StepSmart Executive Summary

Introduction

StepSmart is a wearable smart insole designed to improve the safety and performance of runners. The system is built with an Arduino Nano 33 BLE Rev2 and a React Native Expo mobile application. It captures active acceleration, gyroscope, and plantar pressure data and transmits data streams via Bluetooth Low Energy (BLE) for visualization on mobile devices.

Societal Impact

StepSmart promotes active lifestyles and injury prevention. Economically, the usage of a StepSmart device may help reduce medical expenses associated with running-related injuries. Beyond these benefits, the system encourages broader participation in physical activity by giving runners confidence that they can train safely. On a communal level, StepSmart supports wellness initiatives by making advanced gait analysis and fostering a culture of proactive health management.

Key Benefits

StepSmart provides runners with active insights into their gait and performance. By monitoring acceleration, gyroscopic data, and plantar pressure, the system helps identify running patterns and potential injury risks. This allows athletes to adjust their technique and improve training..

Target Users

StepSmart is intended for runners and athletes who want to improve performance and reduce injury risk. Through active insights into key data metrics, the system helps runners better understand their gait and make adjustments that enhance both safety and training outcomes. Whether users are recreational joggers or competitive athletes, runners can use the system to better understand their running patterns and make informed adjustments.

System Overview

The hardware for the StepSmart system comprises an Arduino Nano 33 BLE Rev2, force sensors, a rechargeable battery, and connectors. The software utilized includes the Arduino IDE (C/C++), React Native with Expo (JavaScript/TypeScript), Expo Go, and Expo Development Build. The data flow of the system goes from the sensors to the Arduino Nano 33 BLE Rev2. The Arduino Nano 33 BLE Rev2 connects to the mobile app, which provides active data visualization.
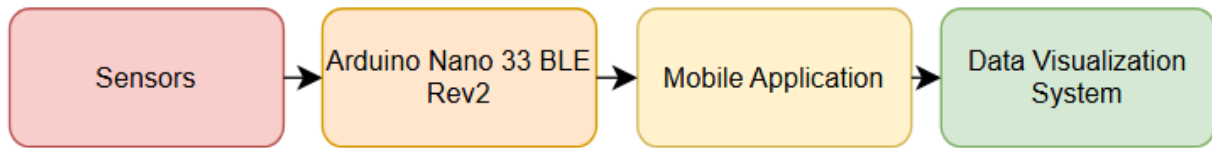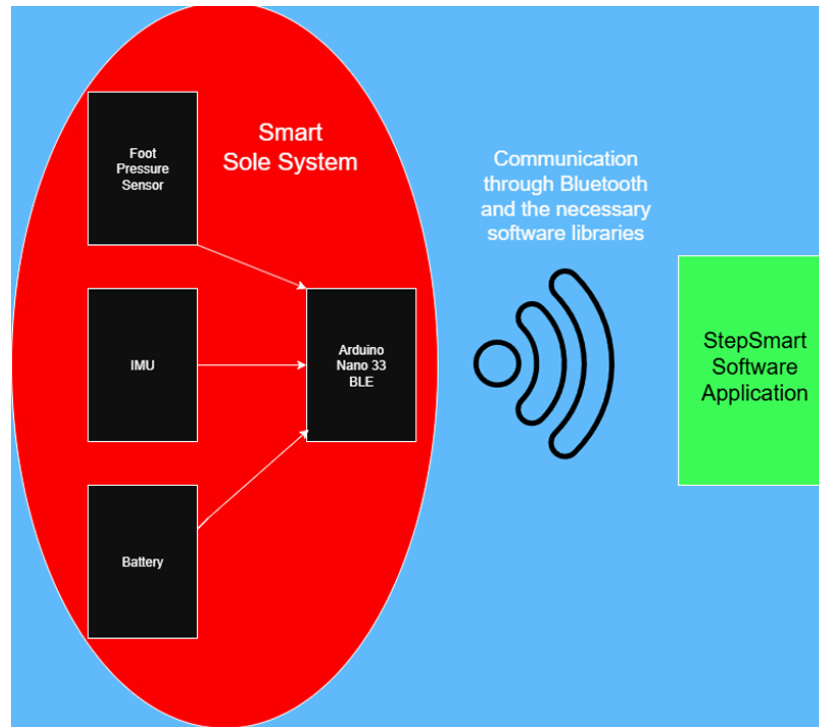
Figure 1: Data flow of the system

Figure 2: System Connectivity

Hardware Setup

To begin using StepSmart, the insole should be inserted into a running shoe. The sensors and battery must be connected securely, and the Arduino Nano 33 BLE Rev2 should be powered on.

Software Setup

An Expo Development Build will be created for the mobile device. The React Native project is run on a computer, and a QR code is generated during the build process. The user scans this QR code with their mobile device to install the development build. Once installed, the StepSmart application can be launched directly from the device, providing full BLE support.

Usage Guide

To use StepSmart, the runner inserts the insole into their shoe and ensures that the Arduino Nano 33 BLE Rev2 and battery components are securely connected. The user then opens the StepSmart mobile application. Once the system is active, the runner can begin walking or running, and the application will stream active data metrics.