MOTION LAB & PHYSIOLOGY LAB

Research and development environments, for both lab and field methods for human motion and performance analysis

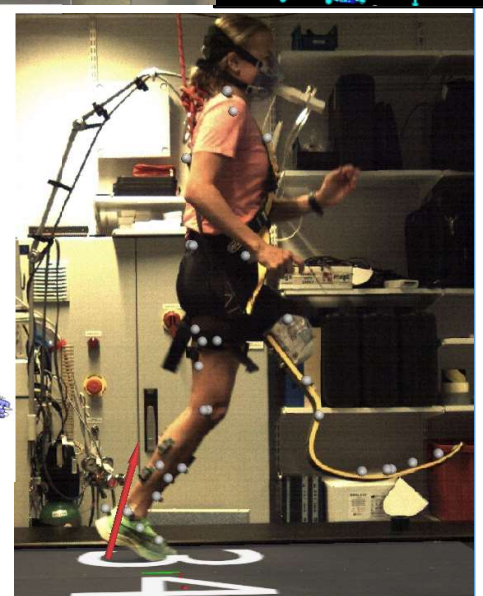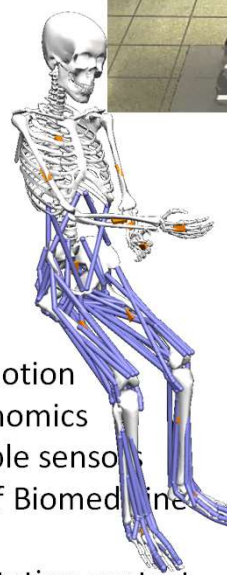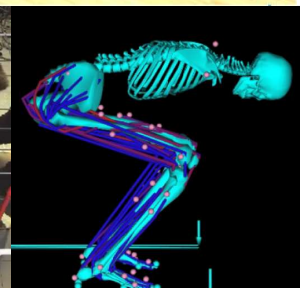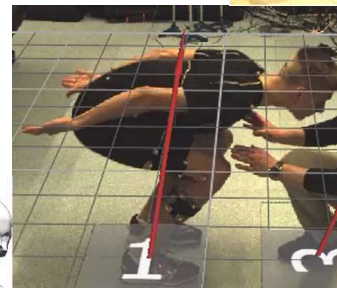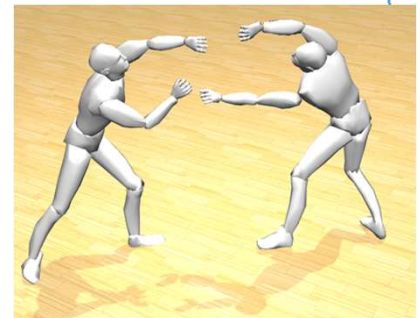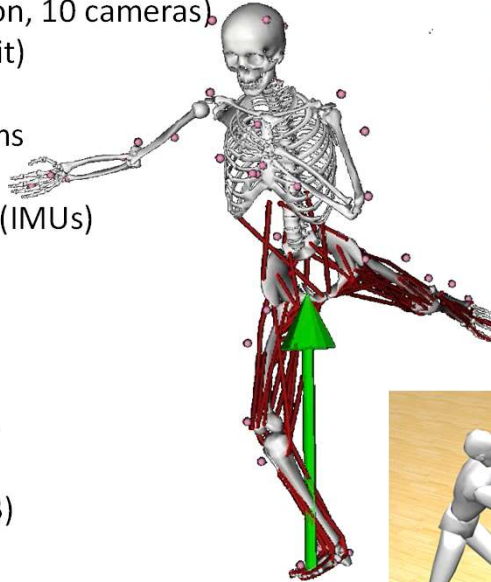*Equipment:*

- Camera-based motion analysis system (Vicon, 10 cameras)
- Force-instrumented treadmill (Motek M-gait)
- Floor-mounted force plates x3 (AMTI)
- Wireless, mobile EMG measurement systems
    (Delsys Trigno 16+ ch., Bittium Faros)
- Full body wearable motion analysis system (IMUs)
    (Xsens Awinda 18 sensors)
- Pressure insoles (Tekscan)
- Woodcast® system for casts and orthoses
- Two ultrasound devices (Telemed)
- Ergospirometer (Ergoline Ergoselect 200 K + Schiller CS-200 + Ganshorn analyzer)
- Mobile spiroergometer (Cortex Metamax 3B)
- Biosignal amplifier system (Biopac)
- Sensorics of physiological signals
    (ECG, ICG (mobile), EEG, GSR, NIR imaging…)

Environment:

- The insturement treadmill in motion capture lab
- 10-m long walkway with customizable force plate setup, incl. stairs
- Ankle and knee extension and flexion force measurement setup

