The Sensitive Backpack

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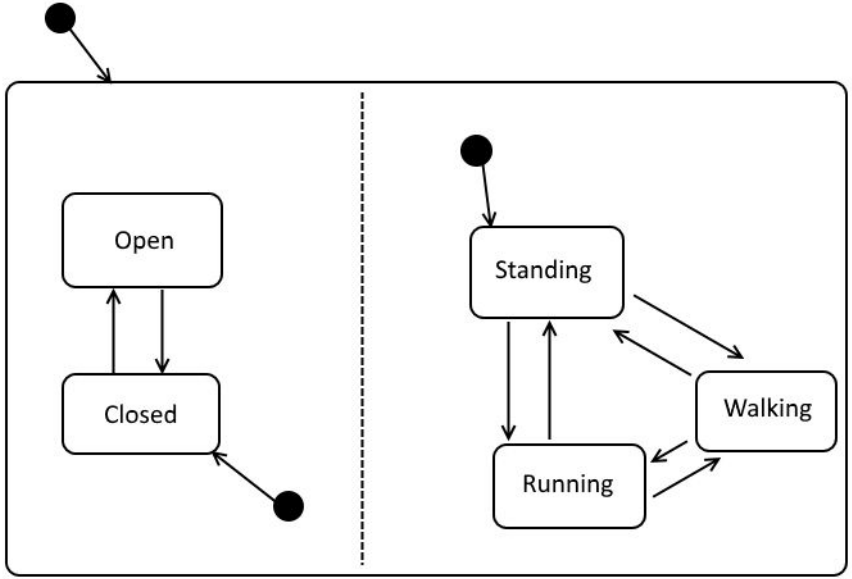
Motivation

