SpeckNet

Research Consortium in Speckled Computing

Step Tracking in MotionViewer

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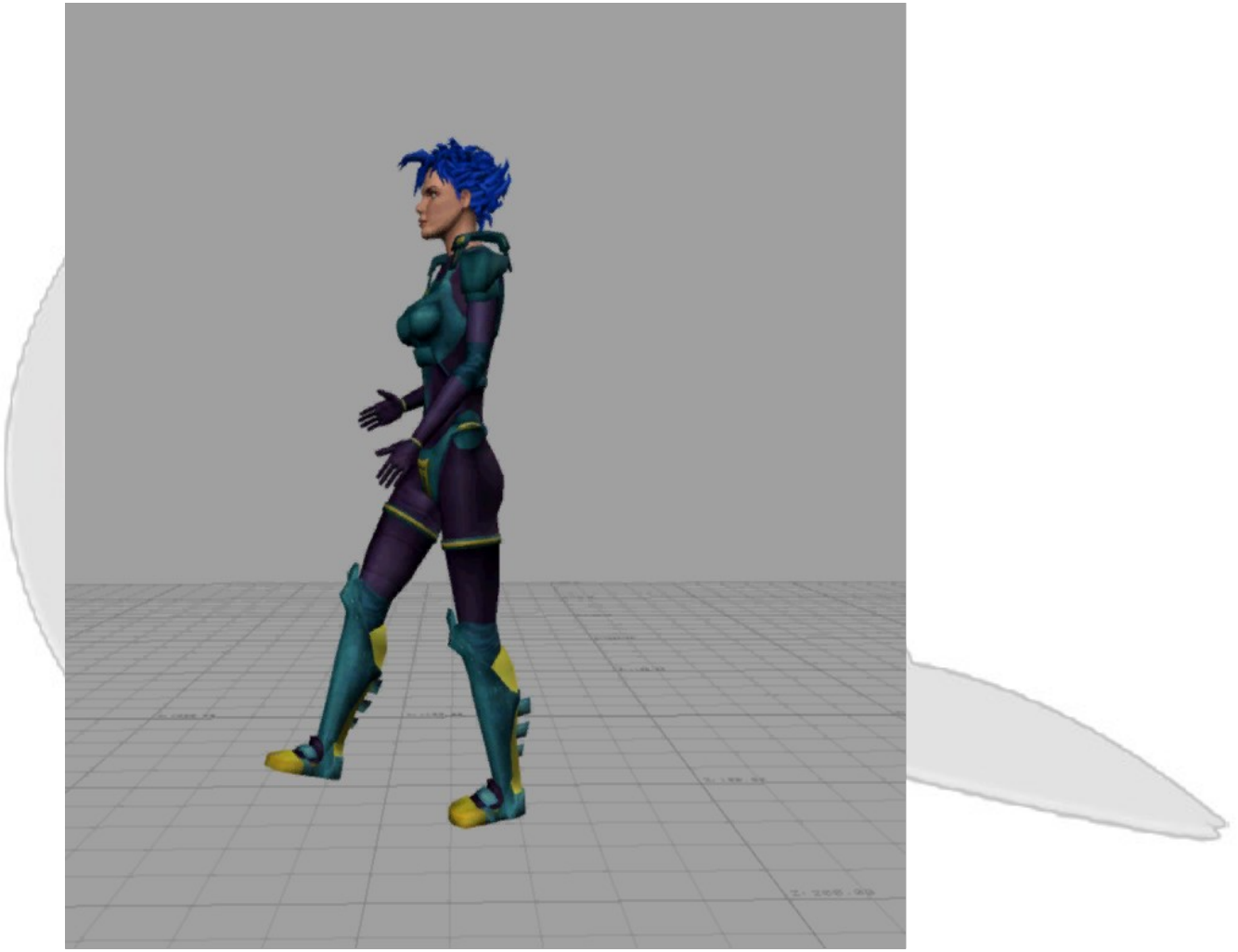
Overview – Motion Capture in Animation

- Motion capture useful tool in animation
  - Saves time and work
  - Highly accurate motion, useful to work from
  - Used for film, adverts, video games and more
- Animators want accurate data regarding the person's *posture* and *position*
- Current systems are accurate, but expensive and require extensive post-processing work

