Scoliosis Brace Sensor Integration
(SCOLISENSE)

Osman Emre Kaya – Hamza Çiçek – Furkan Arslan
Ferhan Burak Özkan – Ayhan Tan Açar

Dr. Sevgi Koyuncu Tunç

Çankaya University, Department of Software Engineering

Abstract

The Scoliosis Brace Sensor Integration system monitors brace usage in scoliosis patients using pressure sensors and Bluetooth communication. It provides real-time data to a mobile app and visual analytics to doctors via a web application, aiming to improve treatment adherence and enable remote monitoring.

Introduction

Scoliosis treatment with braces depends heavily on patient compliance, yet current monitoring methods are limited and unreliable. While previous systems have used sensors to estimate wear time, few offer real-time feedback or accessible data for both patients and doctors. This project introduces a solution that integrates pressure sensors with a Bluetooth-enabled microcontroller, a mobile app for patients, and a web dashboard for doctors.

Solution

To address the lack of objective brace usage tracking in scoliosis treatment, the *ScoliSense* system offers:

Pressure-Based Monitoring
• ensors embedded in the brace measure contact pressure at key body points.
• Data is sampled and interpreted to determine if the brace is being worn correctly.

Bluetooth Data Transmission
• A microcontroller transmits pressure data to the mobile app in real time.
• BLE ensures low energy consumption and reliable short-range communication.

Mobile Application Feedback
• Patients receive immediate feedback on usage duration and connection status.
• Alerts are triggered for disconnection, inactivity, or low pressure levels.

Web Dashboard for Doctors
• Doctors can monitor patient compliance remotely via a visual interface.
• Graphs, historical data, and custom wear-time goals aid in clinical evaluation.

Backend Analytics & Data Sync
• Sensor data is uploaded to a cloud-based backend for storage and analysis.
• Wear-time summaries and usage trends are computed for doctor review.

