Accelerometer Measurements in Cardiology

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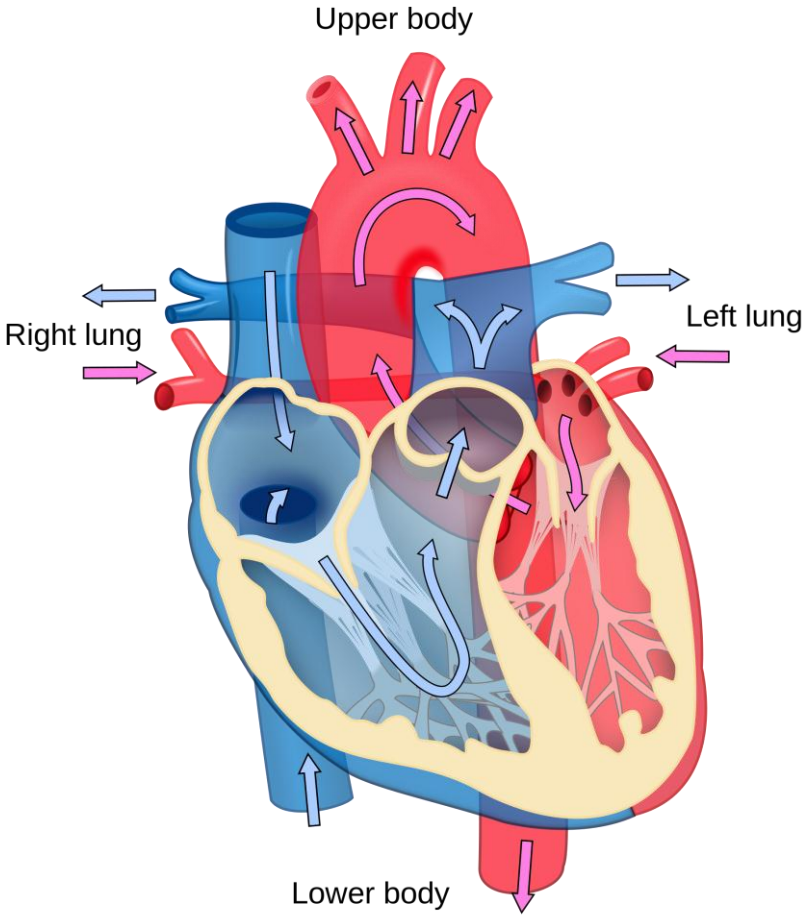
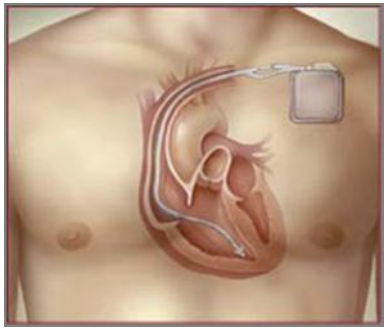
Application Areas

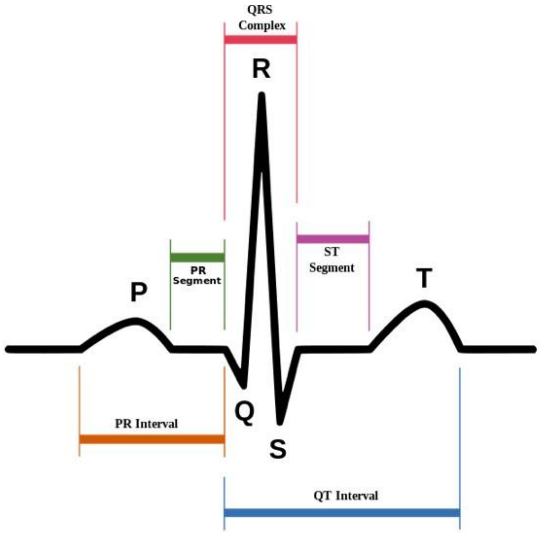
- Implanted Medical Devices
  - Cardiac Rhythm Management
    - improves quality of life
    - improves life expectation
- Condition Monitoring
  - Ballistocardiology
    - improves 24/7 or overnight stress / recovery / physical condition monitoring
    - enhances early detection of cardiac dysfunction
- Preventive Medicine
  - Activity Monitoring
    - makes active life more interesting
    - helps avoiding e.g. metabolic syndrome



