

# Physical Activity detection and Body Posture Recognition

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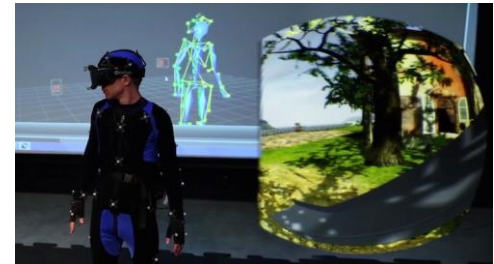
# Body Motion Capture

## Motion Capture/Tracking:

- the process of recording or reconstructing the movement of body parts.

## Applications:

- Filmmaking
- Computer Gaming
- Sport
- Virtual Reality
- Rehabilitation
- ...



# Motion Capture Technologies

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## Mechanical motion capture systems

- ❑ linked structures
- ❑ track the degree of rotation for each link
- ❑ no data noise
- ❑ restricted movement
- ❑ fixed configuration of sensors
- ❑ expensive

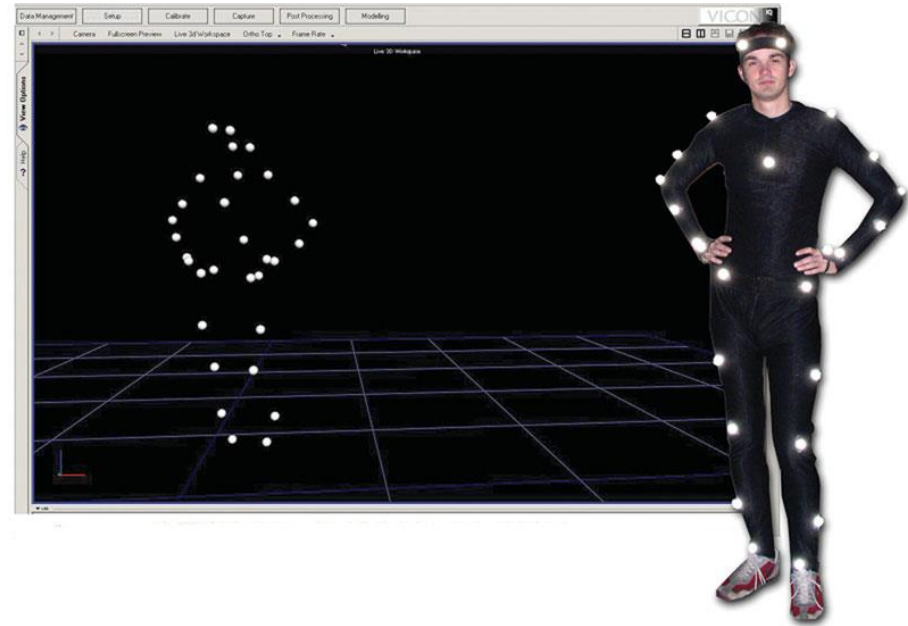
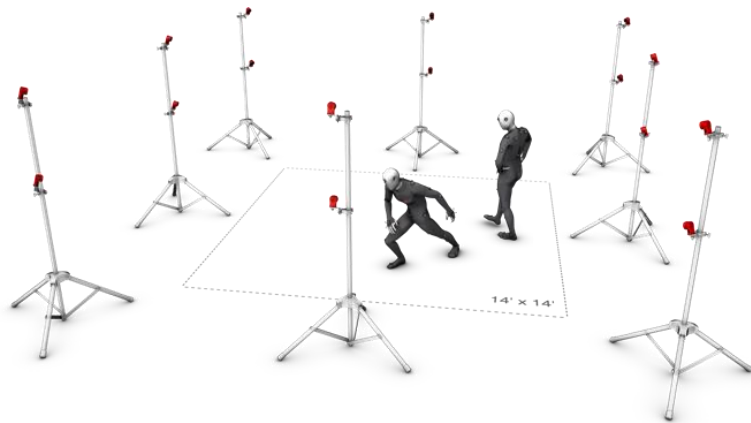


