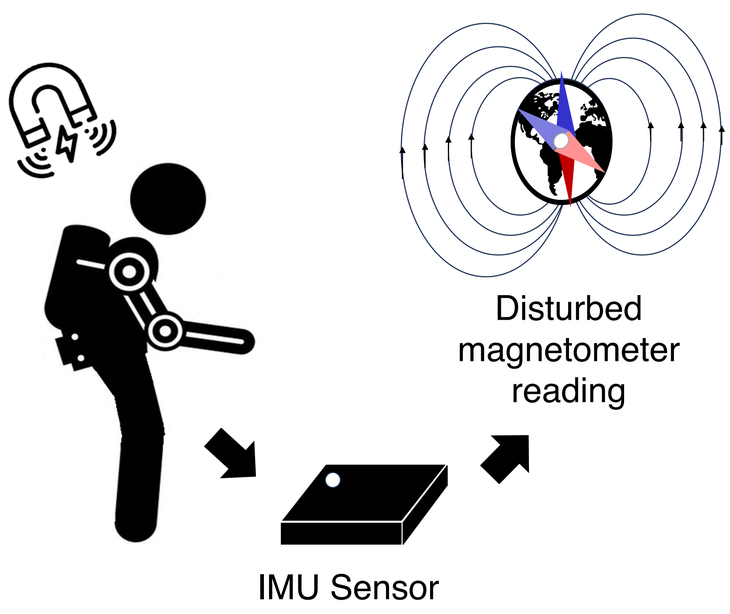
Estimating Thorax and Shoulder Motion Using Magnetic-Free Quaternion-Based Functional Sensor-to-Segment Calibration

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MOTIVATION

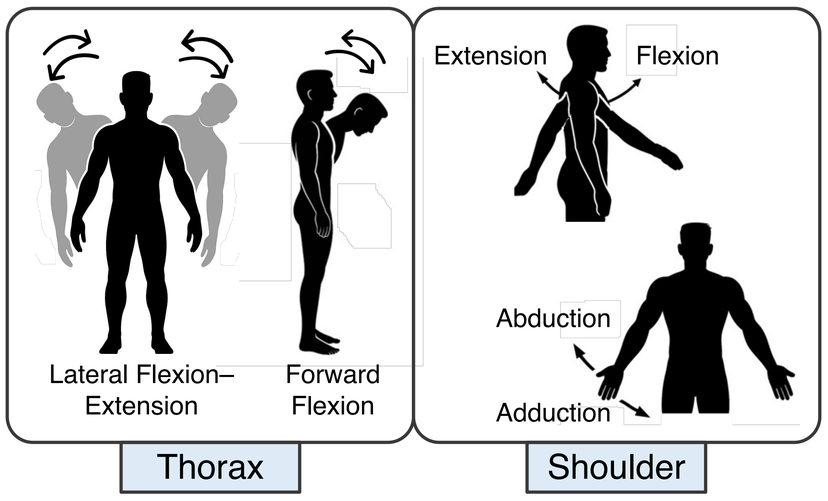


OBJECTIVE

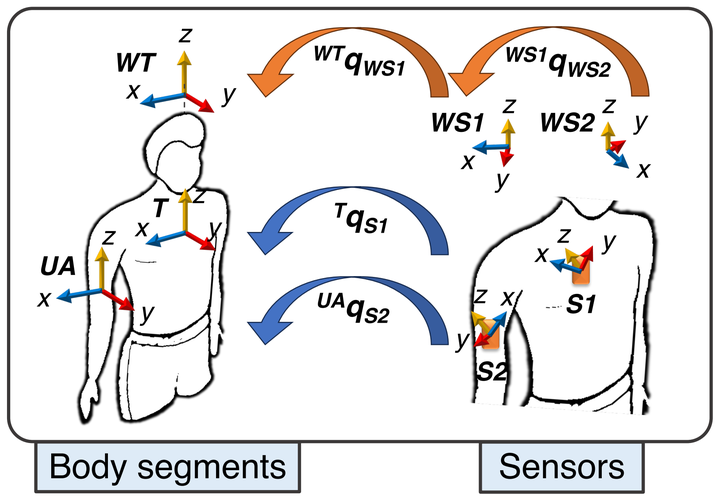
To develop a sensor-to-segment calibration method using magnetic-free inertial sensor orientations recorded while a person does functional movements.

