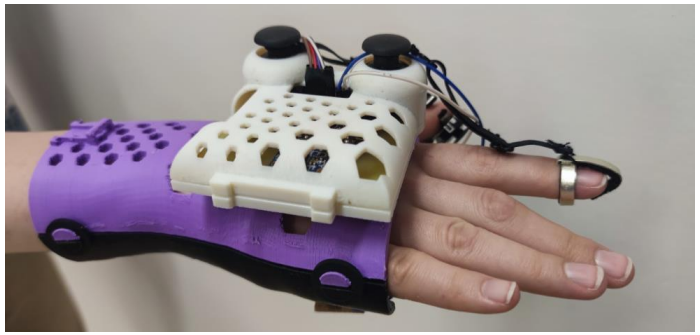
Iceland Liechtenstein Norway grants

European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD

Development of 3D printed biomechatronic devices



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TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

POLITEHNICA UNIVERSITATEA BUCUREȘTI 1818

POLITECHNIKA POZNAŃSKA POZNAN UNIVERSITY OF TECHNOLOGY

UiA University of Agder

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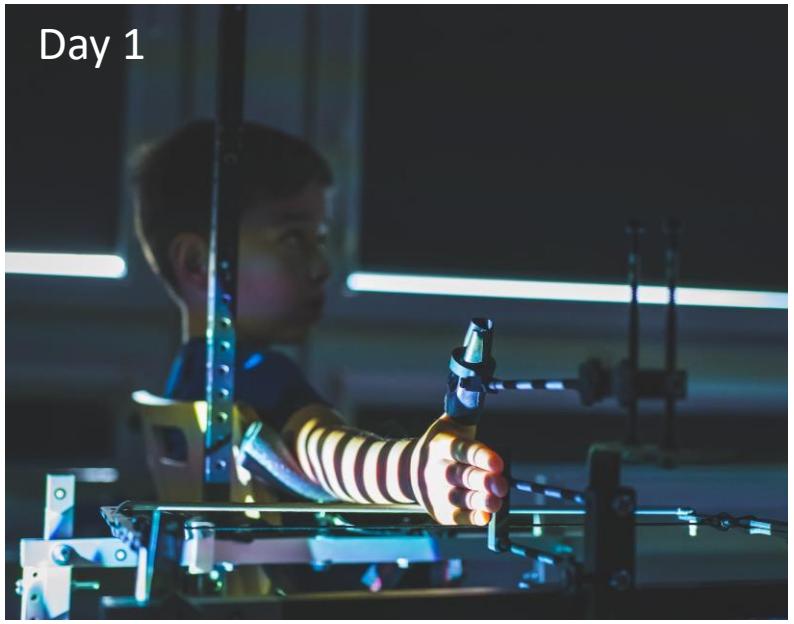
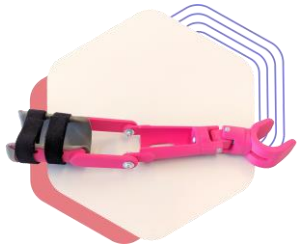
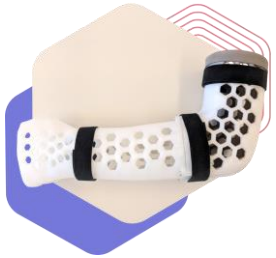
NEW IS COMING!