Overview - MotionViewer

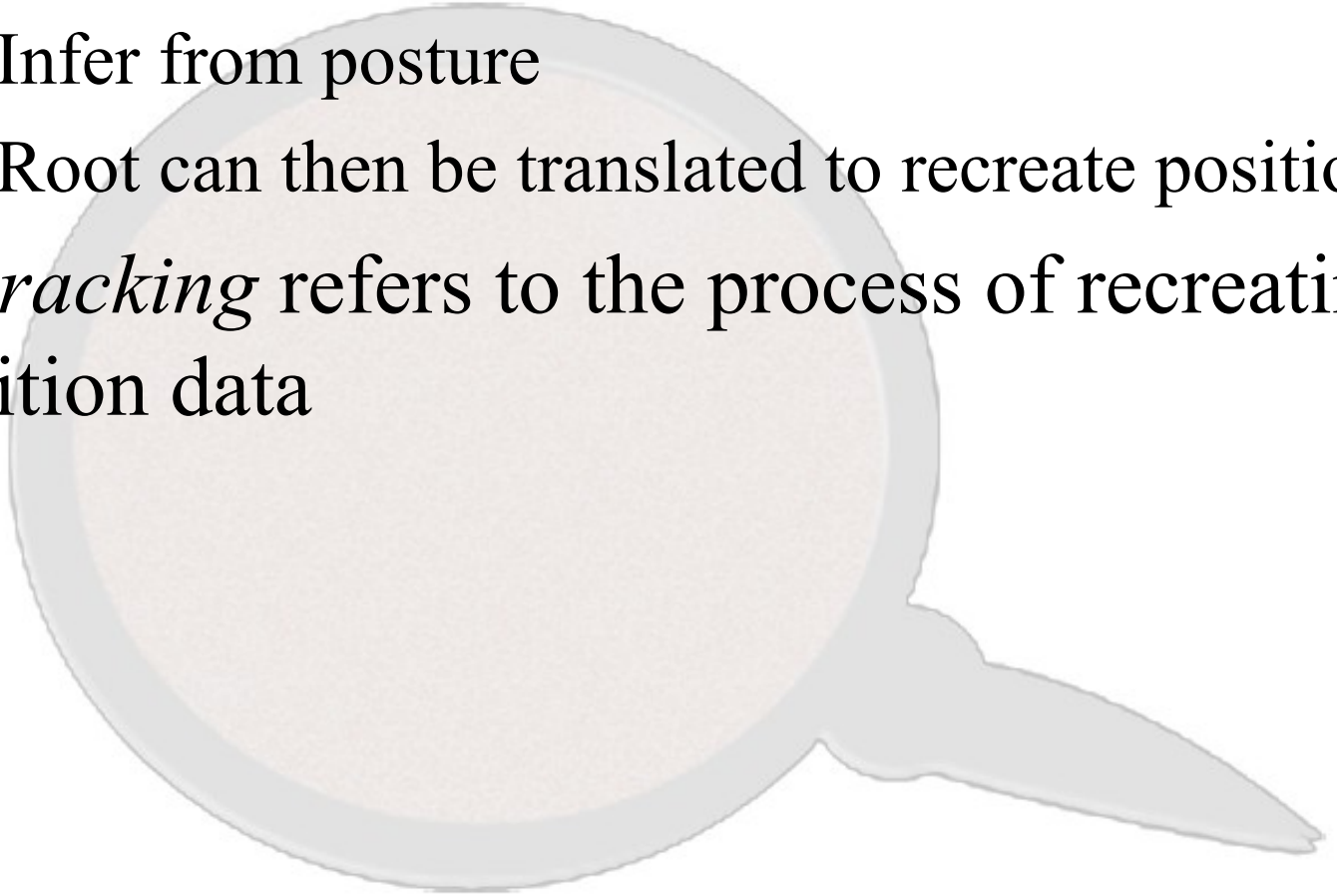
- MotionViewer records the posture of person
- Model has a *root joint* fixed at the world co-ordinate origin
- Relative-position of each joint calculated by rotations around *root joint*
- Position of the body not recorded by Orients/ MotionViewer