Applications:

- Biomechanics of walking
    - Overground, treadmill and stairs
- Running analysis with breath gas analysis
- Perturbed postural balance test on treadmill
- Musculoskeletal modelling and simulation for quantification of knee loading, sports performance etc.
- Muscle and tendon ultrasound imaging during motion
- Occupational ergonomics and seated work ergonomics
- Real time monitoring of kinematics using wearable sensors
- Sports medicine in collaboration with Institute of Biomedicine
- Ergospirometry in the lab and on the field
- Motion capture of dance in neurological rehabilitation context
- Innovation commercialization: **research-to-business** projects with clinical and academic partners

BUSINESS FINLAND

Contact us: Professor Pasi Karjalainen, University of Eastern Finland, Department of Technical Physics, Kuopio, Finland. +3583552546 , pasi.karjalainen@uef.fi Pasi Karjalainen Mika Tarvainen Paavo Vartiainen

www.uef.fi/humea

HUMEA - Human Measurement and Analysis Lab

www.uef.fi/humea   @HUMEA_Lab #HUMEA

UNIVERSITY OF EASTERN FINLAND

## ROBOTICS FOR STROKE REHABILITATION AND TMS NAVIGATION
Research and development environment for robot-assisted neurological rehabilitation and transcranial magnetic stimulation (TMS)

Equipment:
- Collaborative, 7-DoF robot (KUKA lbr iiwa 14 R820)
- Wearable IMUs (Xsens)
- EMG measurement (Delsys)
- Hand&finger tracking (Leap Motion)

Applications:
- Upper body rehabilitation of neurological patients (e.g. robot-assisted mirror therapy; steering robot motion based on real time monitoring of upper body kinematics)

- Targeting of transcranial magnetic stimulation (nTMS) based on MRI
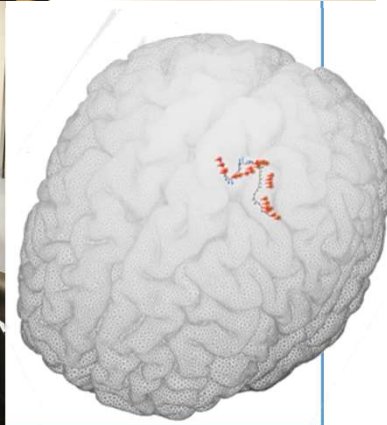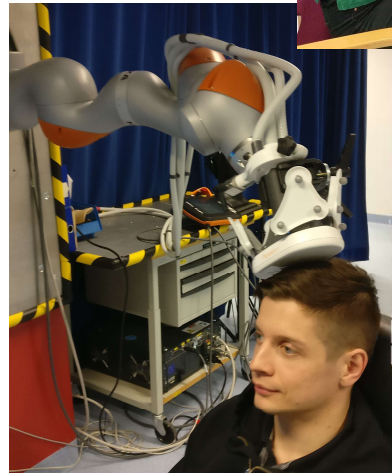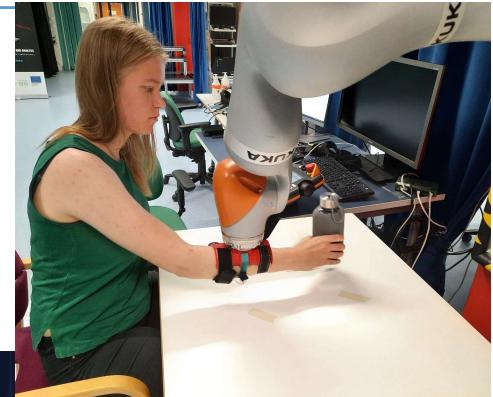
DRIVING SIMULATOR ENVIRONMENT
Research and development environment for studying driver's capabilities in customized traffic environments and situations.

Driving simulator:
- 3-DoF motion platform (Mevea)
- Cabin with realistic wheel, pedals, gearstick, dashboard and seat.
- Simulator software (AVSimulation: SCANeR) with VR-plugin (HTC Vive)
- Several virtual driving environments

Driver monitoring system:
- Eye-tracking systems x2
- (SmartEye remote and wearable)
- Thermal imaging of face
- Extensive data on vehicle behavior
- Wireless biosignal monitoring: HRV, GSR, skin temp. ...
- Driver kinematics monitoring: Joint angles, muscle lengths

Applications:
- Testing of driver behaviour&reactions
- Monitoring of condition to drive
- Driver's stress level

Contact: Professor Pasi Karjalainen, University of Eastern Finland, Department of Technical Physics, P.O.BOX 1627, FI-70211 Kuopio, Finland, Phone: +358 355 2546, email: pasi.karjalainen@uef.fi