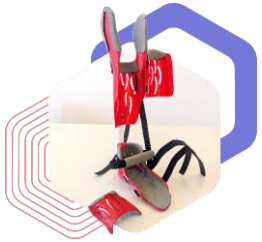


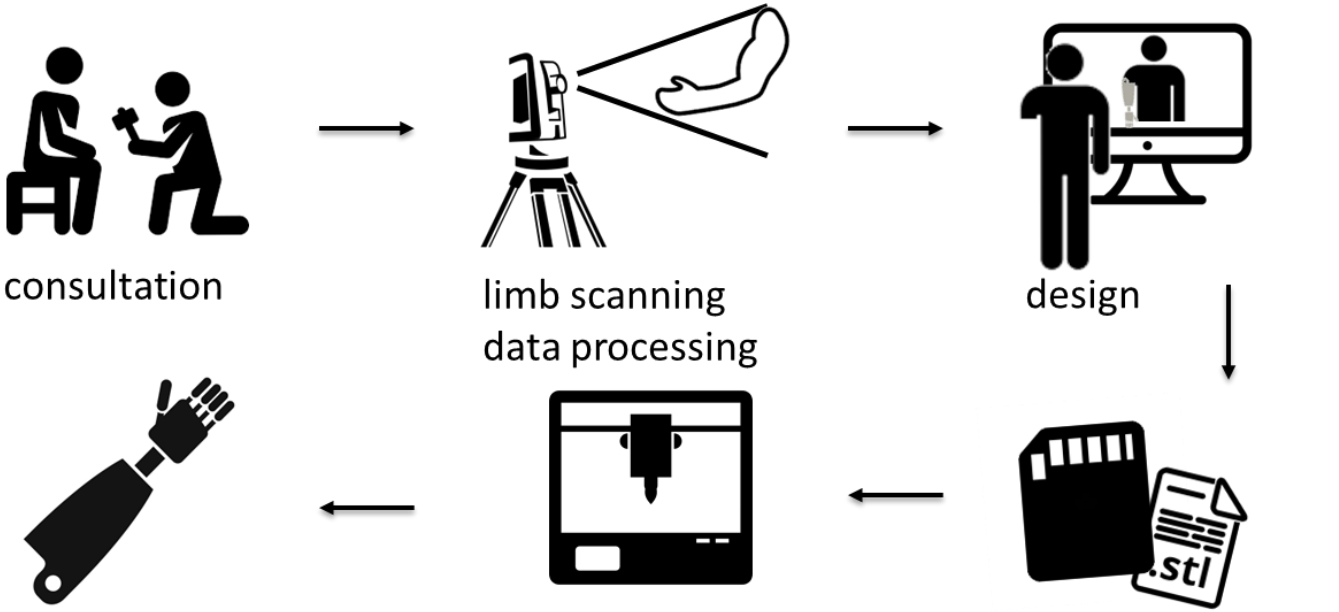
- the **modern digital process** and 3D printing is replacing the traditional molding of prostheses and orthoses for people with physical disabilities
- **3D printing** = completely new technical possibilities + potentially low cost
- **biomechatronics** = possibility of enhancing mechanical devices with sensorization and actuation capabilities

DESIGN METHODOLOGY OF CUSTOMIZED 3D PRINTED DEVICES









AutoMedPrint

Polski Produkt Przyszłości

Narodowe Centrum Badań i Rozwoju

AutoMedPrint – awarded system for 3d printing of orthoses and prostheses, developed at Poznan University of Technology

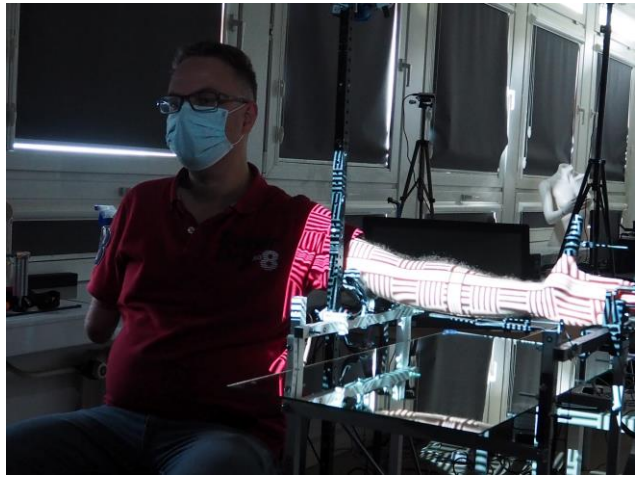
3D SCANNING

Virtual EMERALD laboratory available at
https://my.matterport.com/show/?m=NXHcatKcdW7