Example of MotionViewer Data



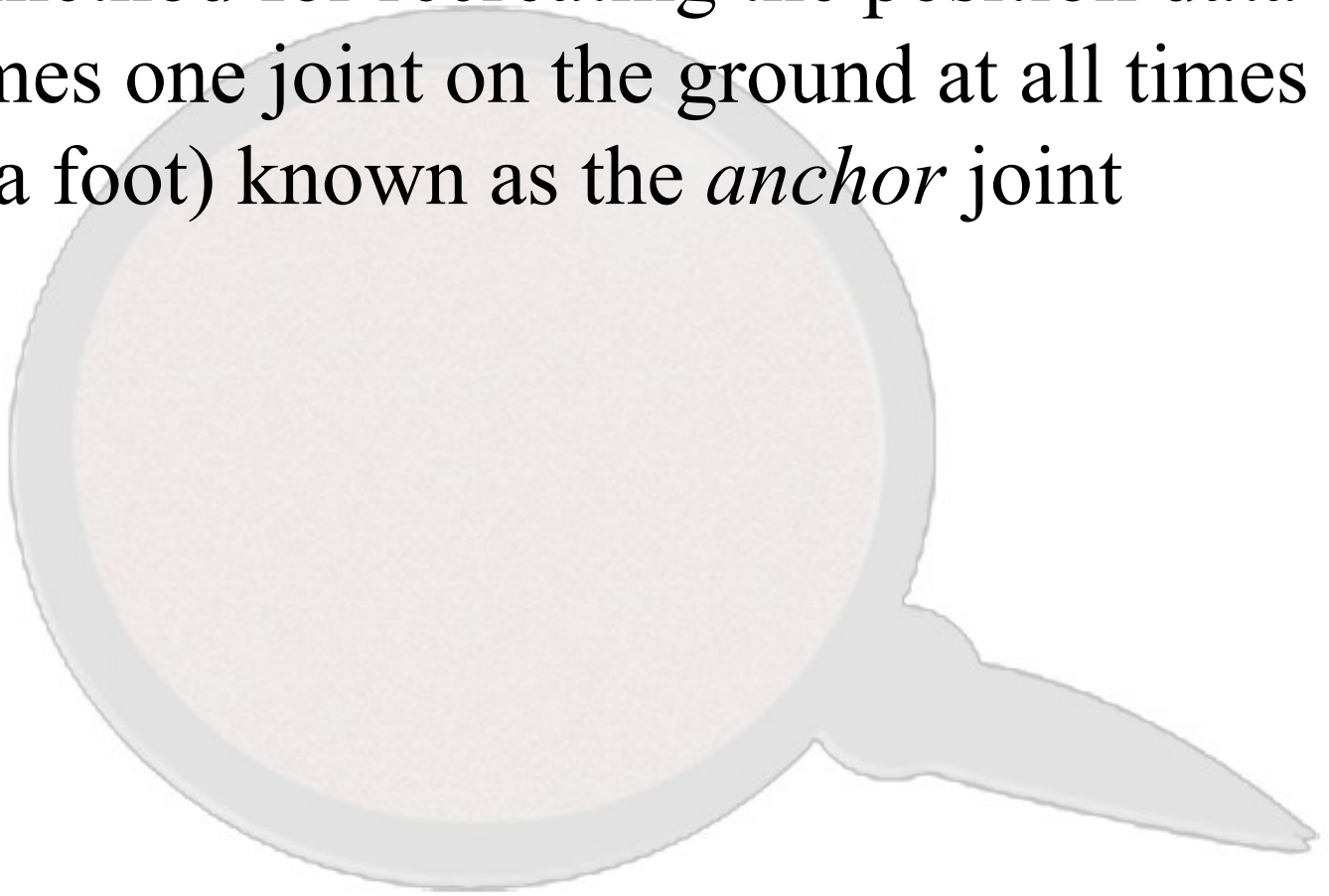
Overview - MotionViewer

- Possible to extrapolate position data:
  - Infer from posture
  - Root can then be translated to recreate position
- *Step-tracking* refers to the process of recreating the position data

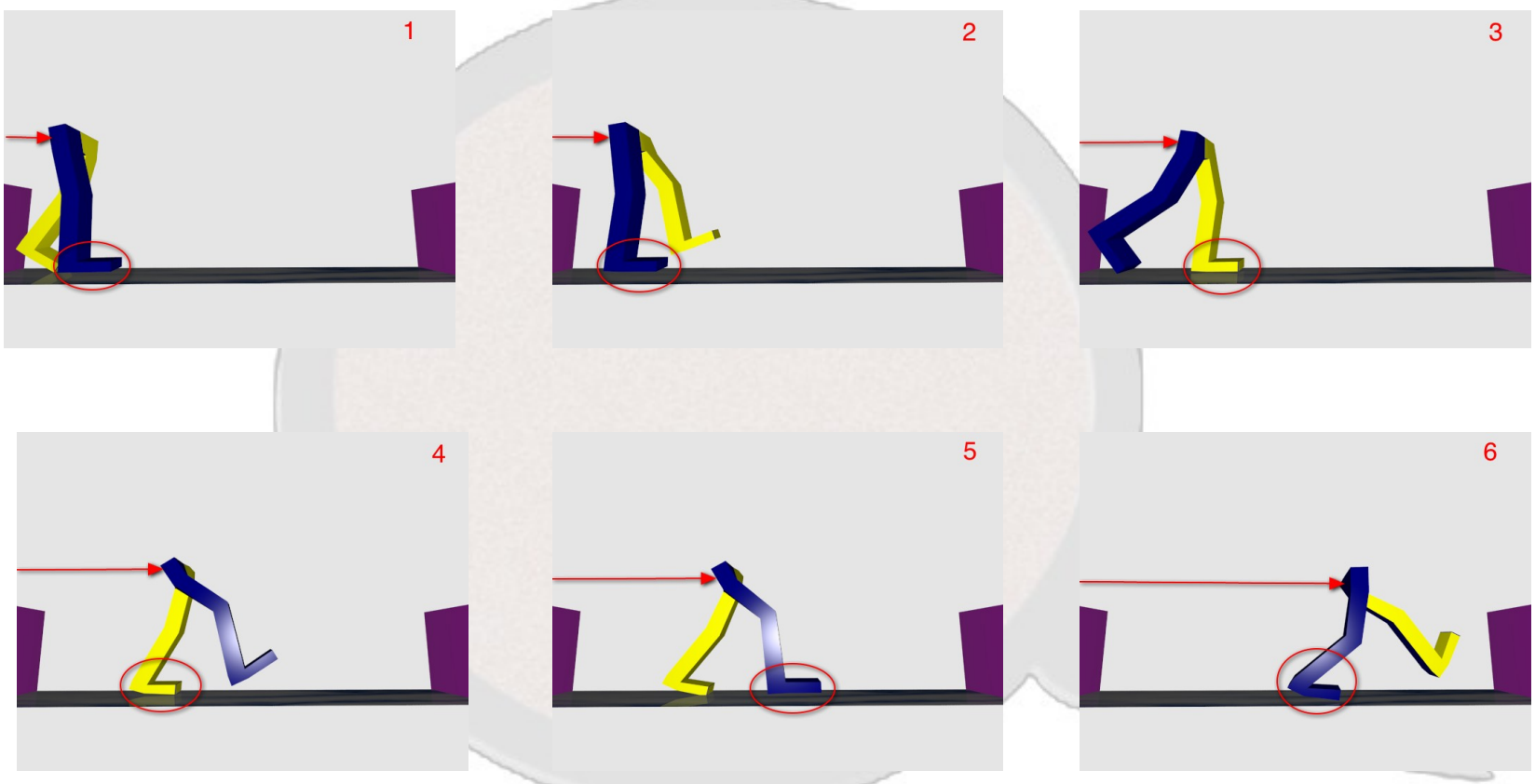


Translating the root – Anchor Joint

- One method for recreating the position data assumes one joint on the ground at all times (e.g. a foot) known as the *anchor* joint

