

Consent Form  
Free University of Bozen-Bolzano

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**Researcher(s):** Prof. Angelika Peer, Full Professor  
Maximilian Maniacco, PhD student

**Study Title:** *Dataset of locomotion actions*

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**1. WHAT IS THIS DOCUMENT?**

This document is a consent form. It will give you information about this study so that you can make an informed decision about participation in this research. We encourage you to take some time to think this over and ask questions now or at any other time. If you decide to participate, you will be asked to sign it, acknowledging that you have read it and understood it. You will be given a copy of this document for your records.

**2. WHY ARE WE DOING THIS RESEARCH STUDY?**

With increasing age, the risk of balance problems and eventual balance loss increases. Related injuries and hospitalization are a growing public health problem. Canes, crutches and other passive devices are helpful, but do not represent a definite solution. Assistive exoskeletons, which aid the user during various locomotion tasks, instead have been proven to be a step in the right direction. Thus, we aim for developing a prototype of a hip assistive exoskeleton with the capability to follow user motions on flat ground, stairs and slopes and to function as fall-prevention device if needed. To this end, we will develop algorithms for intention recognition and control. To train algorithms for intention recognition a dataset with different performed locomotion actions is needed, which we aim to record in this study. Beside benefitting our research, it will be also made public (once anonymized) so that other researchers can use it to develop their algorithms and bring new advances to the field.

**3. WHO CAN PARTICIPATE IN THIS RESEARCH STUDY?**

The participants taking part in this study must be adults between 18 and 45 years of age able to perform daily-life activities without extra difficulties or risks.

**4. WHERE WILL THIS RESEARCH STUDY TAKE PLACE AND HOW MANY PEOPLE WILL PARTICIPATE?**

The study will take place at the Human-Centered Technologies and Machine Intelligence Lab (HCT), NOI TechPark, Via Alessandro Volta, 13, 39100 Bolzano BZ.

We expect to have between 20 and 30 participants.

**5. WHAT WILL I BE ASKED TO DO AND HOW MUCH TIME WILL IT TAKE?**

The following sensing systems will be adopted to record the dataset: To record motion data, the Vicon motion capture system will be used. The Vicon motion capture system is a marker-based system that relies on infrared cameras and artificial reflective markers. The Vicon system consists of 12 cameras arranged around you (see image below) that are used to track and record the location of several markers (the small gray balls in the image below) attached to your body. These markers allow the system to deduce your body posture at each instant. To allow for proper positioning of these markers you will be asked to wear tight and short sport clothes (you can bring your own clothes to the experiments). Further, wearable IMU sensors (Trigno Avanti) as illustrated below will be used to acquire your motion data while performing locomotion actions. The Trigno Avanti EMG system consists of a set of 16 sensors that will be attached to

various segments of your body, such as arms and legs, and permit us to acquire your movements and muscle activity. In addition, FMCW radar sensors will be attached to your pelvis and both thighs with the aim of scanning the environment in front of you and allowing to derive information for terrain recognition. An eyetracking system from Argus ETVision enables us to follow the movement of your eyes during the experiment. Finally, a third-eye video camera will be used to capture the whole scenery for documentation purposes.

Once you arrive at the lab you will be asked to read and sign this consent form and the privacy information sheet. Then, you will be given the possibility to change your clothes. Next, a series of anthropometric measurements will be taken to allow for a more precise calibration of the motion capture system. Then, you will be asked to put on a passive hip exoskeleton (see figure below) that will allow restricting movements of extension/flexion and abduction/adduction mimicking situations encountered later on with the active exoskeleton. To be able to properly position markers of the Vicon motion capture system and the IMU sensors, you will then be asked to perform a series of specific joint movements, which will allow finding key anatomical locations. Then, the markers of the Vicon motion capture system and the IMU sensors will be attached to the skin at specific locations (see figure with marker set below) with a dermatologically tested adhesive tape/glue. The radar sensors will be placed at the pelvis (fixed on the passive exoskeleton) as well as shank (fixed with a strap).

Please note that the researcher applying the equipment on your body will be chosen according to your gender.