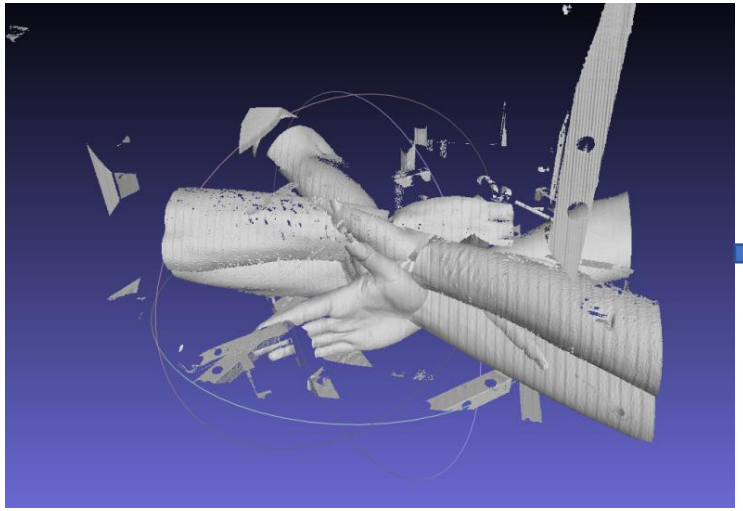
mechanized stand

manual scanner

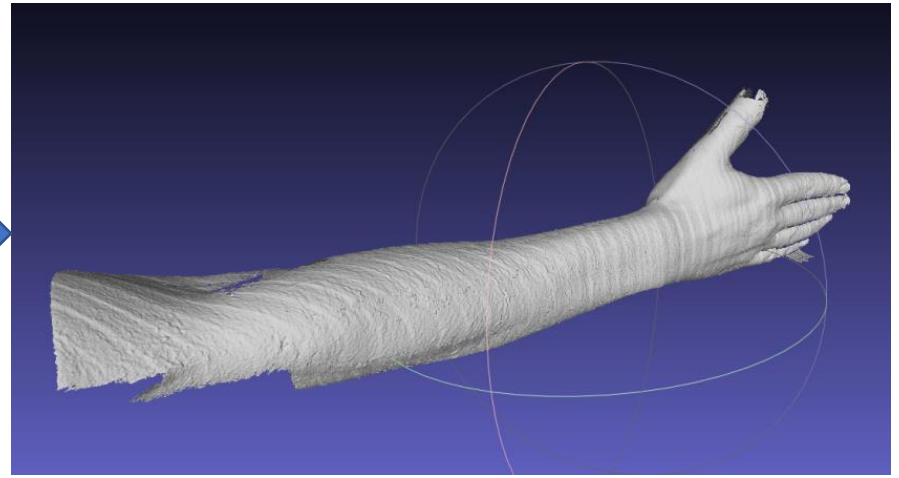
DATA PROCESSING



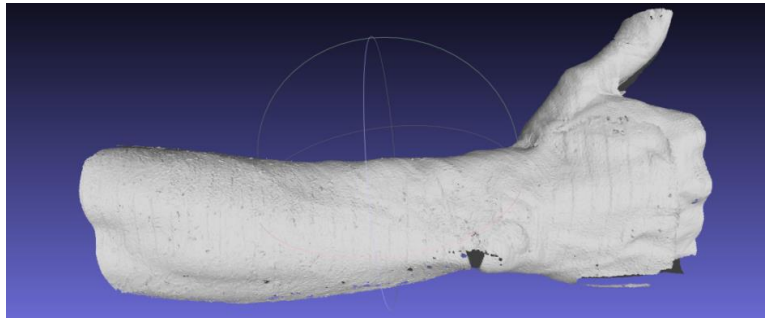
3D scan of human anatomy



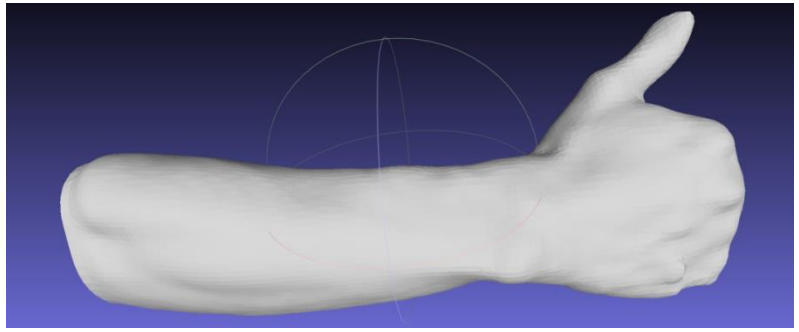
Raw scans



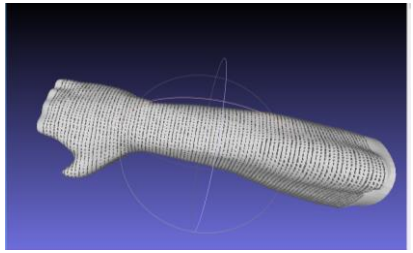
Transformation, initial cleaning



Cutting, final cleaning



Reconstruction

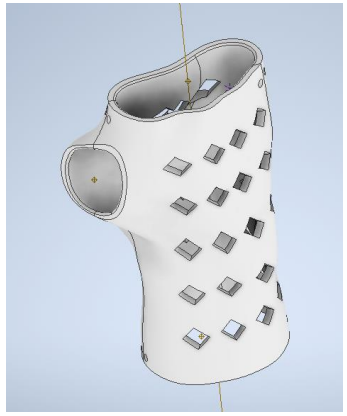
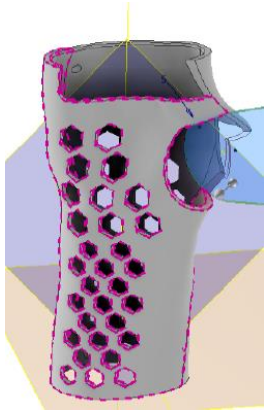