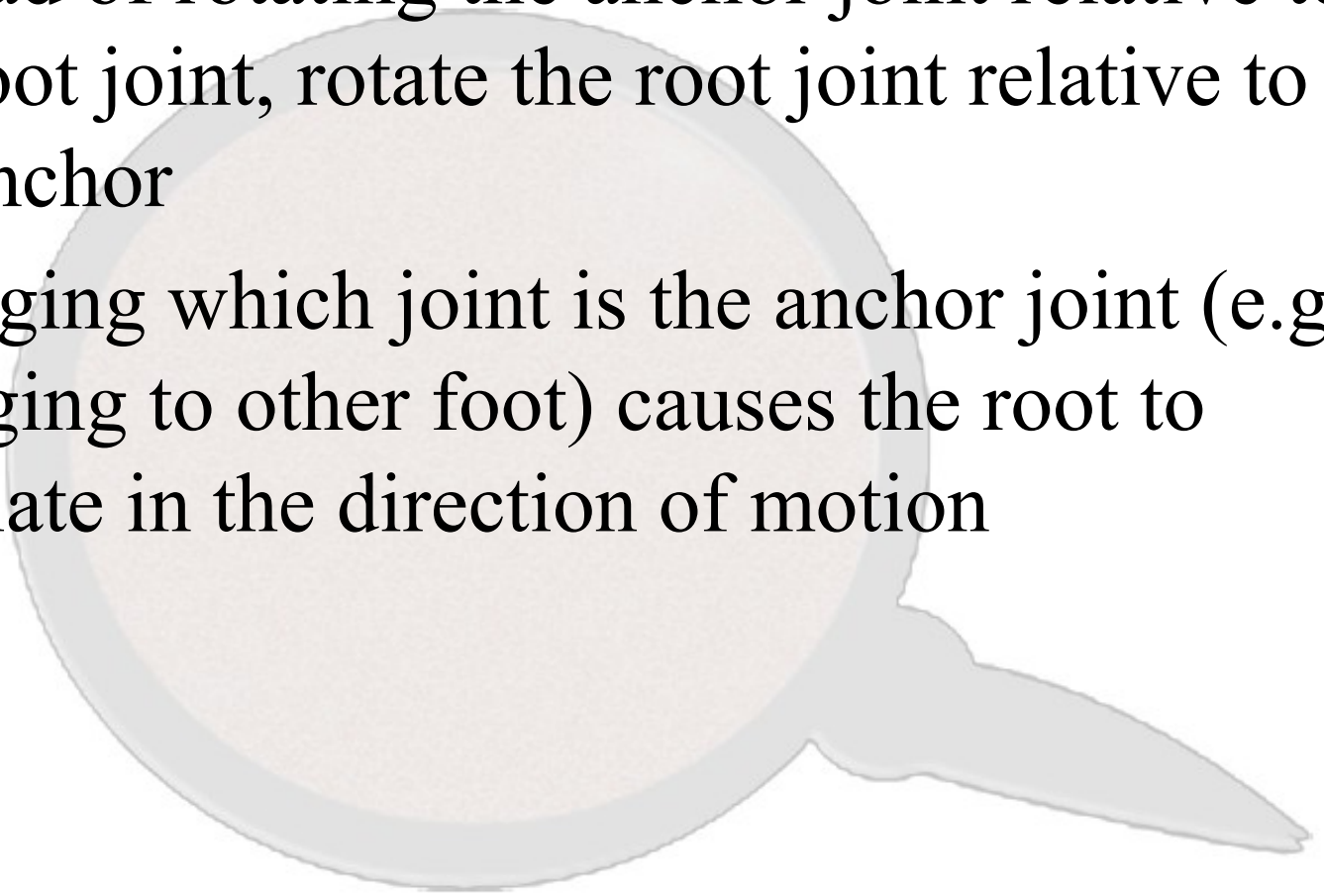


Translating the root – Anchor Joint

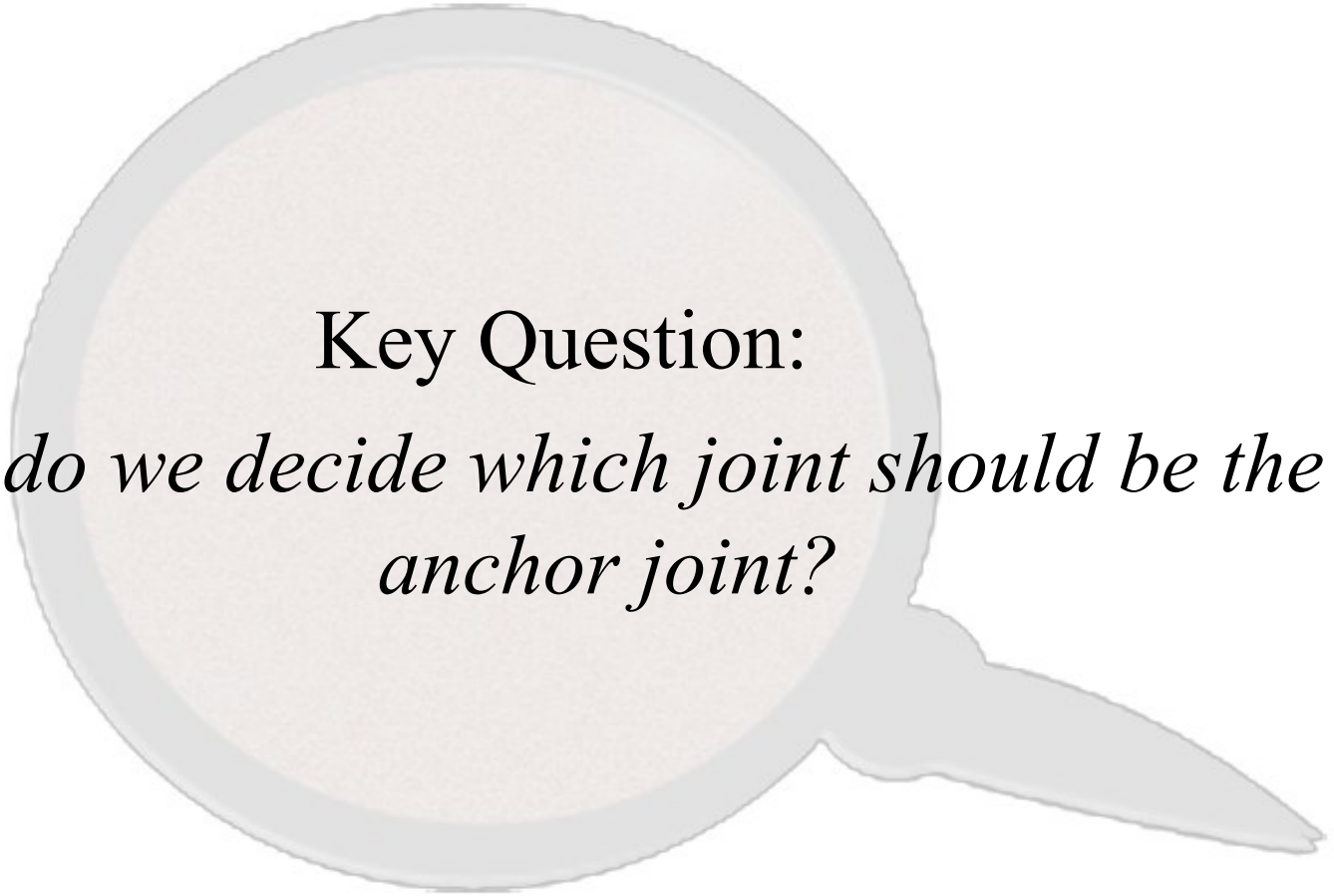


Translating the root – Anchor Joint

- Instead of rotating the anchor joint relative to the root joint, rotate the root joint relative to the anchor
- Changing which joint is the anchor joint (e.g. changing to other foot) causes the root to translate in the direction of motion



