Leveraging Wearable IoT Solutions and AI for Improved Orthopaedic Care in Kenya

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Wearable IoT System Architecture

The first design, figure 1, involved collecting data using a knee brace with a flex sensor and BLE connectivity. Then, stored in InfluxDB, we could visualize in a real-time dash plot.

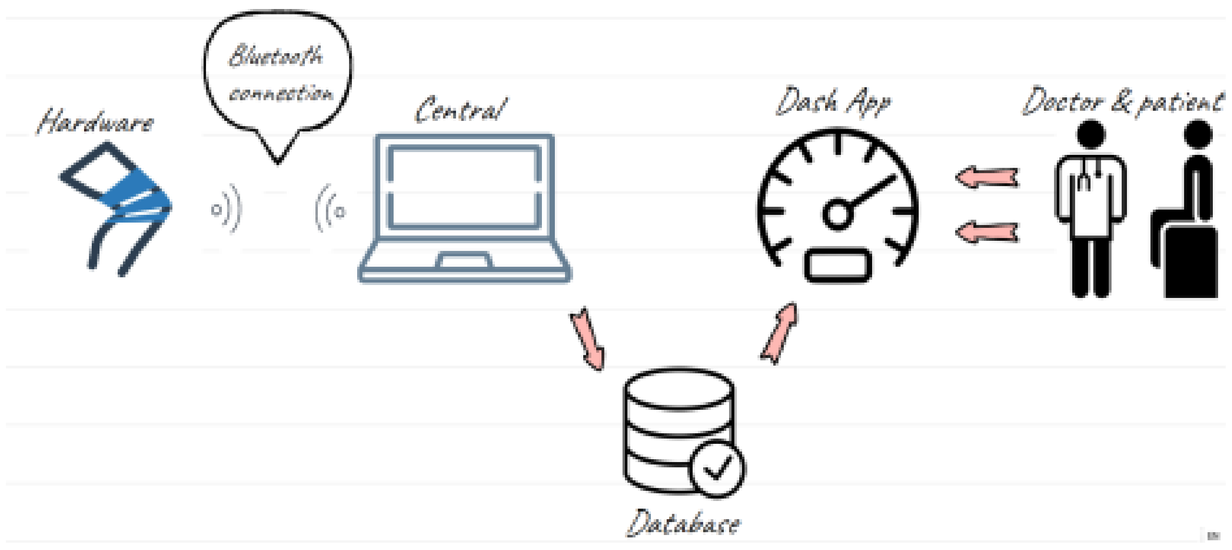


Figure 1. IoT System Architecture

Problems this design is addressing

With only around **100 orthopaedic surgeons** in Kenya, many of whom are unregistered and concentrated in major cities and hospitals, the **demand** for quality orthopaedic care **surpasses** the available **workforce**. To address this issue, **this work** focuses on **designing hardware and intelligent algorithms** that enhance clinicians' ability to monitor orthopaedic patients' well-being and recovery, ultimately **leading to improved treatment** outcomes.

Benefits of this solution

- **Accuracy -** Used sensors and algorithms that complement healthcare providers in making correct readings.
- **Data storage -** Stored the flexion angles in a real-time database instead of manually recording them in a book.
- **Ease -** Empower both the healthcare provider and patients to see their progress on a real-time gauge plot
- **Deployment -** Validating results and reducing invasiveness will allow for easier deployment in a clinical setting.

System Architecture of Wearable IoT combined with AI

In this integrated design, figure 2, in addition to using a knee brace with a flex sensor and BLE connectivity, we also use an Nvidia Jetson Nano and a USB webcam. But still store readings from both systems in InfluxDB, and visualize them on a real-time dash plot.

