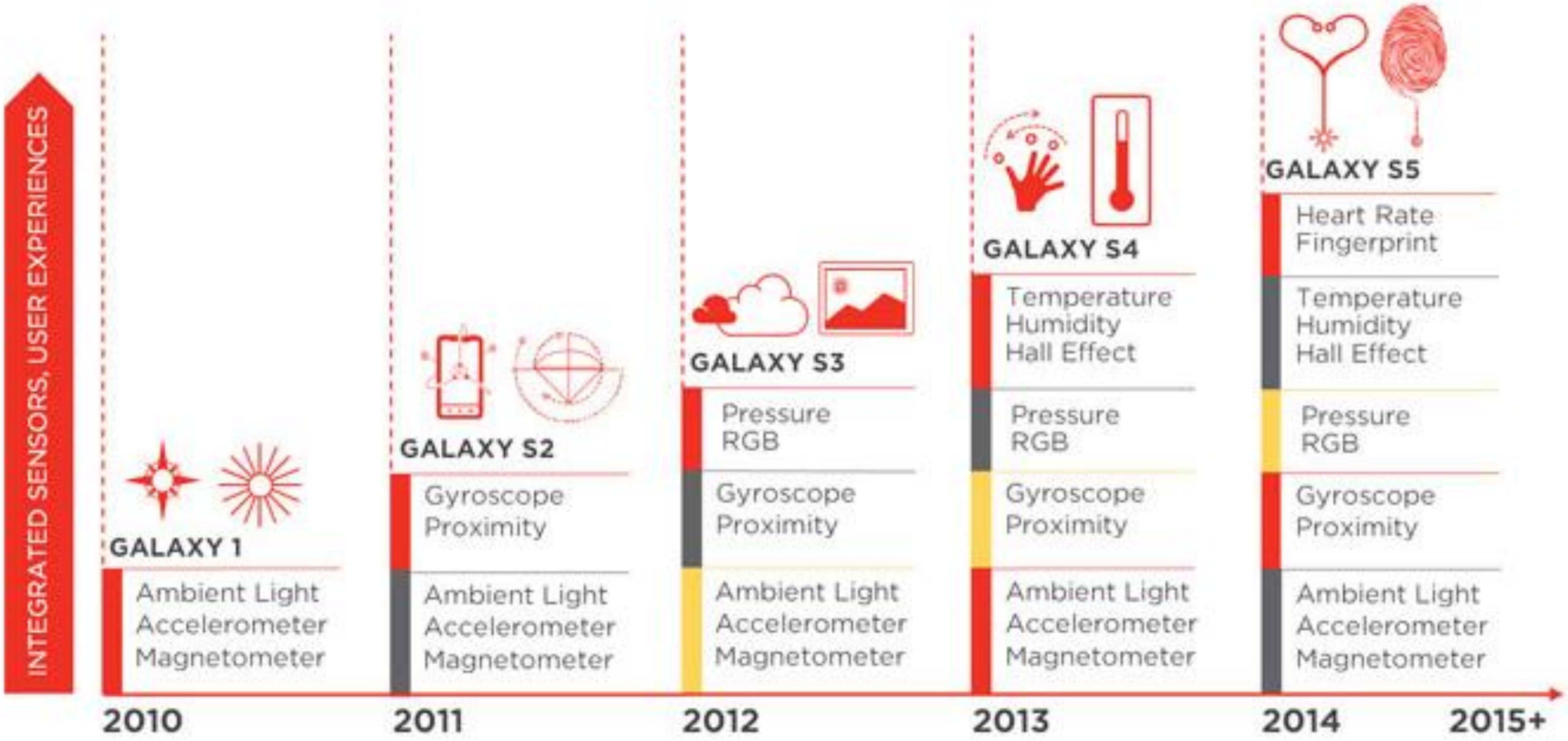
SWAN – SENSING FRAMEWORK FOR ANDROID

VU University Amsterdam

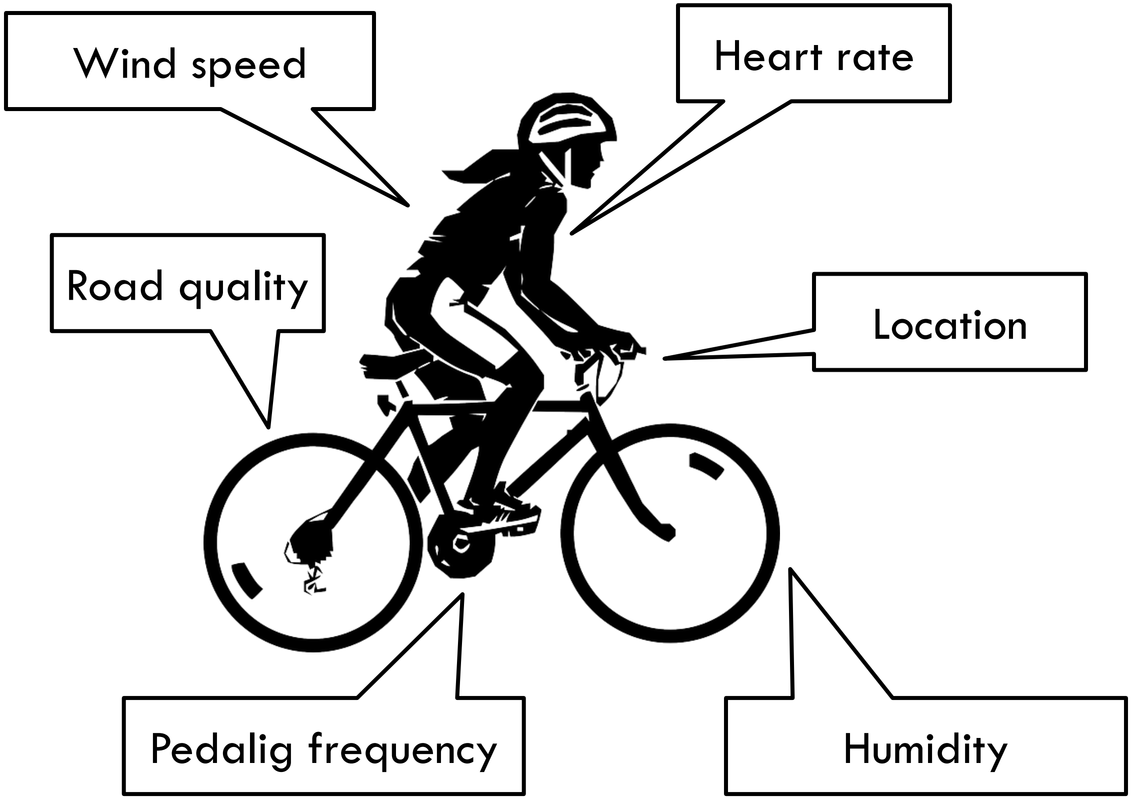
Sensor growth in smartphones



Sensor-based apps

- Some examples
  - AirTouch – use your breath to interact with the phone (humidity sensor)
  - Runtastic – counts your steps (accelerometer)
  - Thermometer – check the temperature (temperature sensor)
  - Fingerprint Lock Screen – unlock screen with your fingerprint (fingerprint sensor)
  - Dimmer – auto-adjust screen brightness (light sensor)
- Less than **0.5%** of all apps use sensors
  - Poor abstractions for sensor access
  - Poor programming support