Once the markers and sensors are placed, you will be asked to perform a set of basic locomotion actions to verify that the marker and sensor acquisition works fine. Finally, you will be asked to put on the eyetracking glasses, which will then be calibrated by asking you to look at specific markers in a given sequence. Then, you will be asked to walk up and down several times in the test environment, which consists of a few stairs, a straight path and a slope (see figure below). Between recordings, the limits of the extension/flexion and abduction/adduction will be changed to better understand their impact on gait patterns. All the actions you are asked to perform are safe actions as they can be performed at normal speed and with everyday efforts. All the actions will be performed within the tracked volume of the motion capture system. Once the recording phase is finished, you will be asked to take off the markers, sensors and eye-tracking glasses. The equipment will be disinfected following standard procedures to make sure it is clean for the next participant. The experiment is expected to take approximately 3 hours.

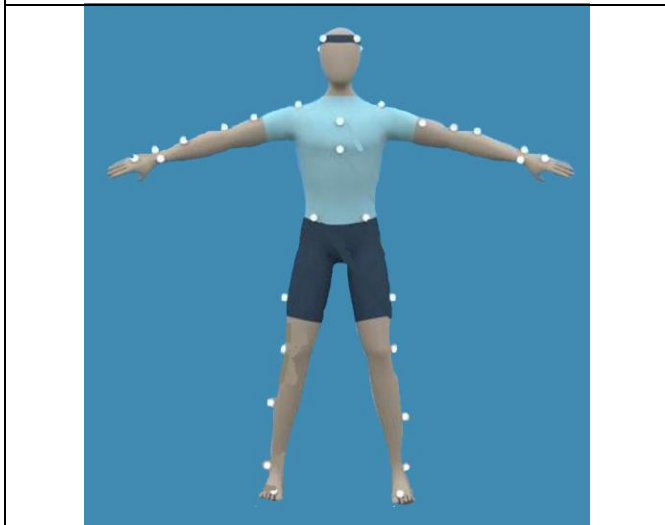
All the resultant data will be anonymized after the experiments to ensure that no information identifying you is maintained. Faces in video recordings will be made unrecognizable. The anonymized data captured will be made public in the Zenodo archive. This archive has been recommended by the library of the Free University of Bozen-Bolzano.