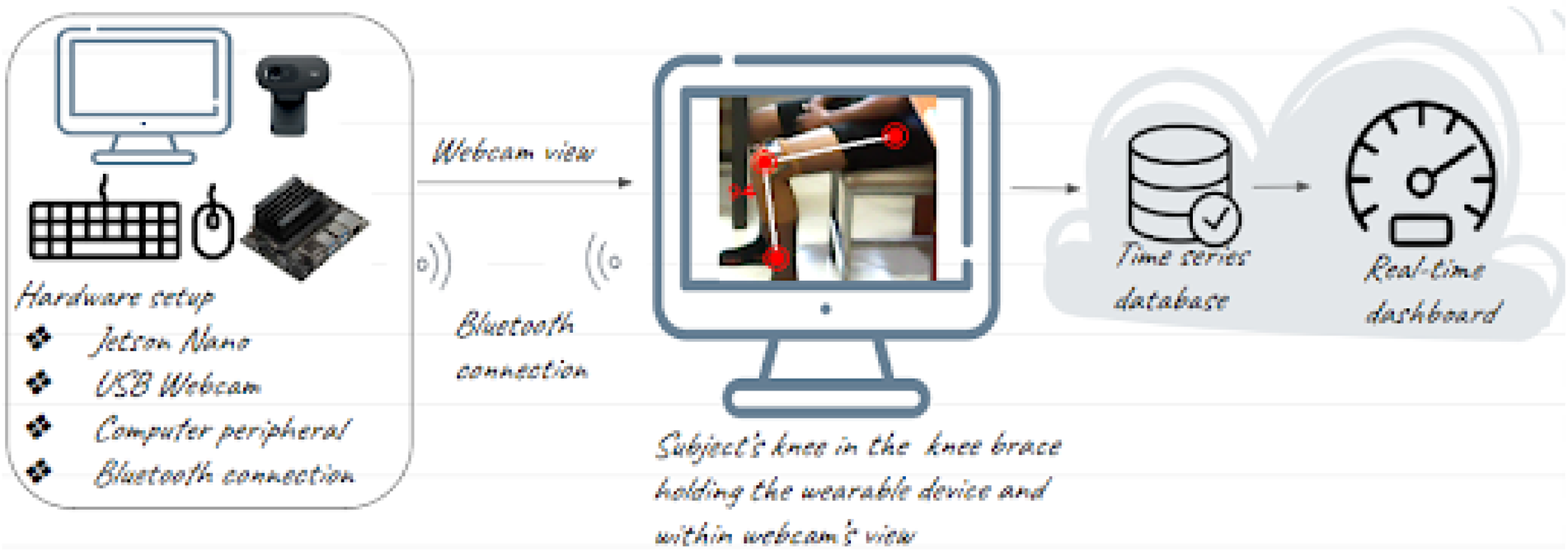
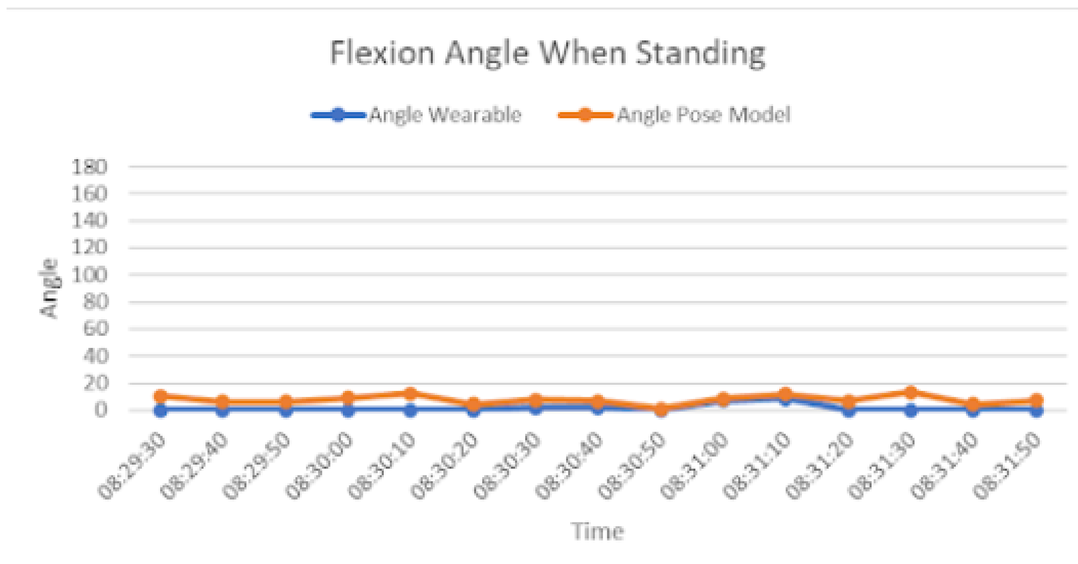


Figure 2. Wearable IoT combined with AI

Results



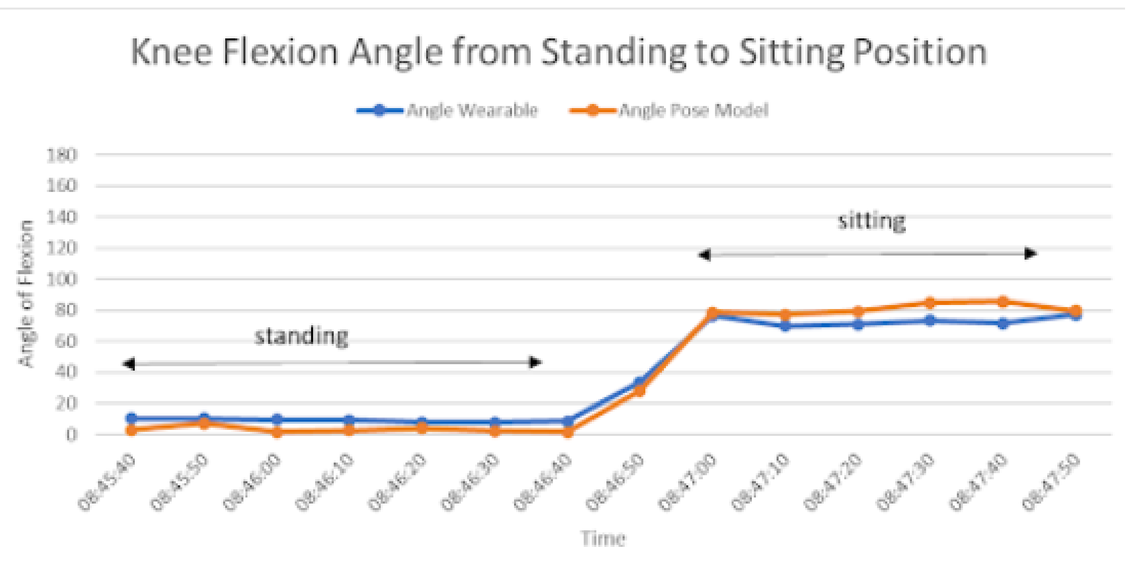


Figure 3. Graphs of the results when the subject is standing and sitting.

We observe a consistency of knee flexion angles estimated by the wearable device and the human pose model, as shown in figure 3. As such, we are enhancing the implementation for actual deployment for the first round of testing in a clinic.