A different kind of app



Wind speed

Heart rate

Road quality

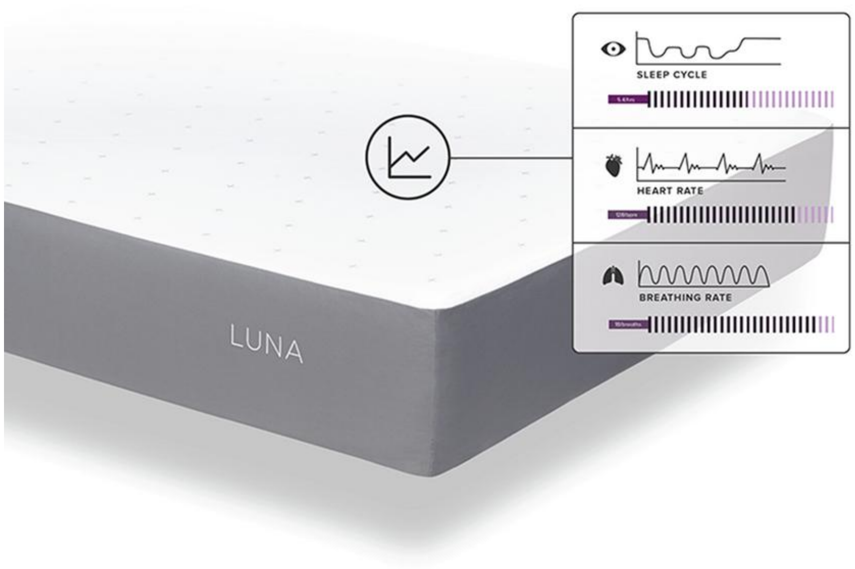
Location

Pedalig frequency

Humidity

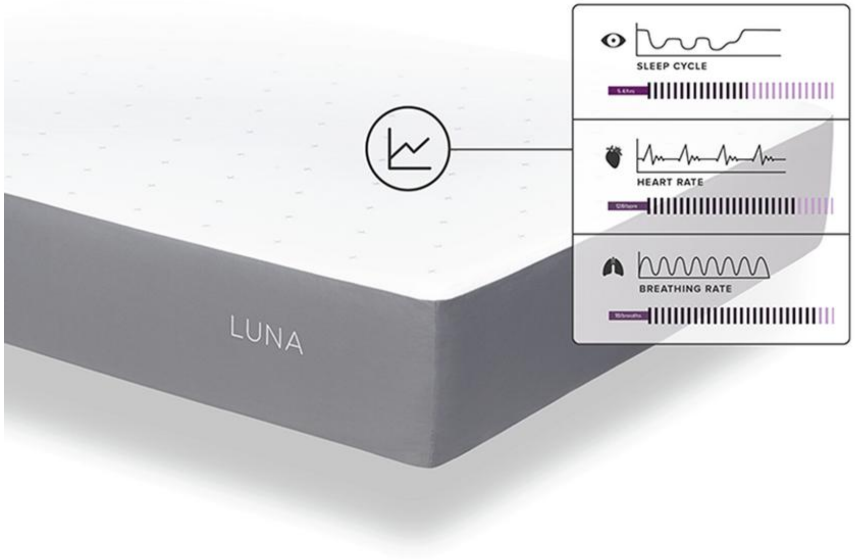
“Due to strong wind, high fatigue level and poor road quality on chosen route, it’s recommended to take alternative route through Amsterdamse Bos.”

The smart mattress



- Smart mattress that adjust light, music volume and room temperature based on:
  - Sleep cycle
  - Heart rate
  - breathing

The smart mattress



- Smart mattress that adjust light, music volume and room temperature based on:
  - Sleep cycle
  - Heart rate
  - breathing

- Price: **$200**
- The same can be achieved with a **smartphone** placed on a regular mattress

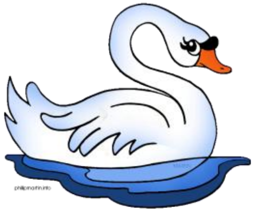
Combining information from many sensors

- Why it’s difficult:
  - Fragmentation in how sensor are accessed
  - Difficult to program hundreds of context rules

- Solution = SWAN
  - Middleware between apps and sensors
  - SWAN-Song – easy to define context expressions
  - Sensor readings are shared among apps
  - It supports by default 20+ sensors
  - Integrates with 3rd party sensors

