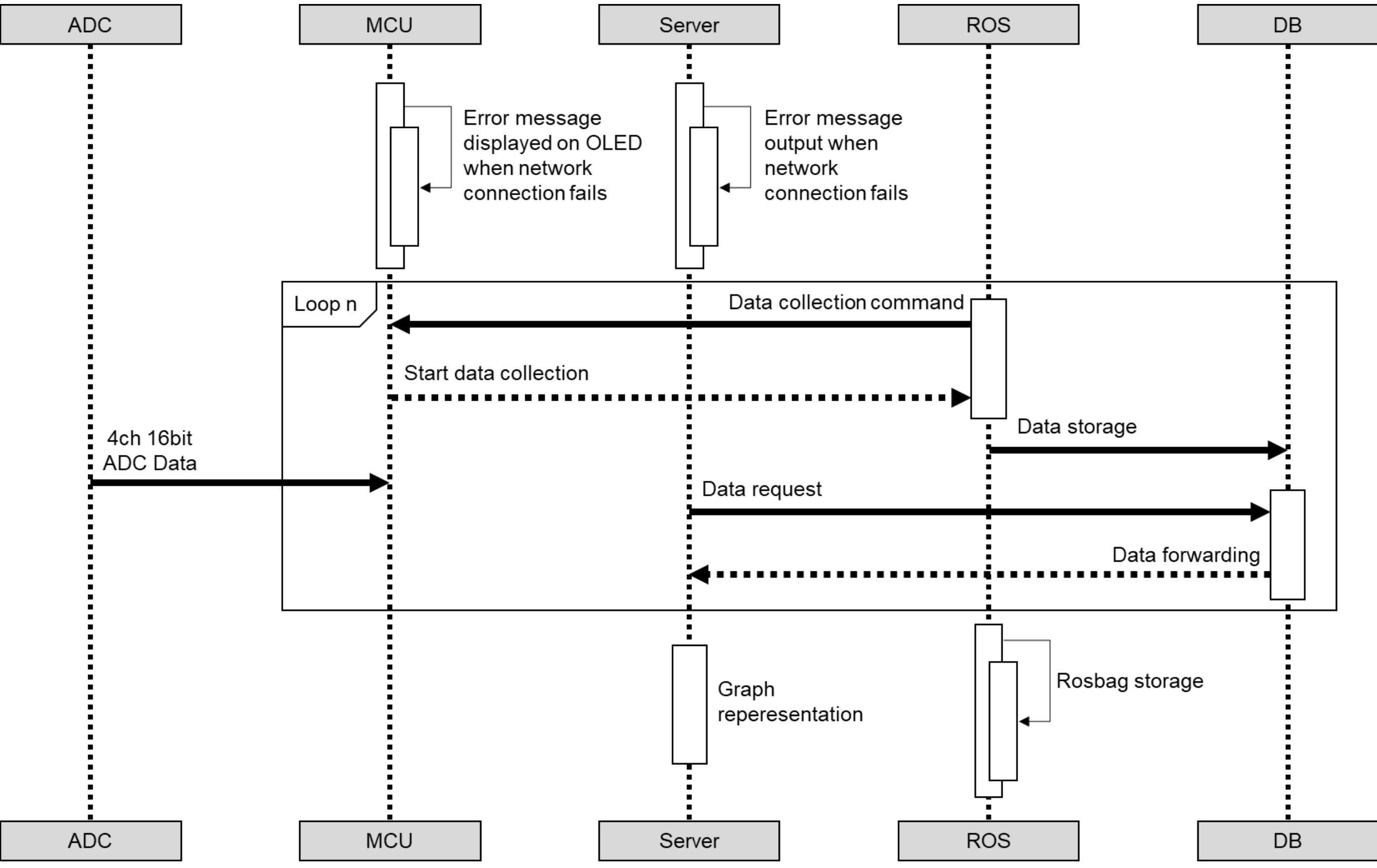


Figure 1. Smart insole and FSR sensor configuration

Hardware Configuration

- The hardware consists of an FSR sensor, Smart insole, data collection device, and a battery.
- The data collection device consists of ADC (Analog Digital Converter) and MCU (Micro controller unit) for Wi-Fi communication and control.
- It also consists of a battery for power supply and a server for data collection.

