

Motion Capture

Name: Tofiq Bakhshiyev

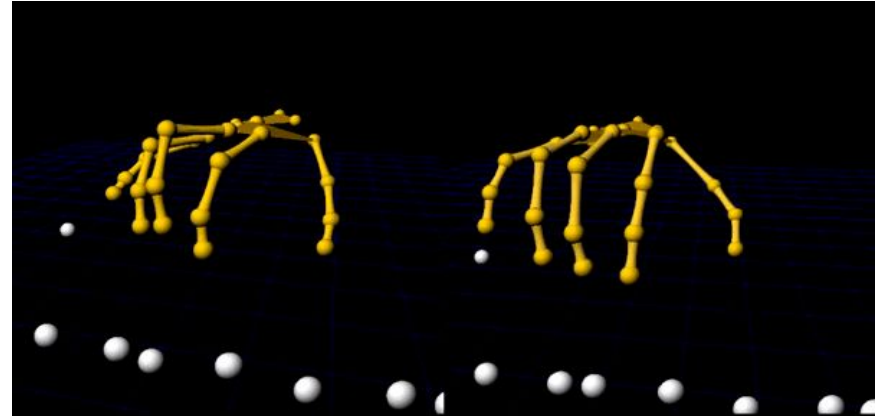
Degree: First year Master student in Computer Science

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What is the Motion Capture?

- Motion capture (sometimes referred as mo-cap or mocap, for short) is the process of recording the movement of objects or people.
- It is used in military, entertainment, sports, medical applications, and for validation of computer vision and robots



What is the role of Motion Capture in Gaming and Movie industry

- In filmmaking and games, motion tracking is match moving.
- In motion capture sessions, movements of one or more actors are sampled many times per second.
- First time Martech Games used motion capture technique
- About 85% of the game's animation was done using motion capture in the Last of Us.



How Motion Capture works

Motion capture uses motion-tracking cameras to capture the movement of an actor or object wearing motion tracking markers. The data is sent to a computer equipped with motion capture software, like Cortex. Cortex takes the motion capture data and creates a virtual skeleton that moves with the actor in real-time.



Method and Systems

There is two systems in Motion Capture

- Optical systems
 - Passive markers
 - Active Markers
- Non Optical systems
 - Inertial systems
 - Mechanical motion
 - Magnetic motion

Optical - Passive Markers

Passive optical systems use markers coated with a retroreflective material to reflect light that is generated near the camera's lens. The camera's threshold can be adjusted so only the bright reflective markers will be sampled, ignoring skin and fabric.