Translating the root – Anchor Joint



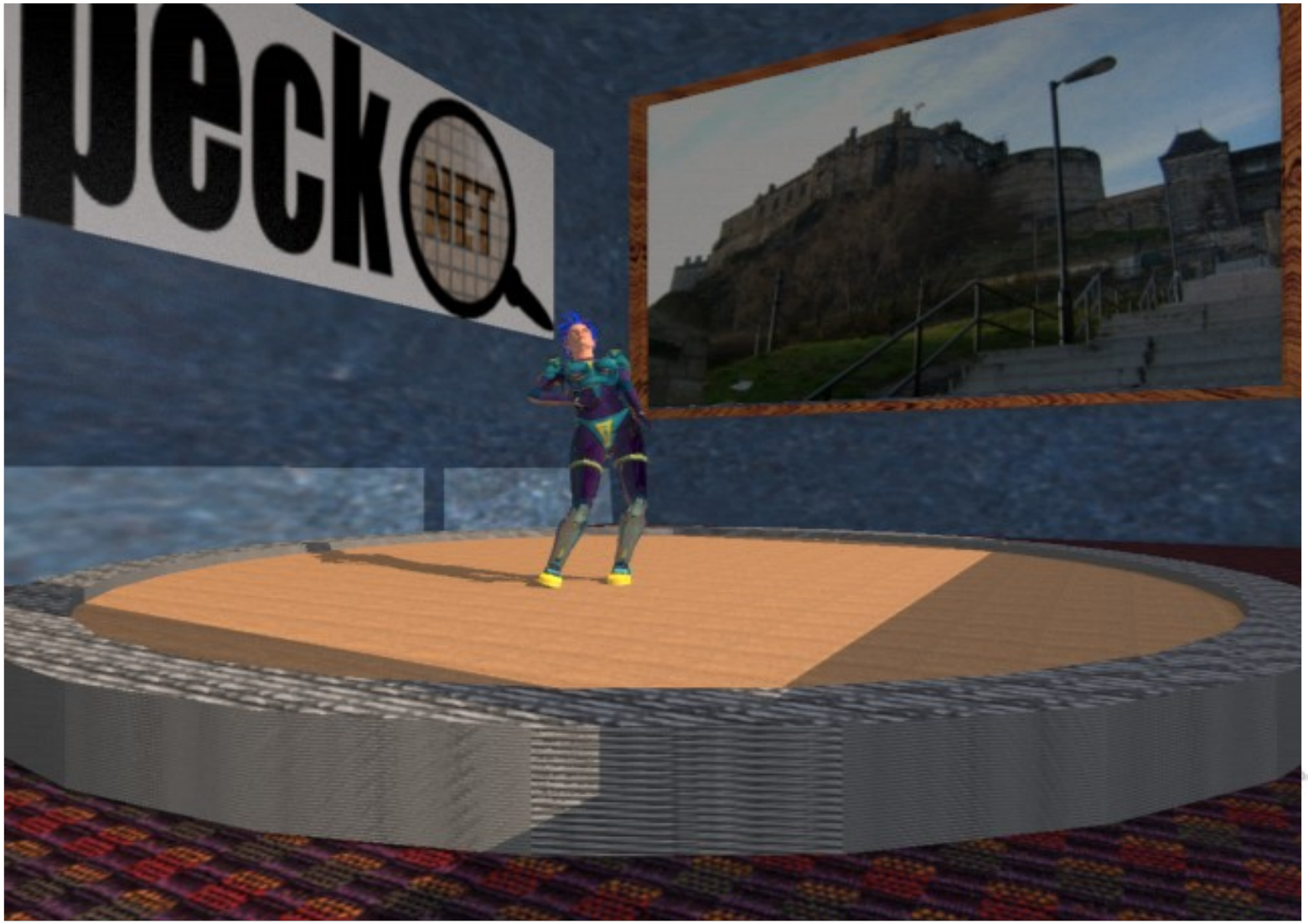
Key Question:

How do we decide which joint should be the anchor joint?

Current Method – Lowest Point

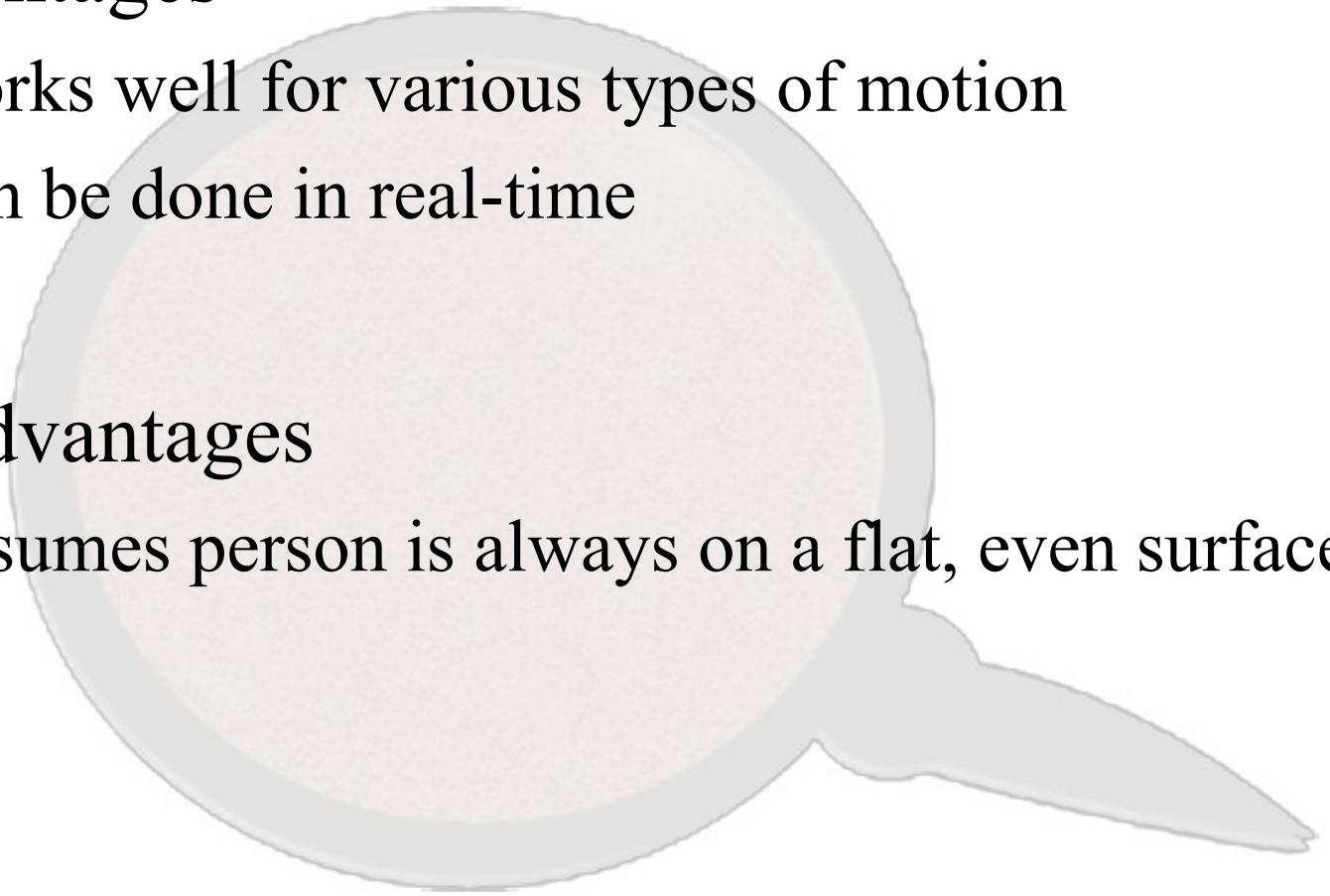
- Examine all the joints on the model, choose the joint with the lowest 'y' value as the *anchor* joint
- Fix the anchor joint's 'y' at a predefined *Ground Level*, then apply the translations to the root joint
- Gives fairly accurate results when person on a flat, even surface