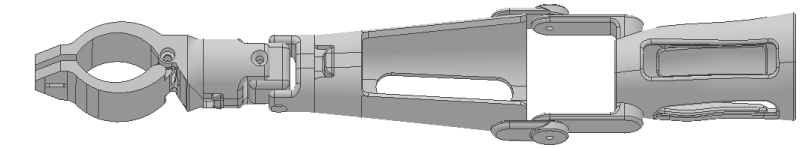
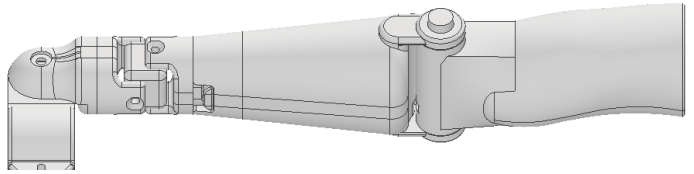
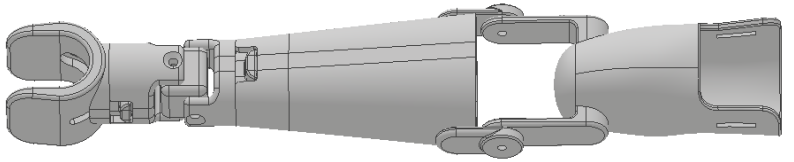
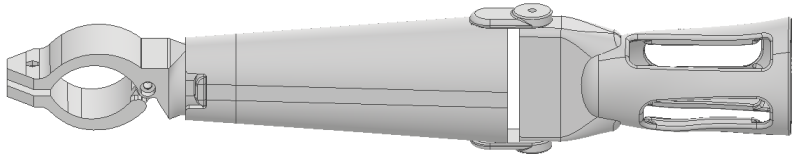
x1_11	0
x1_12	32,541
x1_13	41,769
x1_14	34,588
x1_15	0
x1_16	29,888
x1_17	39,448
x1_18	29,263
y1_11	53,474
y1_12	32,541
y1_13	0
y1_14	34,588
y1_15	48,3
y1_16	29,888
y1_17	0
y1_18	29,263

Data extraction

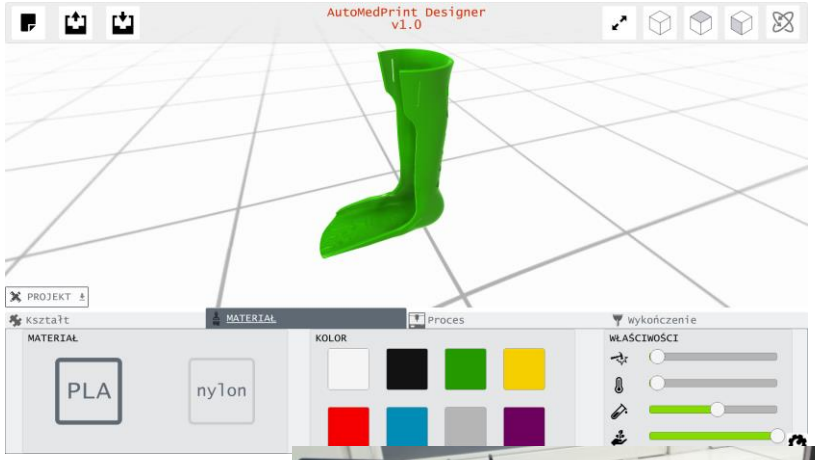
CAD AND DESIGN AUTOMATION

- intelligent CAD models
- easy change of variants for one patient
- replacement of data from a 3D scan for different patients
- standard variant generation time: ~5 minutes