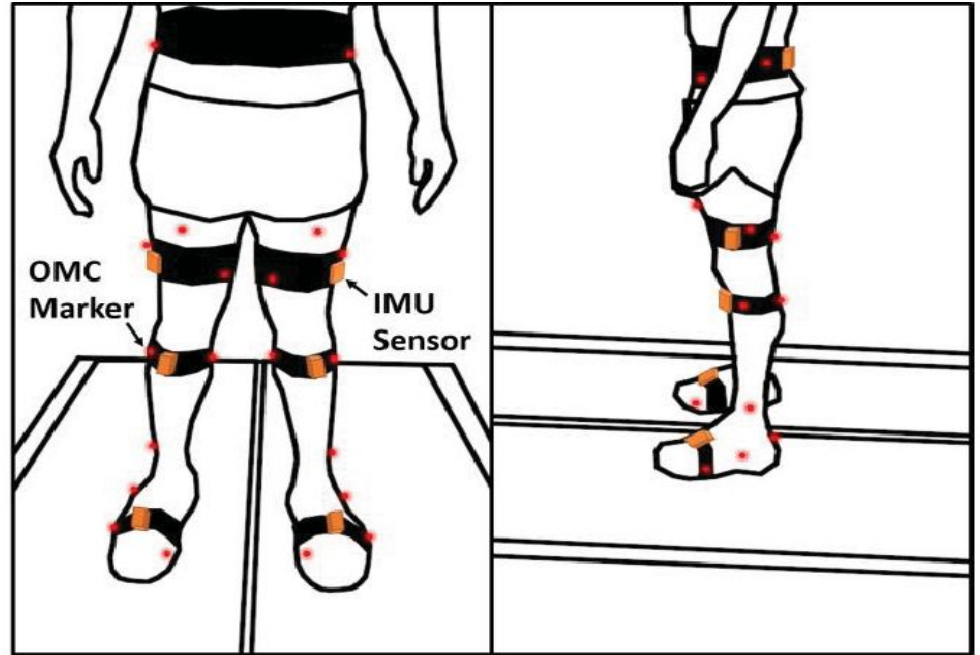
Optical - Active Markers

Active optical systems triangulate positions by illuminating one LED at a time very quickly or multiple LEDs with software to identify them by their relative positions.



Non Optical Systems - Inertial systems

- Inertial motion capture uses IMUs (inertial measurement units) with built in sensors to detect position and movement. These typically include gyroscopes, accelerometers and sometimes magnetometers.



Non Optical Systems - Mechanical motion

- A mechanical motion capture system is a structure that is attached to the subject to act out a sequence of movements. Typically, a mechanical motion system consists of electrogoniometers.
- An electrogoniometer is an electrical device for measuring joint angles.

Non Optical Systems - Magnetic motion

- Magnetic motion capture systems utilize sensors placed on the body to measure the low-frequency magnetic field generated by a transmitter source. The sensors and source are cabled to an electronic control unit that correlates their reported locations within the field.

Motion Capture - Advantages

- It works real time and gives us immediate results.
- It decreases the overall cost of frame based animation in the entertainment industry.

Motion Capture - Advantages

- It allows us to do many tests in different styles.
- With the Motion Capture, the amount of data is larger than traditional animation techniques.
- It can be used with a third party softwares which is cost effective.
- The movements created by capturing moves are realistic, allowing the capture of secondary movements of the body, such as strength and weight.

Motion Capture - What are the difficulties today?

- It requires specific hardware and software to produce and process data.
- The Motion capture system may have specific requirements for the space it is operated in, depending on the camera field of view.



Motion Capture - What are the difficulties today?

- A digital character, for example, can be much larger than the body of the actor.
- There are also not effective ways to transcribe captured movements to a character who has no humanoid form, requiring a lot of correction by the animators.

Motion Capture - What are the difficulties today?

- Equipment and cost: equipment and specific software is required for this type of production. In addition, its cost, combined with the cost of professionals to operate it, becomes a deal breaker for small productions

Motion Capture - What are the difficulties today?

- Almost all material captured needs editing by an animator, therefore, the addition of traditional animation techniques are required.

Best budget setup for it?

- Smartsuit Pro II - Inertial system, €2745
 - Sensor: 9-DoF IMU motion sensors connected to a hub
 - Software & plugins: Unreal - Unity - Blender - Maya - MoBu - Houdini - Cinema4D - iClone - Cartoon Animator 4 - Siemens Jack.

- Prices up to €1000 - €50000 for Inertial systems.

Best budget setup for it?

- Mechanical motion: these suit tend to be more expensive, €22728 - €68184.

Best budget setup for it?

- Active and Passive Markers: 300 markers are needed for suite, and average price is for one marker €55.
- Camera prices for optical systems: Typically a system will consist of around 2 to 48 cameras and average price for one camera is €727
- Total = $300 * 55 + 2 * 727 = €17,954$ is needed for Active and Passive Motion capture system.
- The BaSix system is €20000 and compatible with Maya, MotionBuilder, VizRT, Unity and Unreal Engine software.

Best budget setup for it?

- Average Software Prices for Pro license:
 - Unreal engine: \$1,500 per seat/year
 - Unity: \$1,800 /yr per seat
 - Autodesk Maya: \$1,700 /year per seat

Best budget setup for it?

- Total price:
 - Inertial system: lowest price is 1000 euro
 - Active and Passive: lowest price is 20000 euro
 - Software license: if team consist 5 people: 7500 euro
 - Total price: 28500 euro

How implemented Motion capture in the game



Question to the class

- Questions
 - Based on the video which type of motion capture systems were used in the Last of us 2 ?

Thank you for listening!

References

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