

MOTION CAPTURE VISUALISATION FOR AVATAR CONTROL

In physical therapy, much decision-making is done based on a level of intuition. Physical therapists would like to support their intuition with objective measures and visualisations for making treatment-related decisions. Such visualisations can in turn be used to inform and motivate the patients it concerns, and to provide feedback during training exercises.

In the INSTANT project the Ambient Intelligence research group works together with Roessingh Research & Development, University of Twente and physical therapy practice Topvorm Twente towards a solution that can do the above. The solution will consist of a **recording** module to capture motion data during specific movements, an **evaluation** module to play back and compare recordings, and a **training** module to show a patient how an exercise should be performed beforehand and show how they might improve the execution afterwards. For all of these modules it is important that motion capture data can be played back correctly to the users.

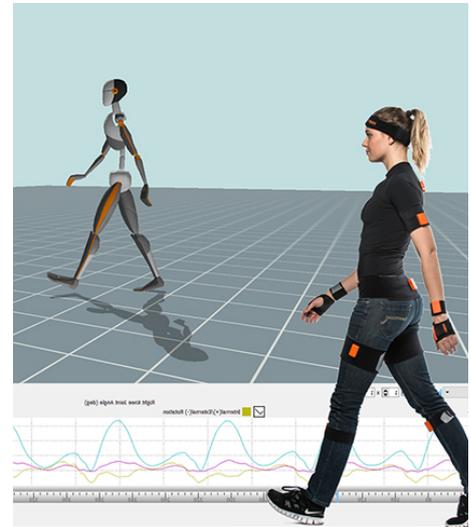


Figure 1 Xsens motion capture

Within the project we use Xsens sensors for testing (which will be replaced with improved sensors developed by Gable), middleware software (XCM) is developed in LabView, and the avatar will be visualized in Unity3D. The visualisation application will need to be called directly from XCM Windows application.

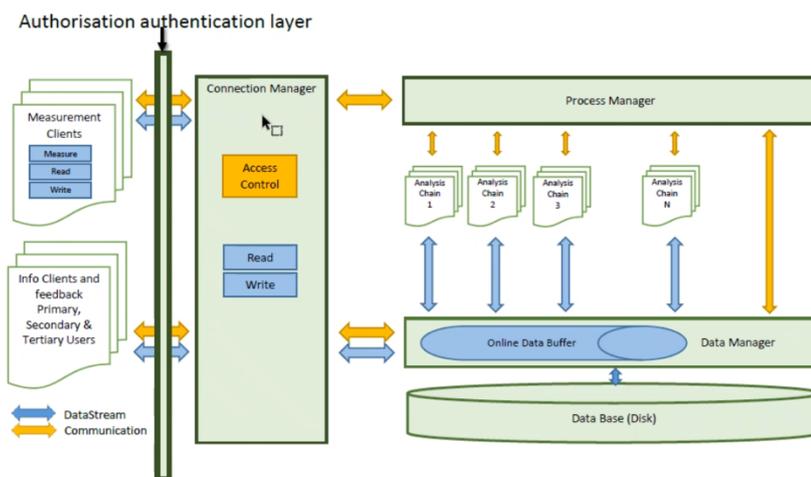


Figure 2 XCM middleware (LabView)

TASK DESCRIPTION

For this project, you will need to:

- **Develop a configuration tool** in Unity3D to support different models and accompanying rigs in the visualisation module (for bone naming, orientation, and n-pose of the model). Models will be provided. How to best determine, store and load the configuration data is part of the research.
- **Define and implement the com API** for communication between the LabView Windows middleware (XCM) and the Unity3D visualisation module, so the unity visualisation module can be called directly from LabView. How to communicate with a dll, needs and best practices

for defining the communication, and how to get the communication to work in practice will need to be looked into.

- **Develop the avatar visualisation** in Unity3D. Aside from the basic mapping of the motion capture data to proper avatar control, there are additional features that can be looked into such as highlighting specific segments and joints (for example to signify that the patient should lift their knee higher), a sphere on a joint to indicate momentum and arrows to indicate force. Playback of two data streams in parallel is also a wanted feature, showing 2 avatars on top of or next to each other. All of these feature requests also have an impact on the API. Design will be handled by others in the INSTANT project. Your company coach is directly involved there, so lines are short. The focus here is on control and development.
- **Write a LabView analysis function in XCM to convert motion capture data** from XSens to the appropriate control data for IK/FK animation of the model in Unity3D (considering orientation of the world and orientation of the body segments). LabView and kinematic computation expertise and support will be provided by Roessingh Research & Development.

In this project, you will learn about motion capture, rigging, Unity3D and LabView. Your solution will be used as part of a tool used in physical therapy as part of the INSTANT project. Aside from working closely together with the researchers from Ambient Intelligence who are working on the interface design and data science, you will also collaborate with Roessingh Research & Development who have deep knowledge on handling motion capture data. Communication with physical therapists as key end users is also possible.

PRACTICAL INFORMATION

- **Student profile:** HBO-ICT SE or CMGT-ENG, graduate student; knowledge of Unity is a plus.
- **Duration:** February 2022 – July 2022.
- **Compensation:** 230 euro per month (before taxes).
- **Contact person:** for more information, contact Danny Plass (d.plass@saxion.nl).
- **More information:** saxion.nl/ami