VIRTUAL REALITY – DESIGN AID



3D product configurator

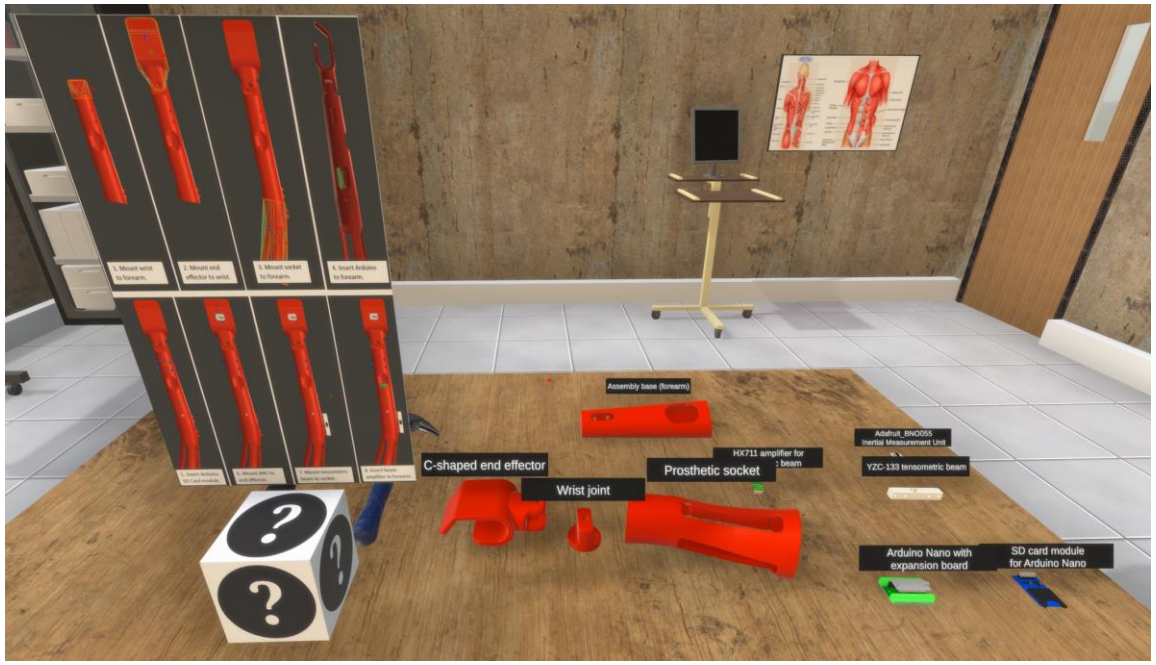
immersive VR simulation and testing in the design phase

VIRTUAL REALITY – TRAINING AID

View and explore these applications at EMERALD virtual e-learning platform

https://my.matterport.com/show/?m=NXHcatKcdW7

training of system use



training of product assembly

3D PRINTING

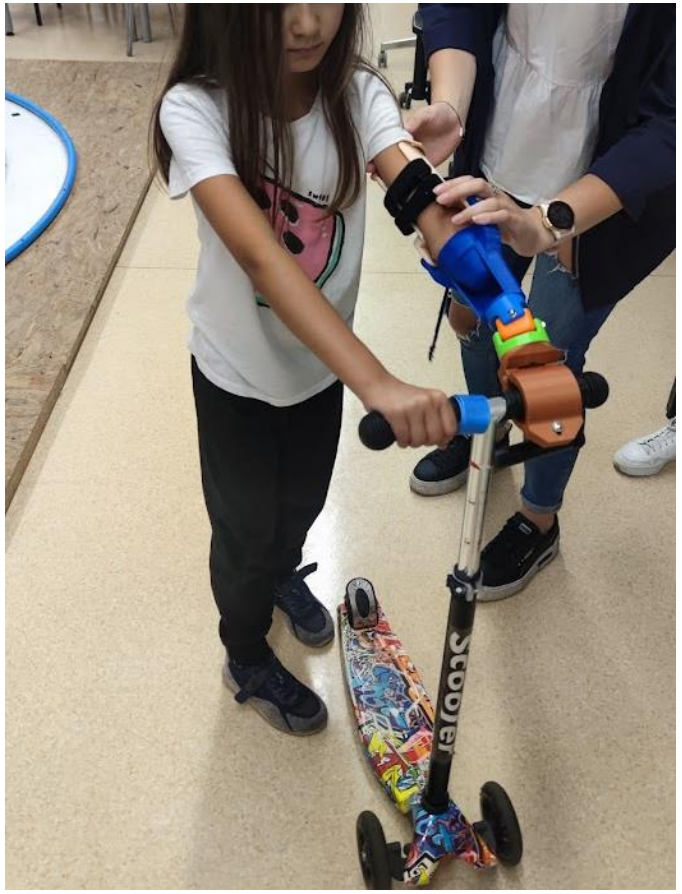
Virtual EMERALD laboratory available at
https://my.matterport.com/show/?m=NXHcatKcdW7

FDM printers – standard (cartesian)