SWAN-Song

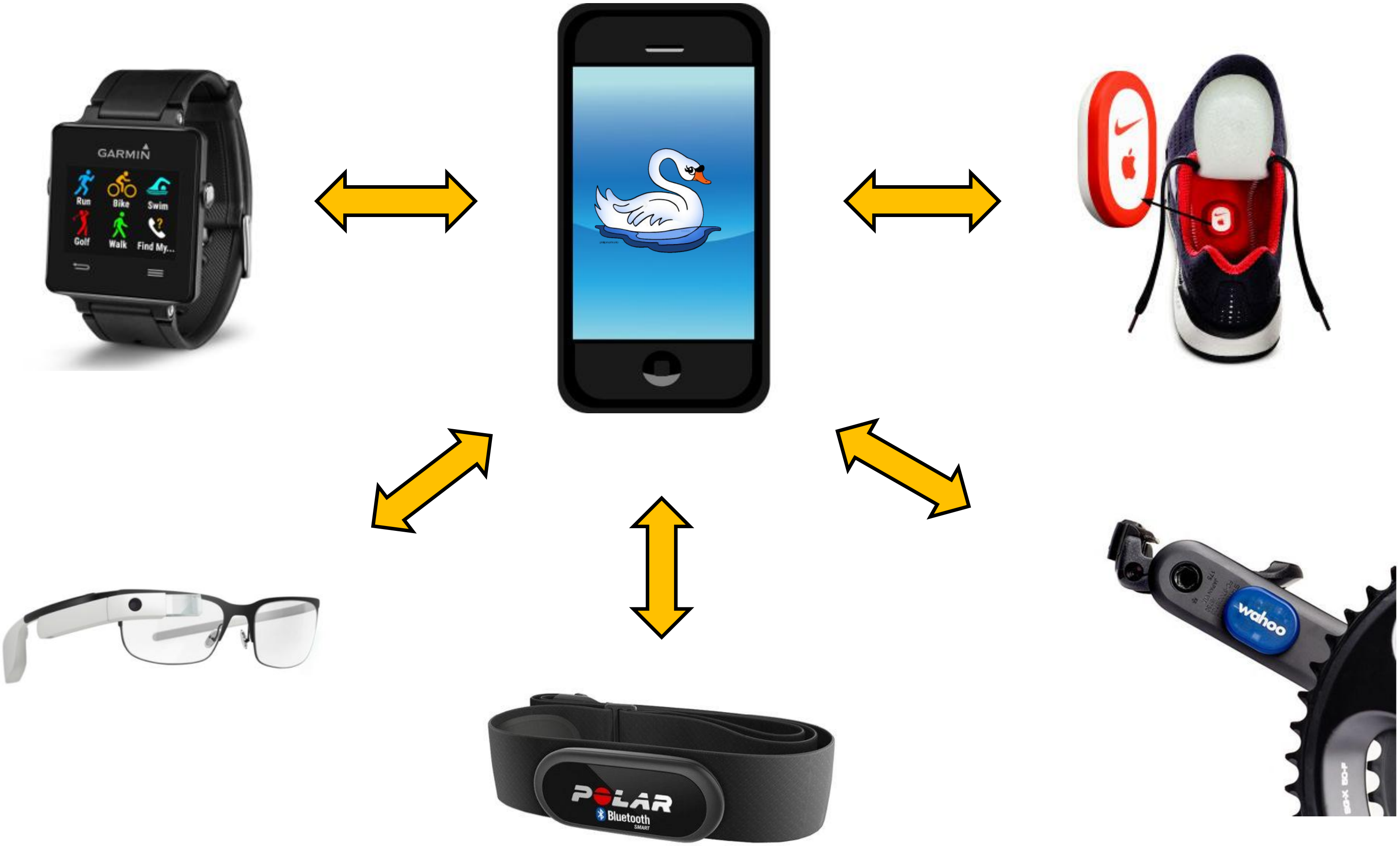
"Let me know if the battery drops more than 25% within 1h with the screen turned off."



```
screen:on {ALL, 1h} == false && (battery:level {MAX, 1h} -
battery:level {MIN, 1h}) > 25
```

```
IntentFilter ifilter = new IntentFilter(Intent.ACTION_BATTERY_CHANGED);
Intent batteryStatus = context.registerReceiver(null, ifilter);
… (10 more lines of code)
```

Distributed sensing



Cloud-ready

- Sensor readings periodically saved in SenseOS cloud
- Intelligent data offloading
  - Layered approach => better performance
  - Adapts to battery level => energy efficient
  - Batching mechanism
  - Customizable
- Works over 3G, 4G, Wifi
- Easily adaptable to other cloud providers