Current Method – Lowest Point



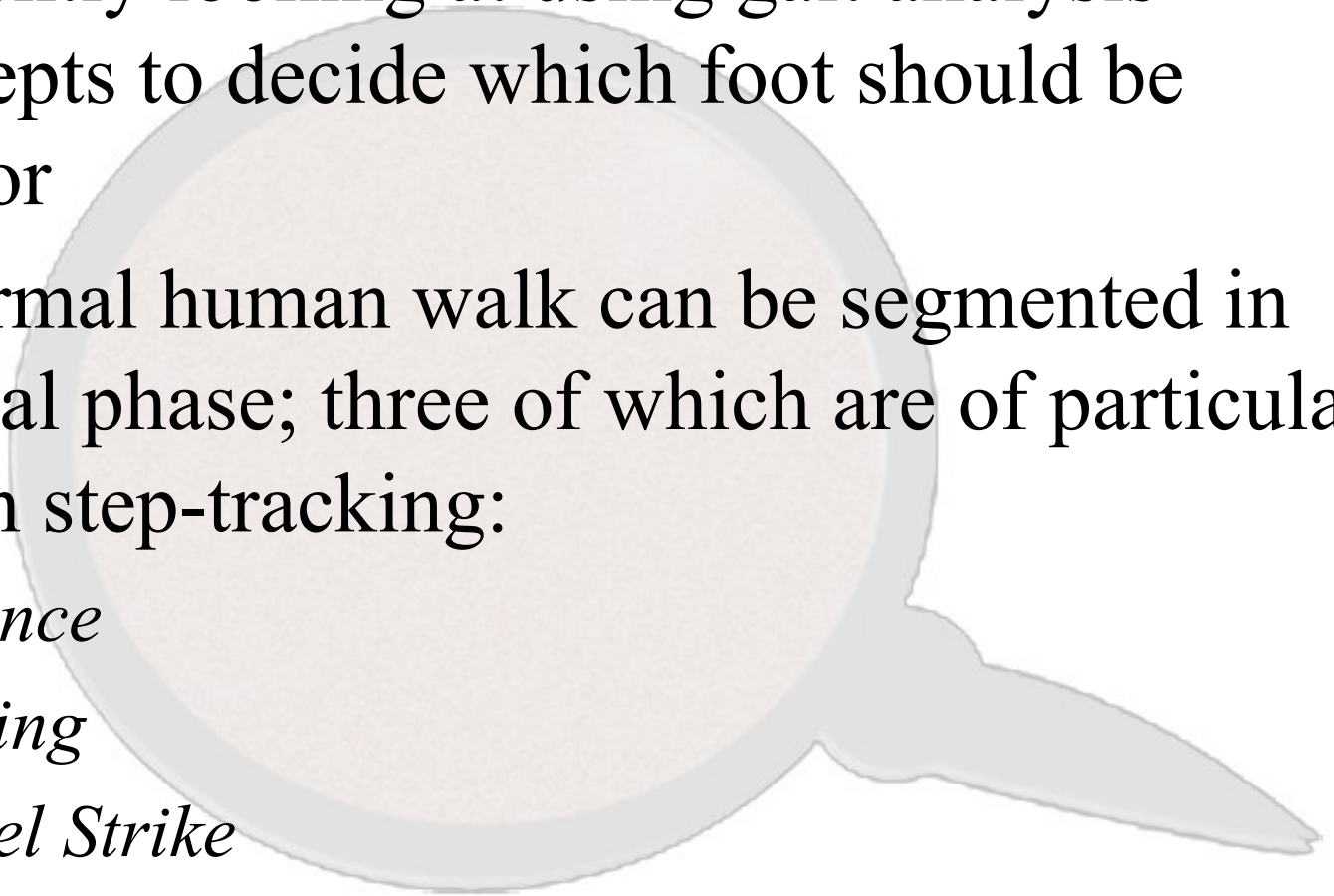
Current Method – Lowest Point

- Advantages
  - Works well for various types of motion
  - Can be done in real-time
- Disadvantages
  - Assumes person is always on a flat, even surface