FDM printers – Delta

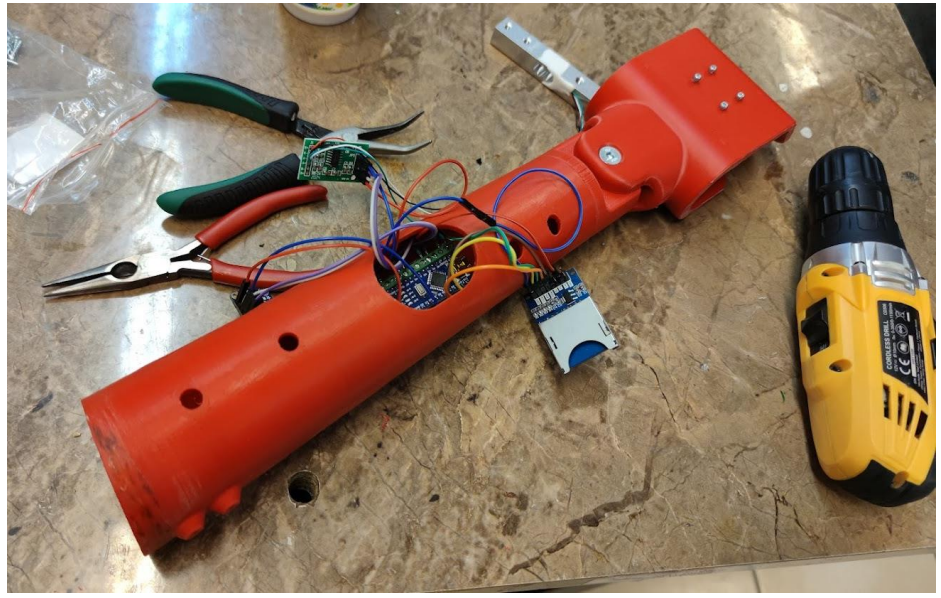
PATIENT TESTING

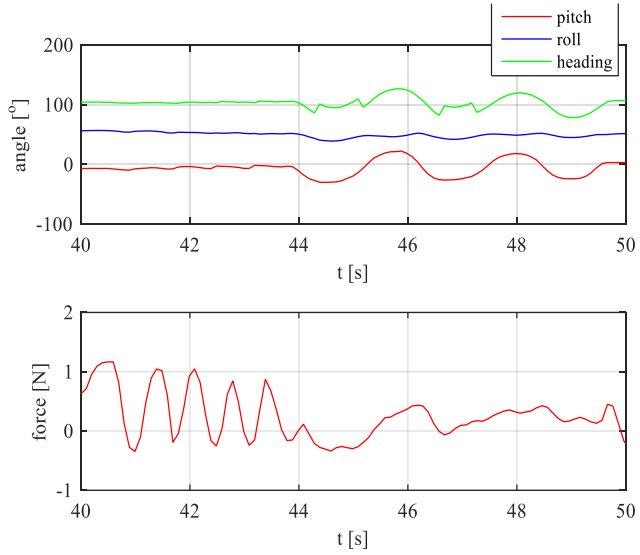

LET'S
ROLL


Scooter


JUNGLE STYLE

MECHATRONIC CONVERSION – CASE #1 SENSORIZATION

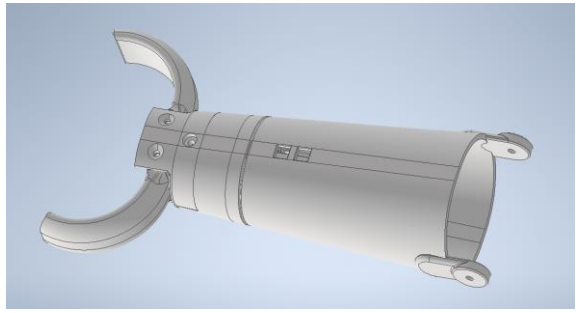


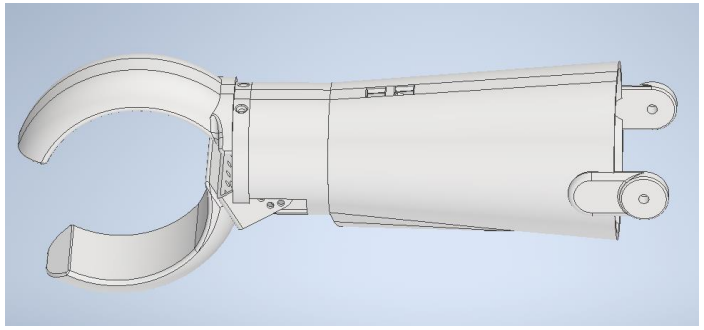


- simple and low-cost mechatronic solution added for gathering data from the bicycle ride
- gathering of data will help improving the construction and process

MECHATRONIC CONVERSION – CASE #2 ACTUATION

test patient (mechanical prosthesis)