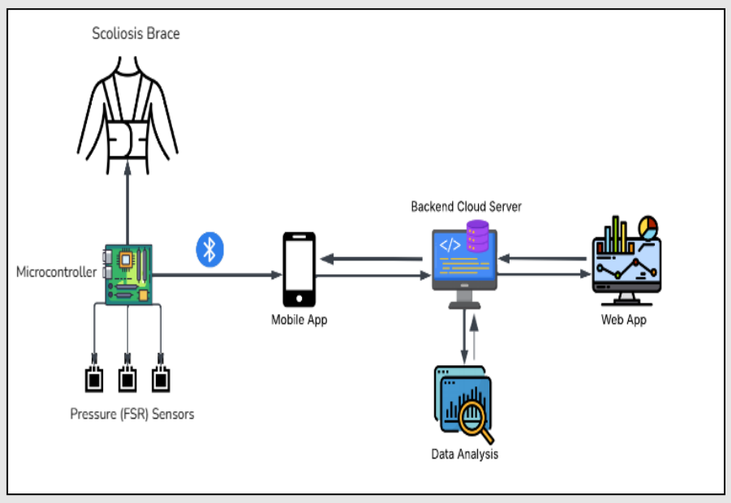


Figure 1 - System Diagram

Software Technologies

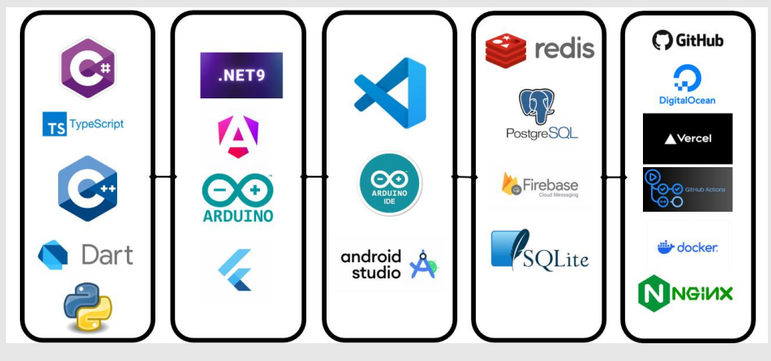
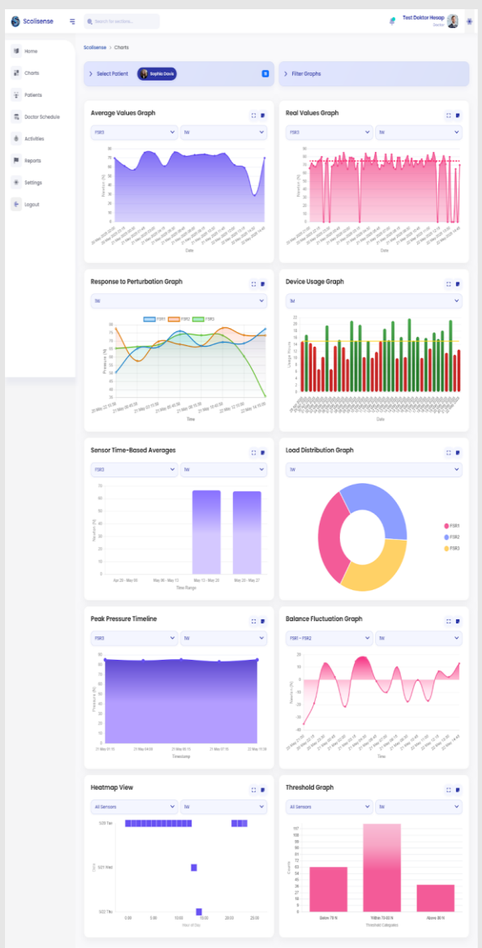


Figure 2 – Used Technologies



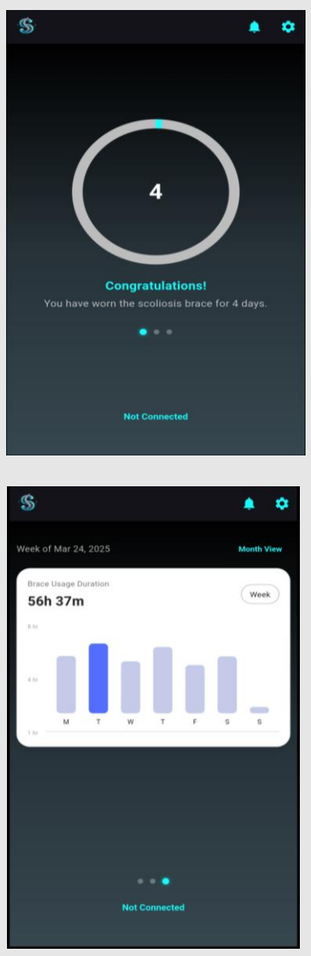


Figure 3 – Finished Product

Company Info

The system is developed by a senior engineering team at Çankaya University, Department of Software Engineering. The project is conducted under academic supervision, combining expertise in embedded systems, mobile development, and cloud infrastructure. It is a collaborative effort aimed at improving orthopedic treatment through wearable health technologies. The system leverages real-time sensor data and cloud-based analytics to support doctors in remotely monitoring patient compliance, making it a distinct and impactful product in the digital healthcare domain.

Results & Conclusion

Key Achievements:
•Reliable real-time data collection
•BLE-based mobile communication
•Usable interfaces for both patients and doctors

Lessons Learned:
We gained experience in sensor integration, BLE communication, and multi-platform development.

Future Work:
•Reducing the doctor's workload by integrating AI into the system.
•Patent application
•Ethics committee approval -> Clinical tests

Acknowledgement

- Dr. Sevgi Koyuncu Tunç
- Dr. Onat Totuk
- Prof. Dr. Engin KOYUNCU
- Doç. Dr. Sibel MANDIROĞLU
- Doç. Dr. Ayça URAN ŞAN
- Doç. Dr. Tuğba ATAN