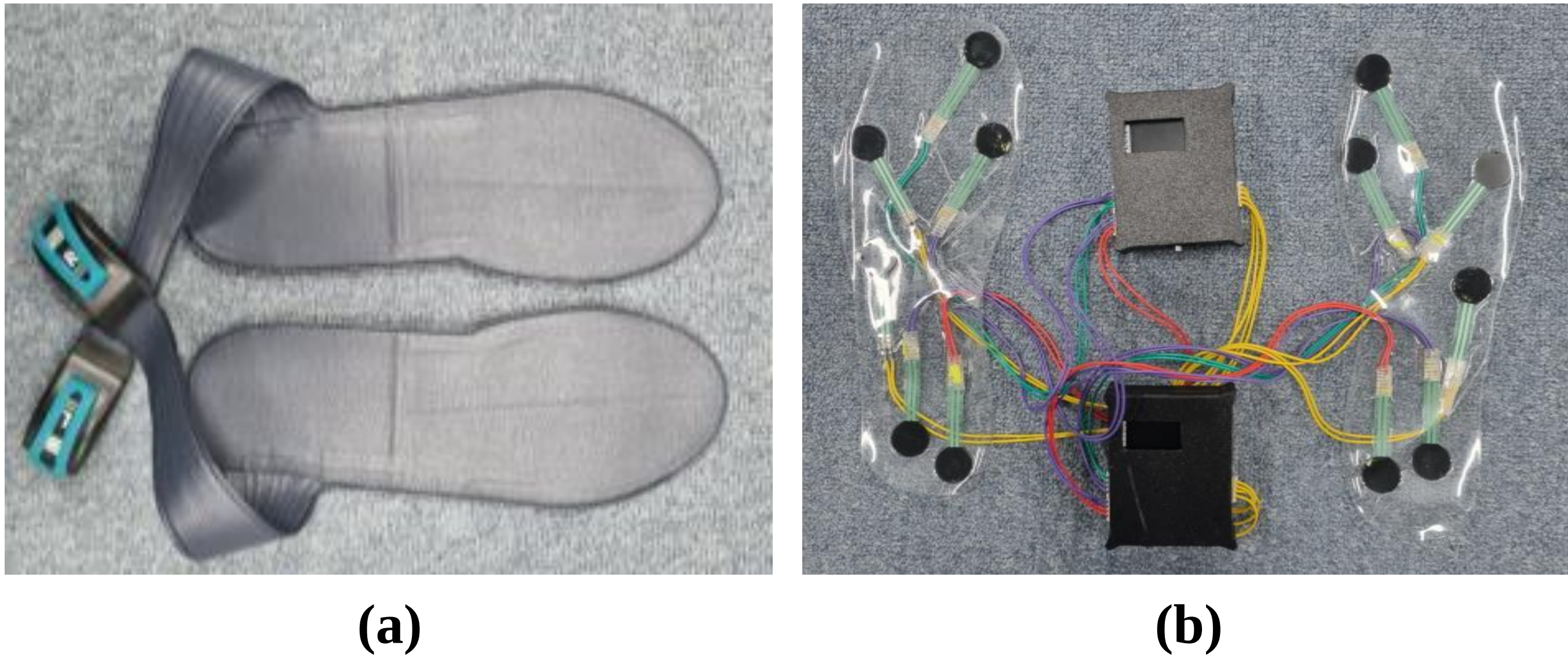


Figure 2. Hardware configuration: (a) Smart insole, (b) FSR System

Data Collection Experiment

- A walking experiment was conducted on level ground with one non-disabled person.
- Data was collected in real time using Smart insole and FSR system.
- It was confirmed that collection was possible without data loss.

