Manual Lifting Detection and Risk Assessment

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Project Abstract

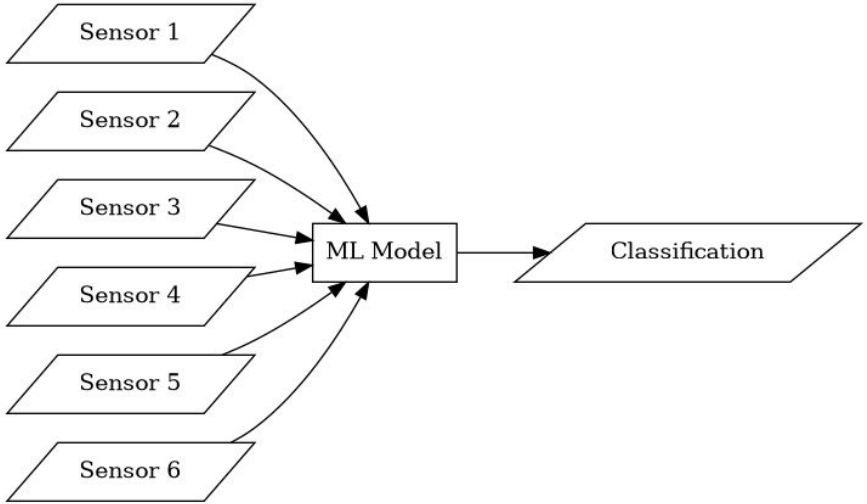
This project is affiliated with UC's MIND Lab, in coordination with the CDC and NIOSH. The project is focused on analyzing data obtained from sensors placed on subjects lifting objects to assess lifting techniques. Some primary focuses are being able to identify a lifting event and classifying lifts based on risk level for future back pain.

Work thus far has focused on filtering noisy data from subjects' sensors. Future work may include work on detecting lifting events, alongside other events such as standing and walking events. The emulation of sensor data from motion capture data is also a potential area of interest.

User Stories

- Manual laborers
  - Want to know when lifts are high risk to avoid future pain
  - Want quick feedback on lifts to be able to make corrections sooner
- Employers
  - Want to identify high risk lifts to have healthier employees
  - Want to identify high risk lifts to reduce number of workers' compensation claims

Design Diagrams



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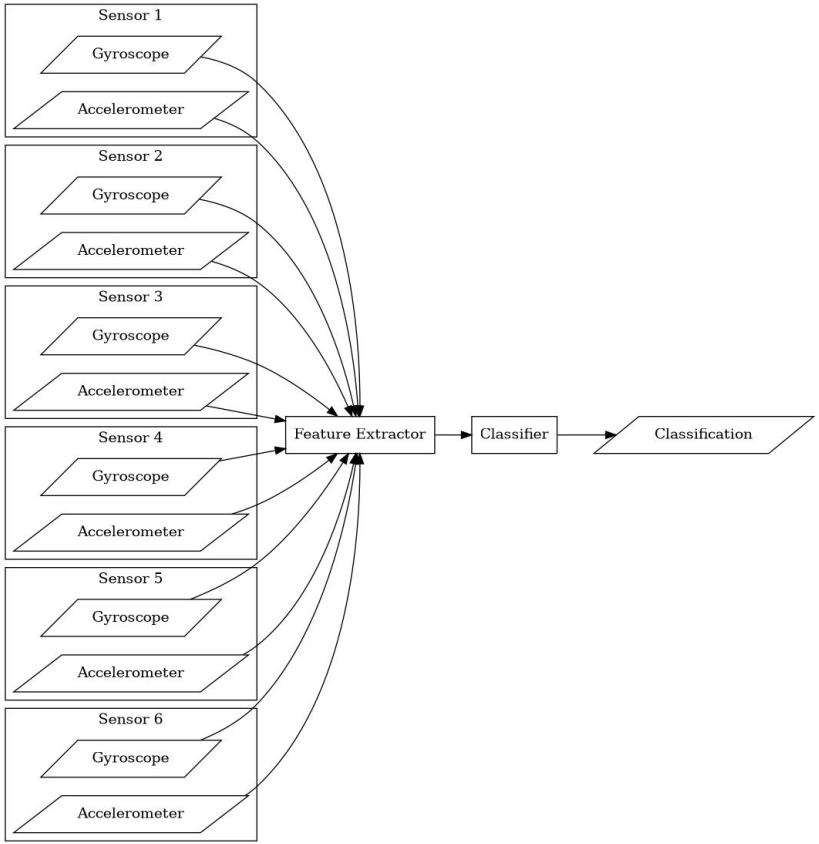

Project Constraints

- Funding
  - Research conducted with NIOSH/NSF grant
  - Requires project members to be hired
- Publishing goals
  - Personal goal of publishing paper in pursuit of a master's degree
  - Contributed work needs to be significant enough to warrant publication
- Established codebase
  - Project has been in progress since before I was onboarded
  - Requires understanding of already written code
- Social goals
  - Work-induced back pain is major problem
  - Research needs to be focused on realistic lifting scenarios

Progress Review

- Have reviewed papers written by previous student researchers
- Familiarized with sensors used by project
- Kalman filter library has been incorporated
  - Fuses data from accelerometer and gyroscope to obtain sensor orientation
  - Designed to handle gyroscope drift
  - Seemed to improve accuracy slightly based on preliminary results from phase 1 and phase 2 data
- Currently preparing to evaluate with phase 3 data
  - Much noisier data
  - Main reason for implementing Kalman filter

Expected End-of-Term Accomplishments

- Improved classification of lifts from filtering
- Improved self-understanding of project and codebase

Expected Demo

- Future research goals
  - Identifying other movements
    - Standing
    - Walking
  - Emulating sensor data using mocap data