Current Test Method – Feet Position

- Currently looking at using gait analysis concepts to decide which foot should be anchor
- A normal human walk can be segmented in several phase; three of which are of particular use in step-tracking:
  - *Stance*
  - *Swing*
  - *Heel Strike*



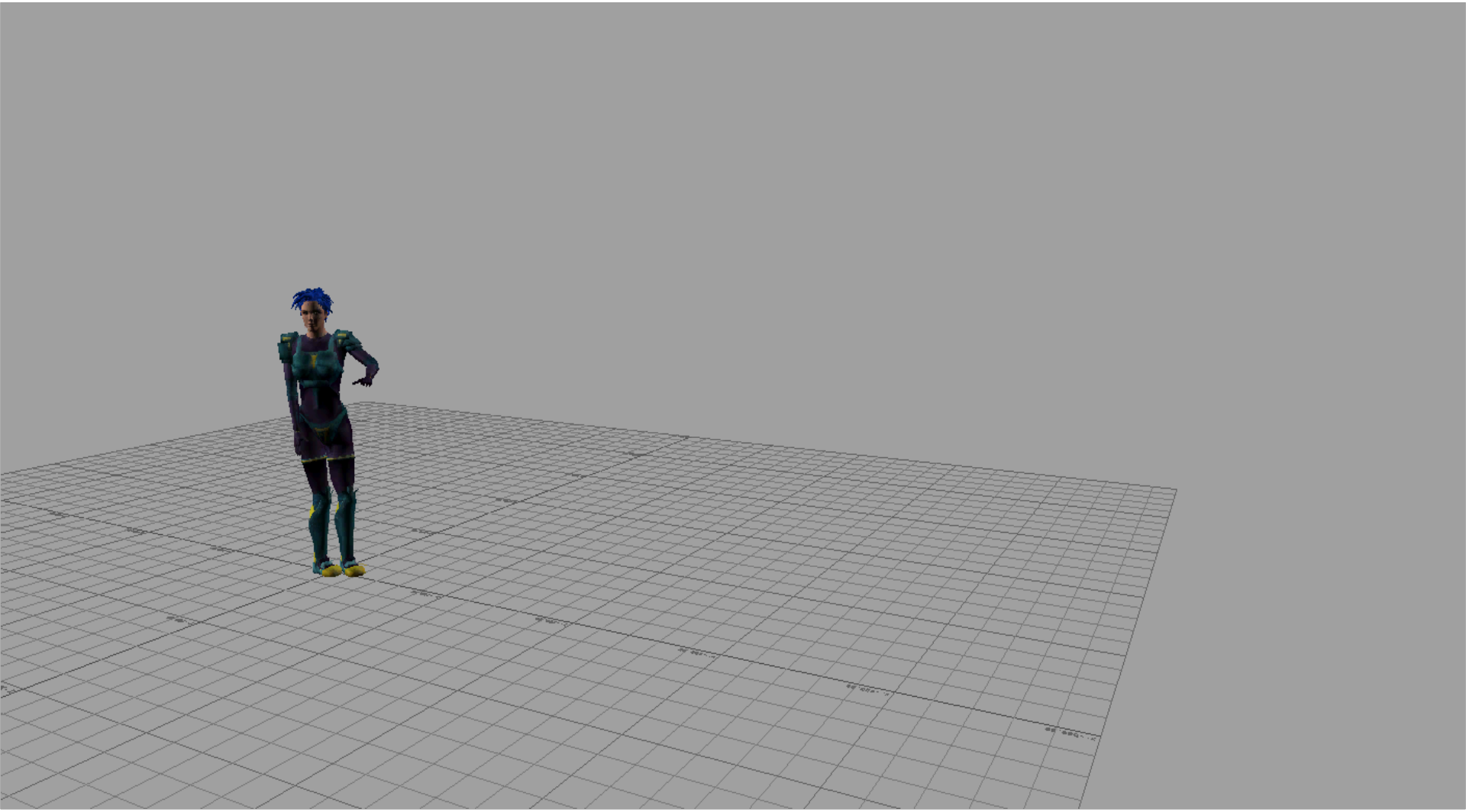
Current Test Method – Feet Position

- *Stance*
  - When the foot is stationary, occurs when the other foot is moving (*single stance*) or when both feet are stationary (*double stance*)
- *Swing*
  - When a foot is brought forward, in front of the stationary foot
- Heel Strike
  - When the swing foot has reached the ground

Current Test Method – Feet Position

- *Stance* foot ≈ *anchor* foot
- Need to detect *heel strike* in MotionViewer:
  - Choose initial *anchor* joint using lowest point
  - *Swing* foot moves in motion direction: once it starts to move in the opposite direction, assume *heel strike* has occurred
- Method not reliant on 'y' position of joint

Current Test Method – Feet Position



Current Test Method – Feet Position

- Advantages
  - Can handle non-flat, uneven surfaces
  - Can be applied real-time
- Disadvantages
  - Tied to bipedal walking motions
  - Some early problems identifying when *heel strike* actually taking place

Future Methods

- Experiment with all the methods, find the heuristic that works best
  - The final solution will more than likely utilise all these methods to identify the motion and perform the most accurate step-tracking
- Experiment with techniques to handle motions with no *anchor* joint (e.g. running, jumping)
- Integration with video system for heightened accuracy


Questions?


Thank you!