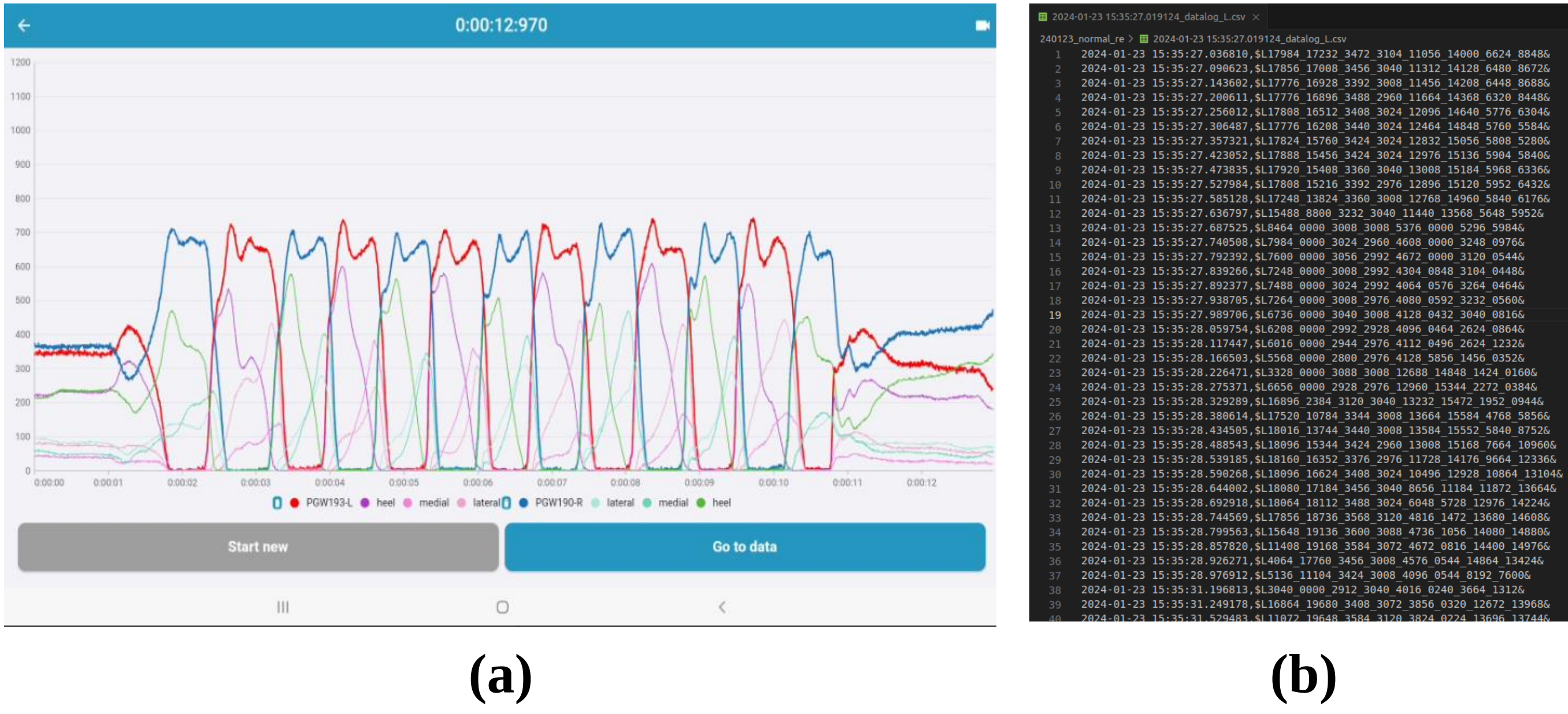


Figure 3. Plantar pressure collection screen : (a) Smart insole, (b) FSR System

Conclusion

- A system for measuring plantar pressure generated during walking was developed using the FSR 402 and Smart insole.
- It was developed to send and receive data by wireless communication method using Wi-Fi, and to perform time synchronization and system stabilization using ROS framework.
- In addition, the collected data was visualized in real time through GUI.
- Accuracy was confirmed by comparing smart insole and FSR system data.

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