Gypsy 7™ Motion Capture System

# Motion Capture Technologies

## Optical motion capture systems

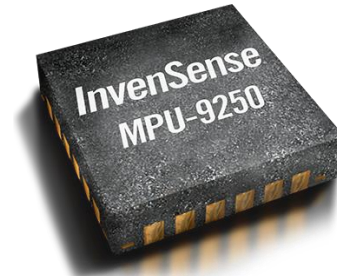
- ❑ light weight reflective markers
- ❑ high resolution cameras
- ❑ marker occlusion
- ❑ limited application environment



# Motion Capture Technologies

## Inertial motion capture systems

- ❑ Inertial Measurement Unit (IMU)
  - ❑ Accelerometer ( $\pm 2g$ ,  $\pm 4g$ ,  $\pm 8g$ ,  $\pm 16g$ )
  - ❑ Gyroscope ( $\pm 250$ ,  $\pm 500$ ,  $\pm 1000$ )
  - ❑ Magnetometer ( $\pm 4800\mu T$ )
- ❑ Small size
- ❑ High accuracy
- ❑ Cheap ( $\sim 5$  USD)
- ❑ Easy to use
- ❑ Not limited to the lab or studio



3x3x1mm

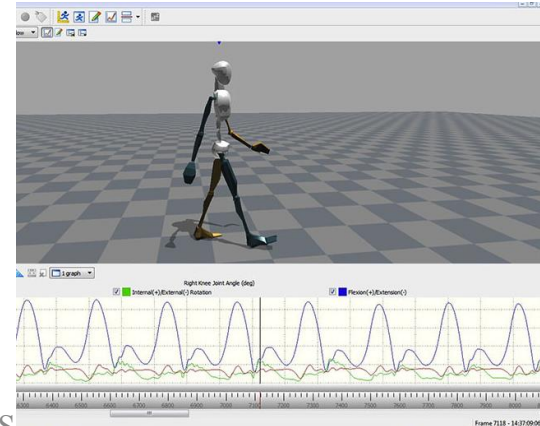
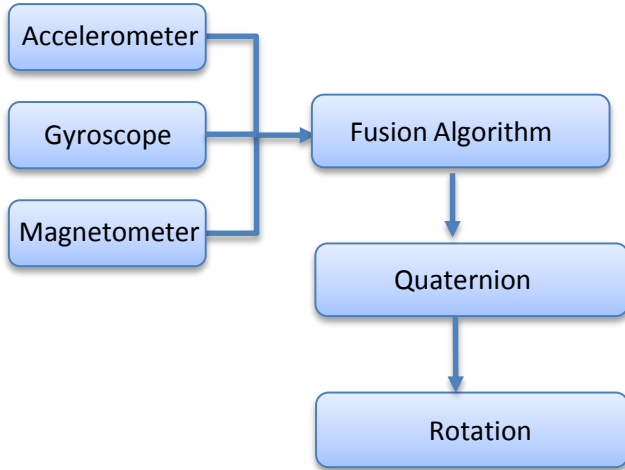