react on

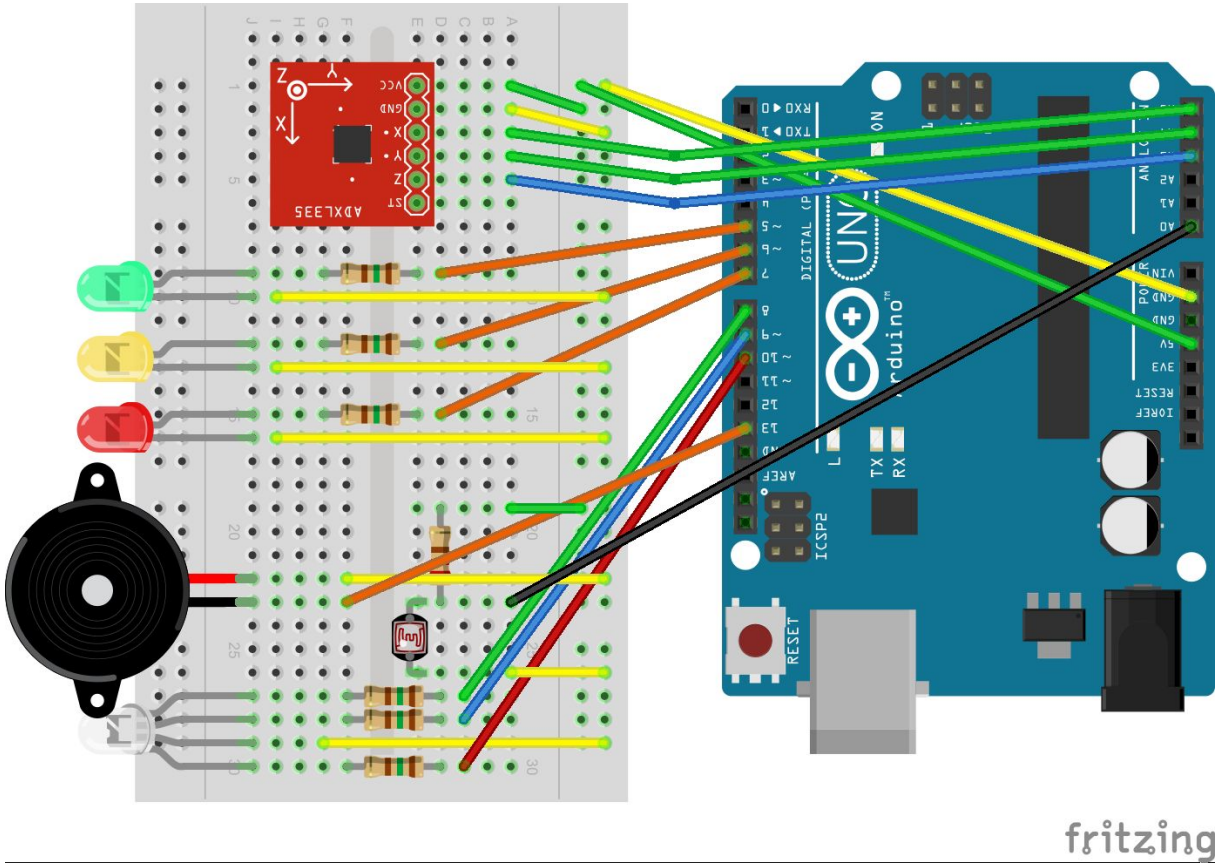
Context

Contexts

- Arduino-based sensor system
  - Detect context
    - Activities: running, walking, standing
      - Accelerometer
    - Backpack open / closed
      - Light sensor
  - What could not be detected?
    - Indoor / Outdoor



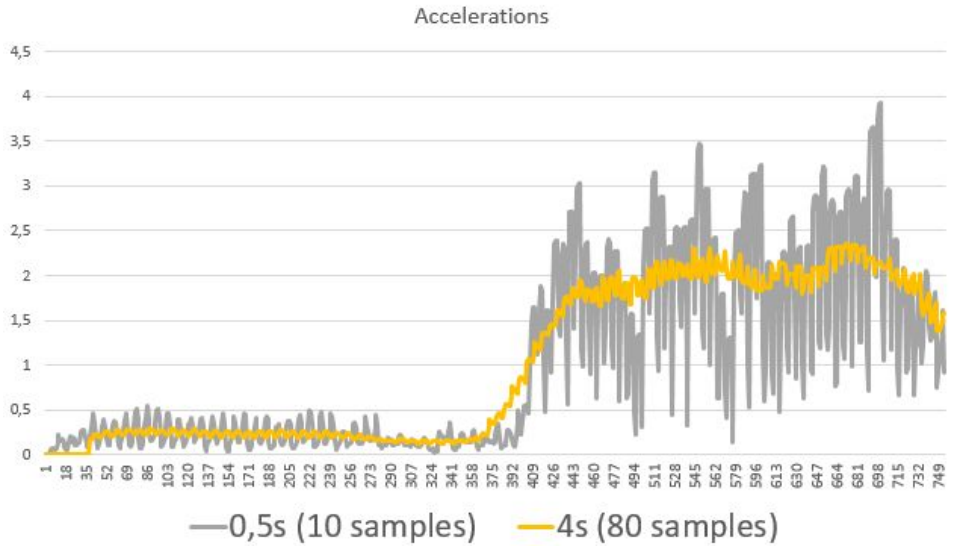
Wiring



Activity detection algorithm I

- 1 sample = Absolute acceleration vector in g
- Sample Frequency: 20 Hz
- First approach:
  - Sum (smoothed) accelerations
  - Pro: Easy to compute
  - Con:
    - Not very robust
    - Takes 4sec to detect activity
  - Still time left to find better method!

$$a = \sqrt{x^2 + y^2 + z^2} - g$$



Activity detection algorithm II

- Better approach: Detect steps and step frequency
  - More complex (lots of preprocessing)
  - Low Memory/CPU Usage:
    - Solved with 3 Int-Ringbuffers
- Activities:
  - Standing: No step for 1.25s
  - Walking: < 2 Steps/sec
  - Running >= 2 Steps/sec

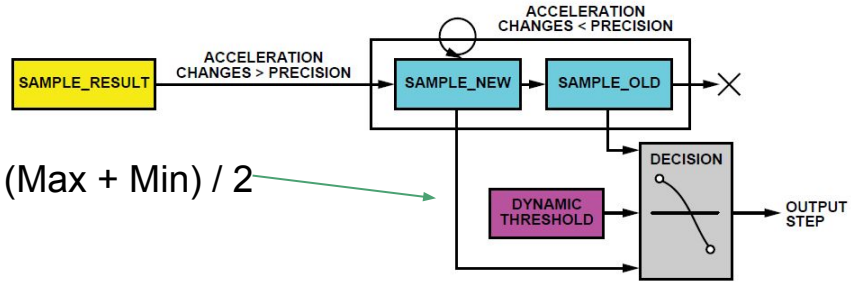


Figure 6. Dynamic threshold and dynamic precision.