METHODS

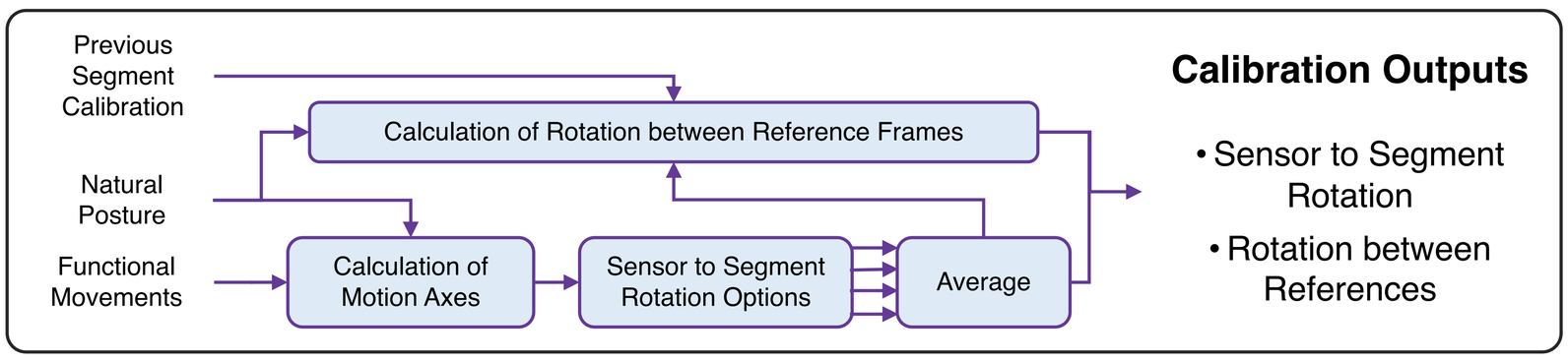
Functional Movements



Coordinate Systems

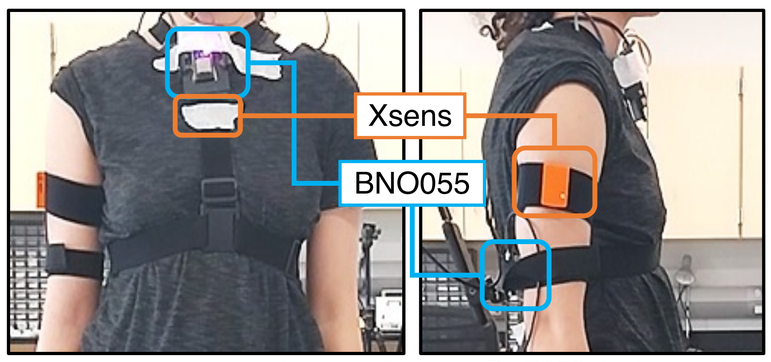


Methodology Diagram



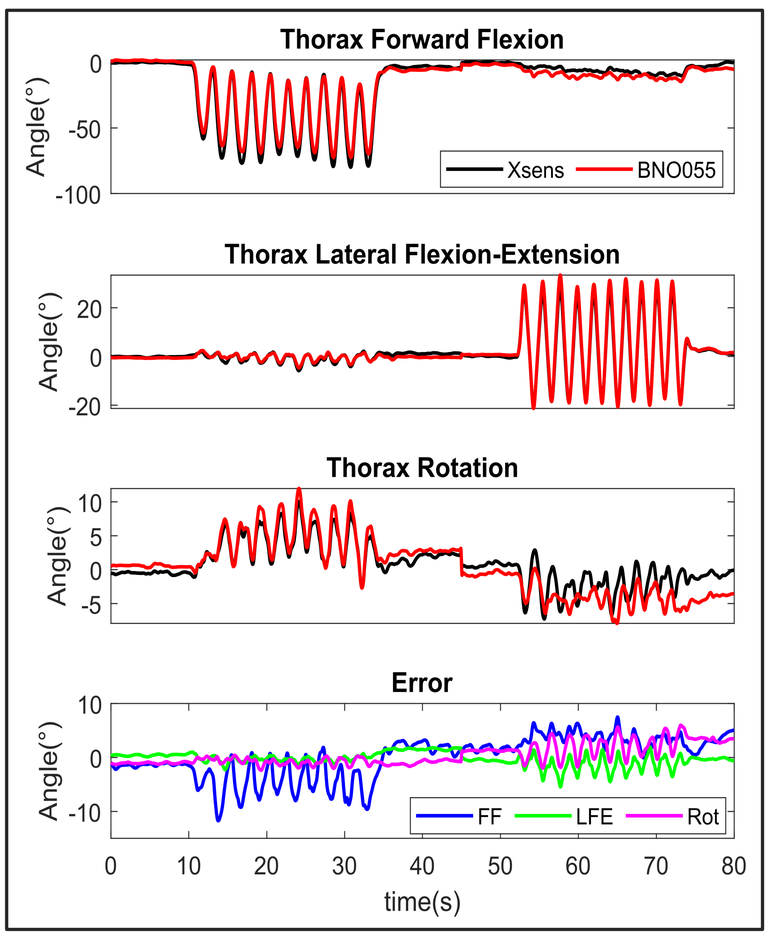
RESULTS

Experimental Setup



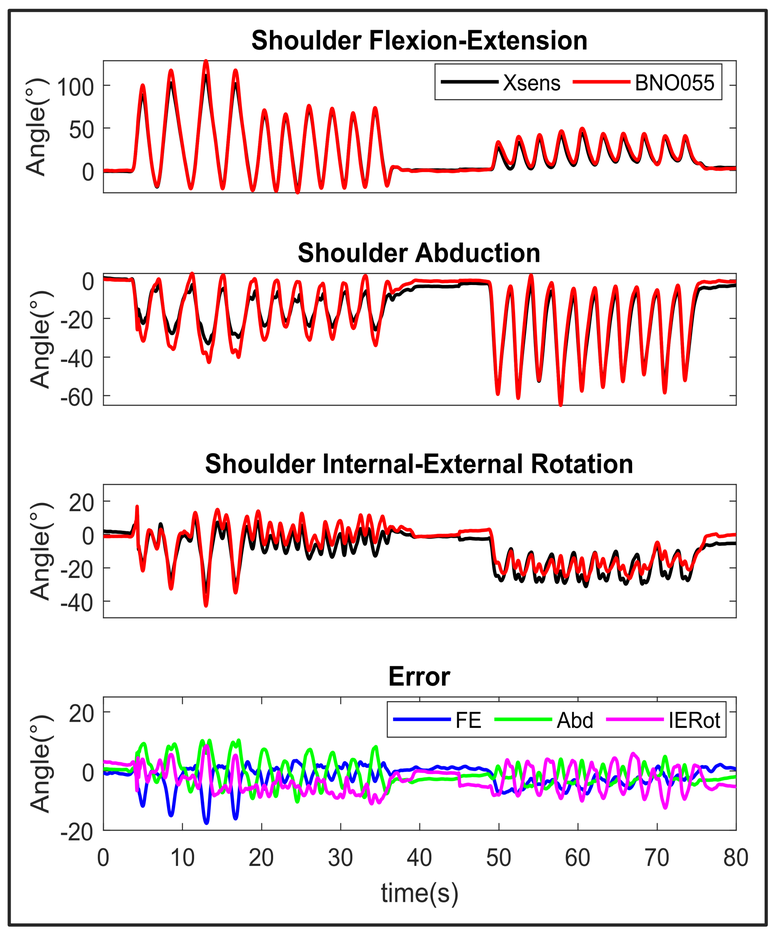
Xsens: commercial system of reference, BNO055: tested inertial system

Thorax Motion



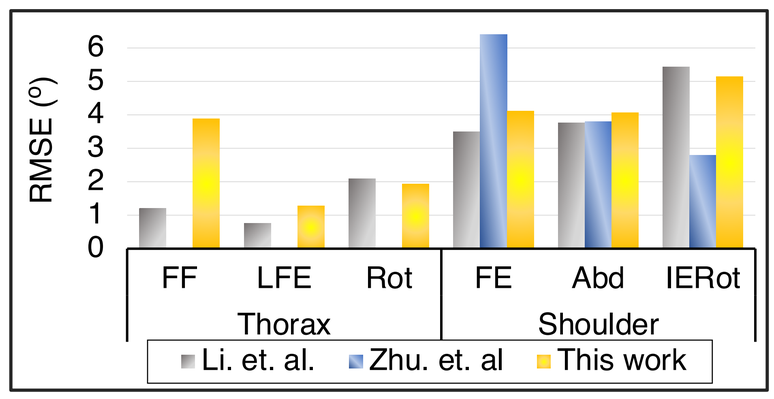
FF: forward flexion, LFE: lateral flexion–extension, Rot: rotation

Shoulder Motion



FE: flexion–extension, Abd: abduction, IERot: internal–external rotation

Comparison with Similar Studies



CONCLUSIONS

- **Two** instead of three **inertial sensors** to measure thorax and shoulder angles are needed.
- Is a robust approach for environments with **magnetic disturbances**.
- **Comparable accuracy** to a high-end Xsens system for shoulder and thorax orientation.
- **Future work**:
  - Add more complex tasks, such as dynamic exercises and activities of daily living.
  - Integrate this system with wearable rehabilitation robots.

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Scan the QR code for an audio summary