Cardiac Rhythm Management

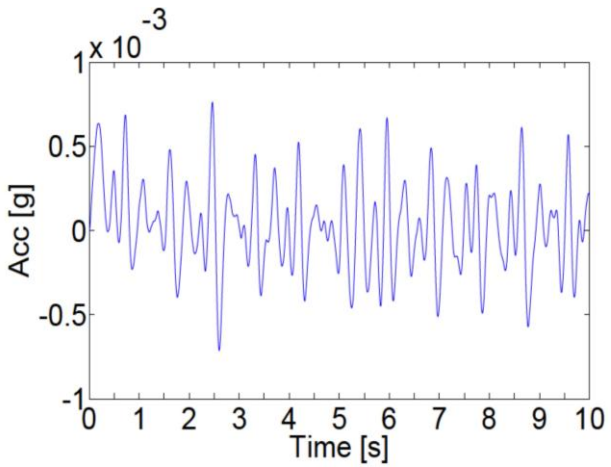
- Implanted Cardiac Pacemakers
  - device with leads going into the heart
  - miniaturized device completely inside the heart
- Demand based heart rate
  - accelerometer measures activity (and posture)
- Heart response monitoring
  - accelerometer measures the motion of the heart in response to electrical trigger pulse
- Main accelerometer requirements:
  - ultra low current consumption (nA)
  - high reliability

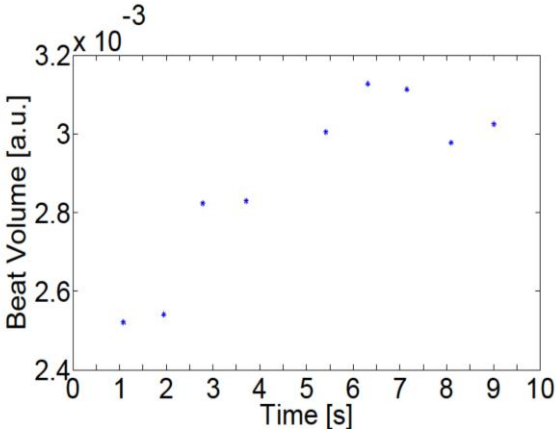


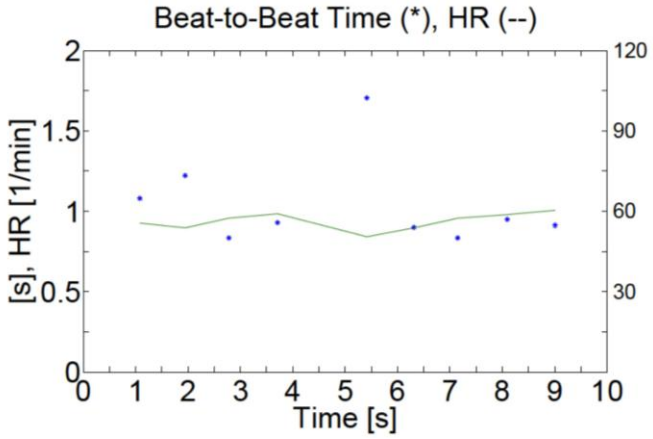


Ballistocardiology

- Accelerometer measures heart motion
  - attached to the chest
  - 3d measurement
- Accelerometer measures recoil caused by blood flow
  - main flow in longitudinal direction
  - filtering gives e.g. beat volume, beat-to-beat time, heart rate, heart rate variability
- Main accelerometer requirements:
  - very high resolution (µg)
  - controlled frequency response



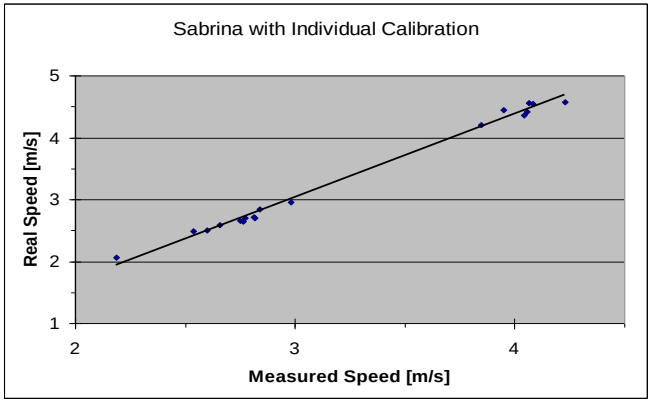




Activity Monitoring

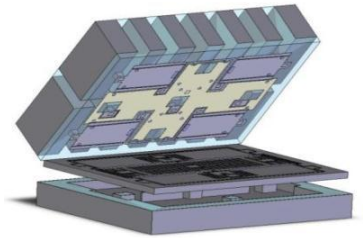
- Accelerometer measures (24/7) type and level of activity, e.g. Polar FA20

- Accelerometer measures runners & walkers speed and distance, e.g. Sigma RC1411



- Other activity or context related measurements
- Main accelerometer requirements:
  - very low current consumption (µA)
  - small size
  - low cost



Questions?