

The Sensitive Backpack

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Motivation



react on

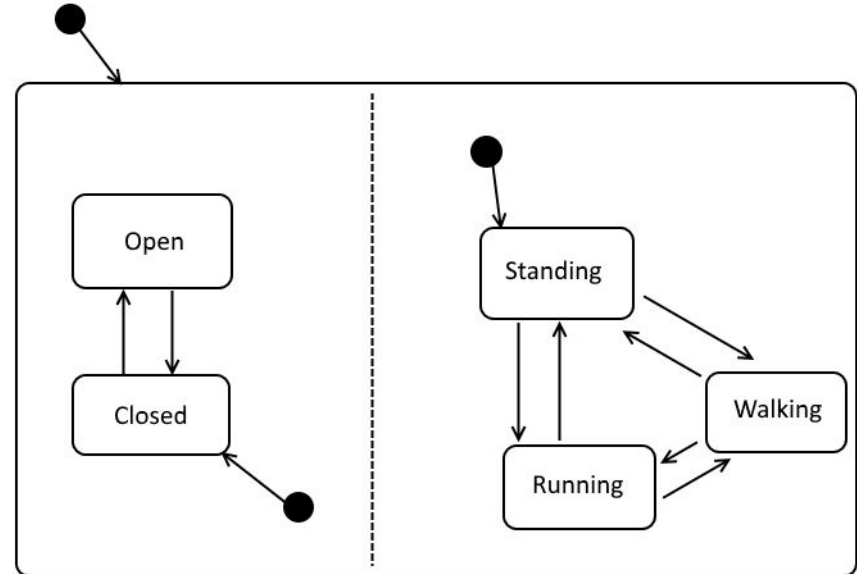


Context

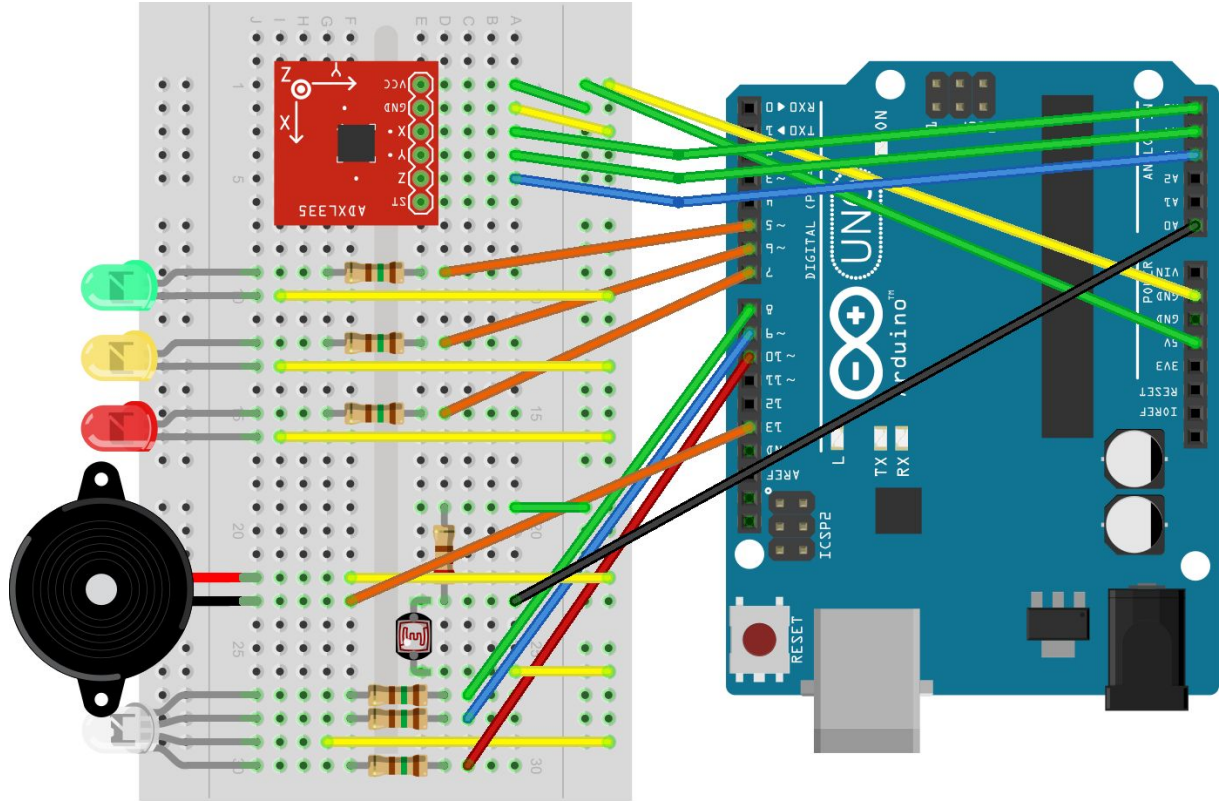


Requirements

- Arduino-based sensor system
 - Detect context
 - Activities: running, walking, standing