Shimmer3 IMU Unit

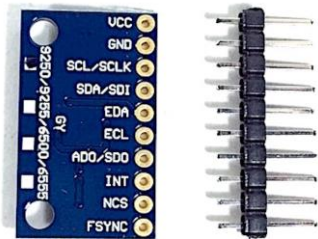


# IMU-based Motion Tracking

**Accelerometer:** gravity direction  
**Gyroscope:** angular velocity  
**Magnetometer:** magnetic field



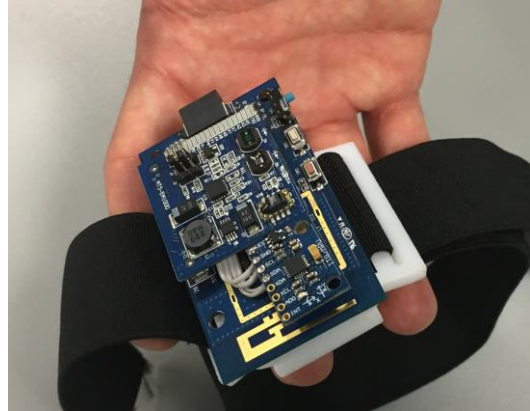
# What We Have Done @ Otago



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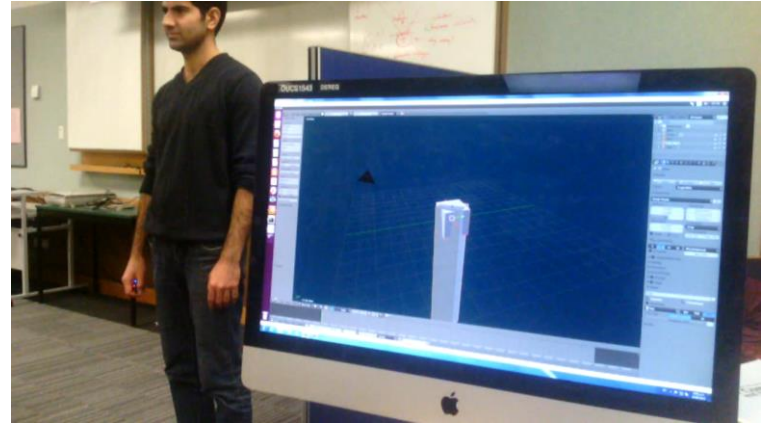
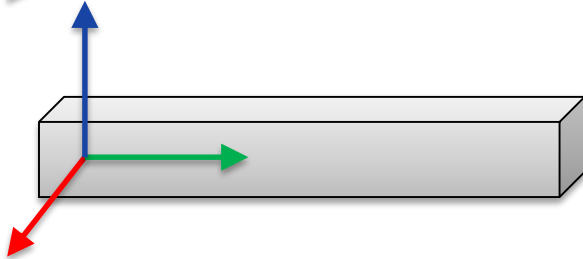
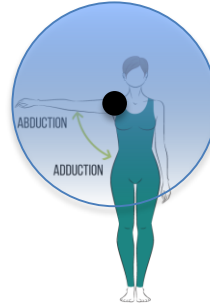
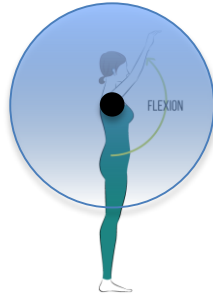
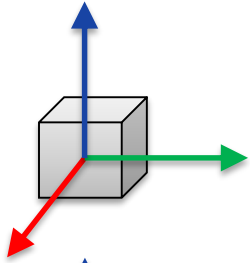
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# Body Posture Capture

## Our projects:

- Body posture capture

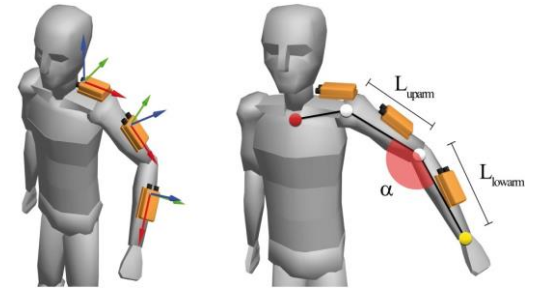
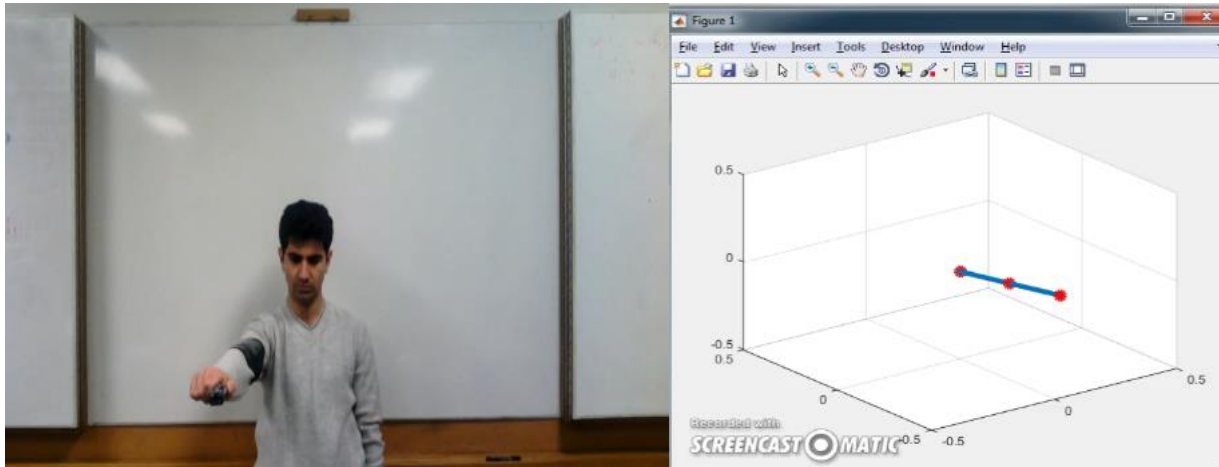