Passive exoskeleton



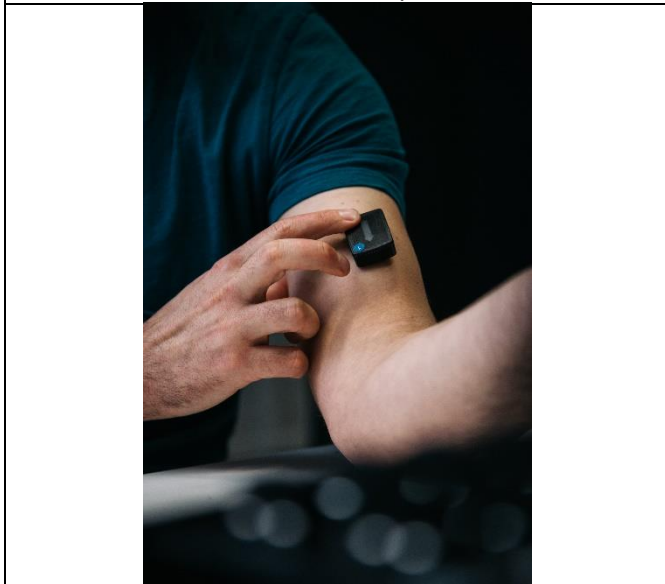
Radar sensor



Vicon Nexus marker placement



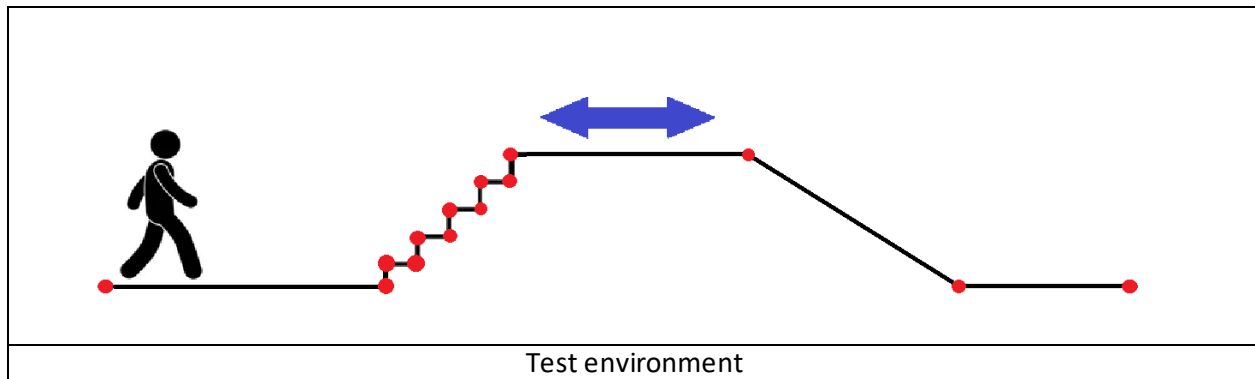
Motion tracking camera



EMG sensors



Eyetracking system



#### **6. WILL BEING IN THIS RESEARCH STUDY HELP ME IN ANY WAY?**

You may not directly benefit from this research; however, your participation in this study contributes to the advancements of knowledge in the field of assistive exoskeletons. This study aims to build a prototype of a hip assistive exoskeleton and to establish it with the capability to follow user motions on flat ground, stairs and slopes and to function as fall-prevention device if needed. In the future, we expect such robotic exoskeletons to help us in a variety of locomotive tasks, at home or in other environments.

#### **7. WHAT ARE MY RISKS OF BEING IN THIS RESEARCH STUDY?**

All locomotion actions you will be asked to perform will be safe actions and will not involve high-speed movements or big efforts. Still, you are allowed to stop the experiment at any time. Also, you are allowed to ask any questions or doubts you have at any time. Regarding your personal data, all the captured data will be anonymized (faces in video data will be blurred), and therefore, there will be no links between your identity and the data published in the datasets.

#### **8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?**

All the captured data will be anonymized immediately after the recording session. All links between your identity and the collected data will be destroyed. This way, there will be no possibility to connect the data in the public datasets to you. The signed consent documents will be stored securely following university rules.

#### **9. WILL I BE GIVEN ANY MONEY OR OTHER COMPENSATION FOR BEING IN THIS RESEARCH STUDY?**

You will not receive any payment.

#### **10. WHO CAN I TALK TO IF I HAVE QUESTIONS?**

If you have any questions before or after the experiment, you can contact the researcher Maximilian Maniaco (e-mail: [mmaniaco@unibz.it](mailto:mmaniaco@unibz.it); phone number: +39 0471 017786) or Prof. Angelika Peer (e-mail: [angelika.peer@unibz.it](mailto:angelika.peer@unibz.it); phone number: +39 0471 017069). During the experiment, you are also allowed to ask questions at any time.

#### **11. WHAT HAPPENS IF I SAY YES, BUT I CHANGE MY MIND LATER?**

If during the experiment you decide that you no longer wish to participate in this study, you can notify the researchers, and the experiment will be stopped immediately, withdrawing the data collected so far. Nonetheless, your data cannot be withdrawn once the data has been anonymized. All direct identifiers from your data will be destroyed after the session.

Thank you for reading this and considering taking part in this study. Do not hesitate to contact the researchers mentioned in question 10 for further information or clarification about this study.

Consent Form  
Signature Page

Please complete this form after having read the whole document.

**Title of the study:** *Dataset of locomotion actions*

Thank you for considering taking part in this study. If you have any questions regarding this document or the explanations given to you, please ask the researcher before deciding whether you wish to participate.

1. *I acknowledge that I have read this consent form and have been given the opportunity to discuss the information and my involvement in the project with the researcher(s).*
2. *I understand that, if during the session I decide that I no longer wish to participate in this study, I can notify the researchers and the data will be withdrawn immediately.*
3. *I understand that my data cannot be withdrawn after the session, due to the data anonymity.*

**Participant's statement:**

I, \_\_\_\_\_, agree that the research project named above has been satisfactorily explained to me and I agree to take part in this study. I understand what the research study involves.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Researcher's statement:**

I, \_\_\_\_\_, confirm that I have carefully explained the nature and demands of the proposed research to the volunteer. I indicate that the participant has read and, to the best of my knowledge, understands the details in this document about the project and has been given a copy of it.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_