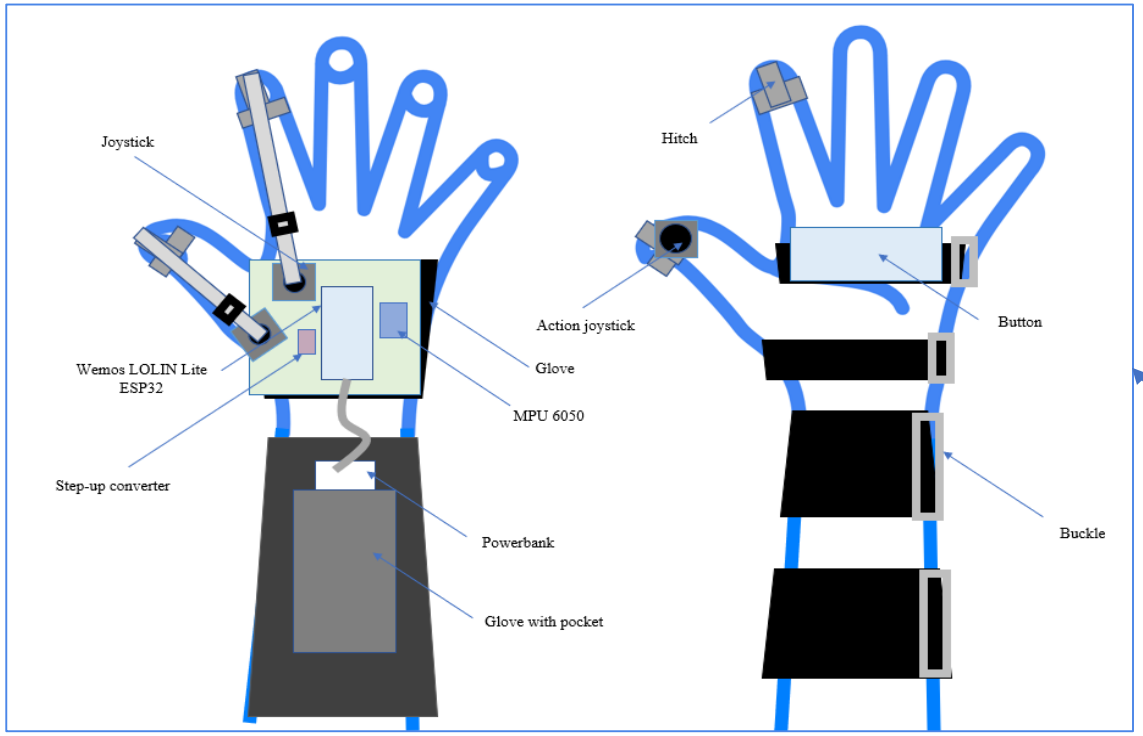
two designs of actuated prosthesis:

1) DC motor, wormgear, two-sided opening
2) servo, one-sided opening

additional wrist rotation in both variants

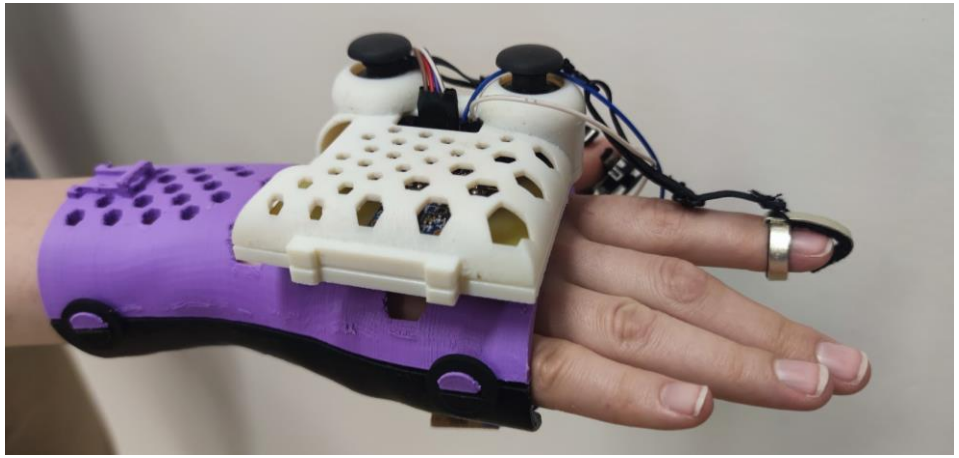
manufactured prototypes

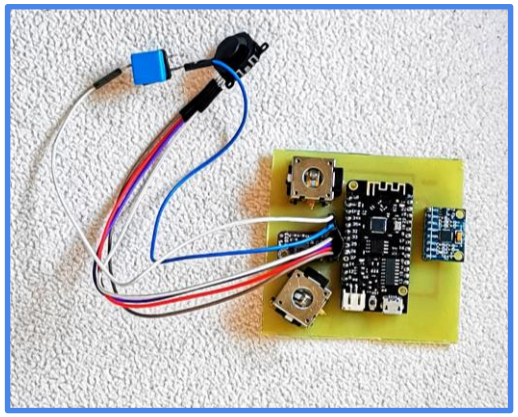
MECHATRONIC CONVERSION CASE #3: SENSORIZATION AND GAMIFICATION



- for better rehabilitation process of patients - gamification approach
- use of VR application with set of exercises
- use of corrective 3D printed orthosis as a game controller – conversion to mechatronic device

ORTHOSIS FOR VR GAME CONTROL - IMPLEMENTATION

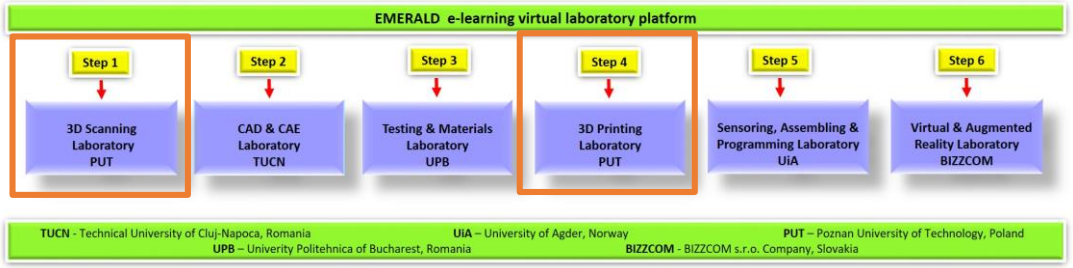


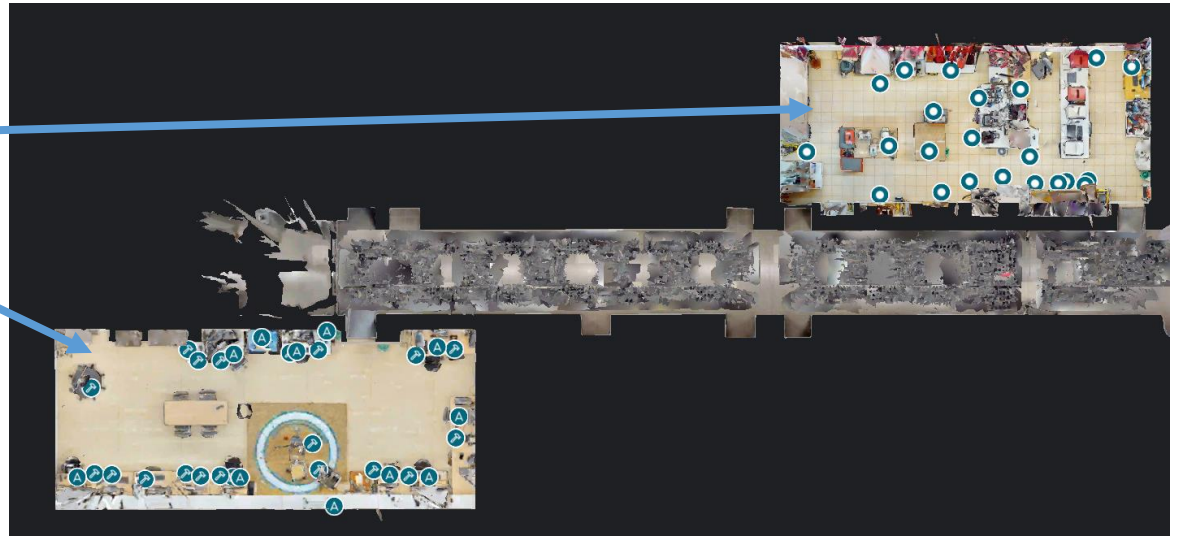


- orthosis equipped with own motion controller with joysticks
- additional motion tracking via Vive Tracker 3.0
- VR application for HTC Vive

EMERALD VIRTUAL E-LEARNING PLATFORM – POZNAN UNIVERSITY LABORATORIES

- direct link: https://my.matterport.com/show/?m=NXHcatKcdW7
- also through project EMERALD website
- 3D printing laboratory
- 3D scanning and VR laboratory
- contents: VR applications, teaching materials, videos, instructions





Thank you for your attention!

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automedprint.put.poznan.pl