 - Accelerometer
 - Backpack open / closed
 - Light sensor



Wiring

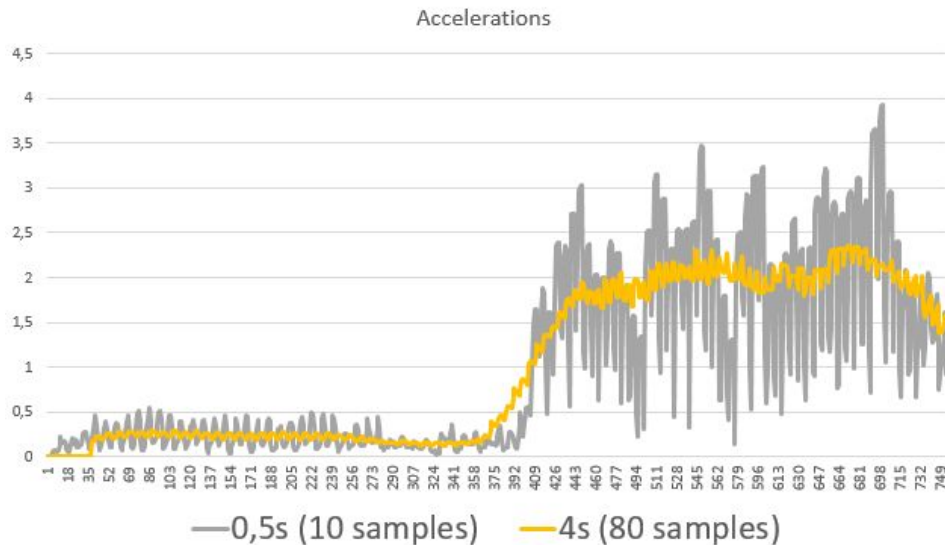


fritzing

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

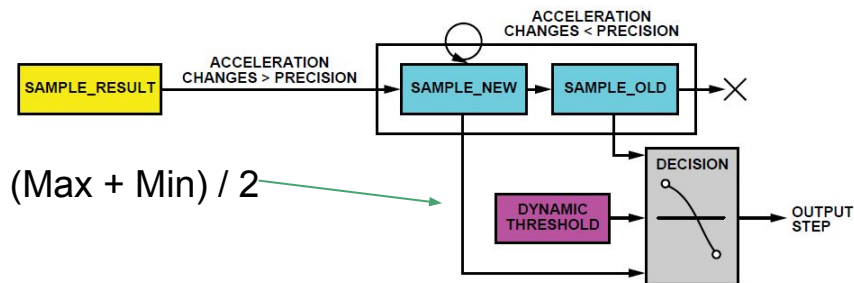


Figure 6. Dynamic threshold and dynamic precision.