# Body Posture Capture

## Our projects:

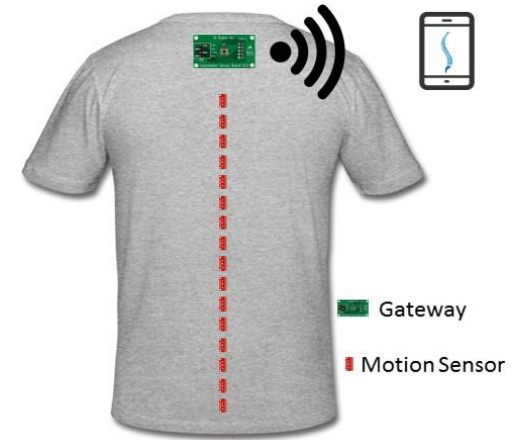
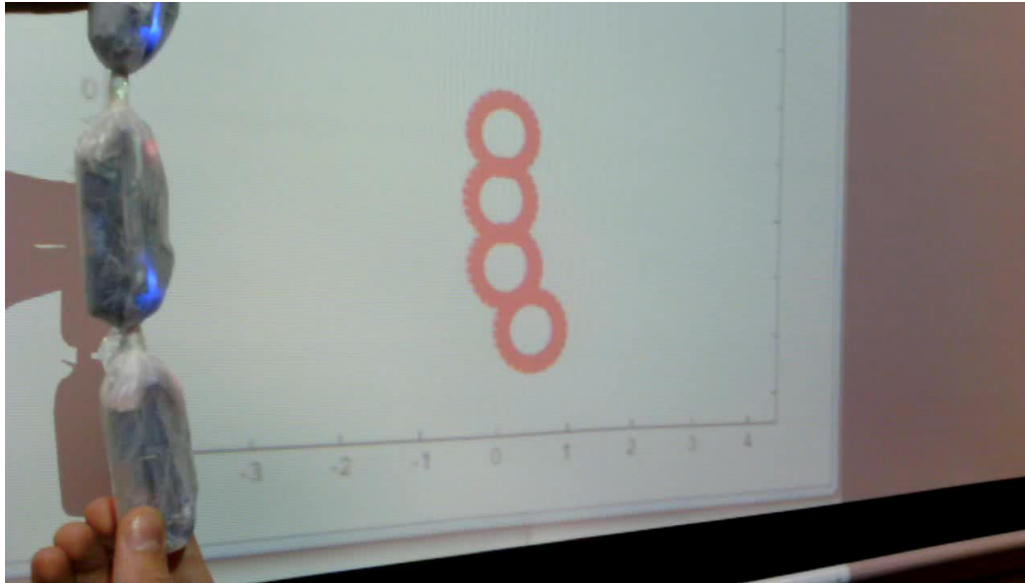
- Body posture capture



# Activity Recognition and Posture Detection

## Our projects:

- Spinal posture monitoring and improper curve recognition



Smart shirt for spinal posture monitoring and bad posture detection