

Horzim Research to Business (ex-TUTL) project Final report attachment

Commercialization research of highly realistic equestrian simulator

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Research to Business funding is intended for public research groups and researchers in public research organizations, who want to build new business based on their research and make it real by commercializing their idea.



RESEARCH TO BUSINESS

FUNDING FOR PROJECTS PREPARING THE COMMERCIALIZATION OF THE
RESEARCH BASED IDEA AND PROMOTE ITS DEVELOPMENT AS A NEW BUSINESS
AT THE SAME TIME.

BUSINESS
FINLAND

LUT Universities

LUT University and the LAB University of Applied Sciences compose the high-level, curious and dynamic university group LUT Universities.

LUT is an international science university that conducts strong academic research and provides higher education based on that research. LAB is a higher education institution that specialises in innovation, business and industries. It provides education driven by the needs of the working world and carries out applied research, development and innovation activities and artistic activities.

LUT's research focuses on energy, air, water and responsible business. LAB's education, research, development and innovation specialise in the circular economy, design, the commercialisation of innovations, and health care service innovations. LUT and LAB also collaborate in education and projects in these focus areas.

We are stronger together on the green campuses

The growth strategy of LUT Universities focuses on international student recruitment, education export, new continuing education solutions and paths, and impacting industries.

The education community has 14 000 students and employs 1 500 experts in total. We share campuses in Lahti and Lappeenranta and university services and information systems that support our core activities.

What are the project's goals and expected concrete results?

Project goal is to develop realistic & cost-efficient horse simulator platform which can be used for business activities leading to a new spin off company.

Sufficiently capable proof of concept is absolutely necessary to attract the potential customers.

Based on initial research horse simulator market is global and Finnish based company would be strong exporter of simulation platform and services that would strengthen Finnish economy on longer timespan by providing jobs and utilize local supply network. Ideally the new equestrian simulator platform will form an efficient and safe horse-riding training tool for both the beginners and novice riders.

The possibilities for other simulator usages are also present as one of the main research areas is the development of different horse movements and creation of different scenarios which provide multiple opportunities. For example, the horse owners could log in their own horse with newly developed sensors and transfer data model into the simulator which would allow precise training before competitions. The realistic simulation will also involve a head movement and some algorithms for personal training is possible to be developed.

The development phase will be backed by **market research** and **business feasibility study**, which will include customer need assessment, positioning on the market and development of profitable business model.

Work packages (1.5.2019 – 31.8.2021)

WP1: MARKET RESEARCH

- Evaluating the operational environment
- Mapping and contacting potential customers
- Assessment of customer needs and requirements
- Competitor analyses
- Defining actions for market penetration
- Positioning in the value chain

WP2: BUSINESS REQUIREMENTS RESEARCH

- Evaluating the buying process of the potential customers
- Identifying key partners and planning the co-operation network
- Identifying other actors in the value chain
- Study and comparison of different business models
- IPR-analyses
- Defining the financial requirements for business creation

WP3: INNOVATION TECHNICAL DEVELOPMENT

- Design and optimization of the novel high performance motion platform
- Set up of the experimental motion platform and motion tests
- Measurement data collection from real horses
- Building and testing the high performance platform against measured data
- Novel horse neck design and construction
- Development of portable interface devices for rider aids
- Configuring a test benchmark for proof of concept validation

DATA FLOW & COLLABORATION

Main tasks of work packages summarized

Market Research

- User needs and requirements
- Quantitative and qualitative analysis
- Business model & market entry concepts analysis & calculations (workshops)
- IPR research (100s patents etc.)
- Ecosystem & value chain analysis

Networking

- Visiting partners and fairs
- Cold calls to potential users and customers
- Investors & partners search

Technology testing PoC

- User needs and requirements
- Technical requirements
- Simulations and validations with users
- Competitor benchmarking
- Manufacturing and critical components supply chain analysis



DATA FLOW & COLLABORATION

Joint project 753 586 €, two separate budgets

LUT	TOTAL
Wages and salaries	145 000
Indirect personnel costs (46%)	66 700
Overheads (71%)	150 307
Travel	11 500
Material and supplies costs	25 000
Machinery and equipment costs	0
Purchased services	0
Other costs	0
TOTAL	398 507
Business Finland (70%)	278 955
LUT (30%)	119 552
TOTAL	398 507

Salaries biggest part
Work package item contents research

Platform development material costs, safety testing
Bolts and bigger sliders, some CNC works

LAB / SUAS BUDGET	TOTAL
Wages and salaries	109 379
Indirect personnel costs (65,6%)	71 753
Overheads (60,7%)	109 947
Travel	10 000
Material and supplies costs	24 000
Machinery and equipment costs	0
Purchased services	30 000
Other costs	0
TOTAL	355 079
Business Finland (70%)	248 555
SUAS (30%)	106 524
TOTAL	355 079

Services costs included communication service,
platform related software installations

Possibilities of HORZIM motion platform

Transfer of real horse
movement pattern into
simulation

Optimal riding position
training in monitored
environment

Realistic motion platform

Real time interaction
between rider and
simulator

Horse head movement
pattern

Customized software
possibilities for different
user groups

1.

Training & practise

SAFE training
Learn optimal riding posture
Virtual training
Games like Polo, cricket, horseball
etc.

2.

Physiotherapy

Welfare of the horse
Correct muscle
development

3.

Entertainment

Direct integration into existing
horse simulation games
"golf"-training analogy

Organisation and team

LUT

Heikki Handroos,
Project leader,
advisor

Ming Li,
Project manager
Work Package 3

Ivan Kulagin,
mechanical design

Amin Hekmatmanesh,
software design

Vadim Fadera,
horse body analysis

Amirali Abdolzadehgan,
Embedded design work

LAB

Pasi Juvonen,
Project leader,
advisor

Alexander Matrosov,
Project manager
Work Package 1 & 2

Hannes Lainio,
market analysis
Iida Laukkanen,
UX integration research
Mäkelä Elisa,
user needs & physiotherapy POV

Juho Juutilainen,
market analysis
Andrei Pyykkö,
mechanical design work
Asko Kilpeläinen,
Xsens suit testing

Biggest challenges

Project succeeded well in achieving project goals, four months extension was applied to guarantee more value in business research

COVID19 was main big challenge, difficulty in travels, users testing, delivery effects, general lab working environment slower due to restrictions

LUT Project deliverables

A fully programmable Proof of Concept (PoC) has been tested and verified **closely in customer interface**

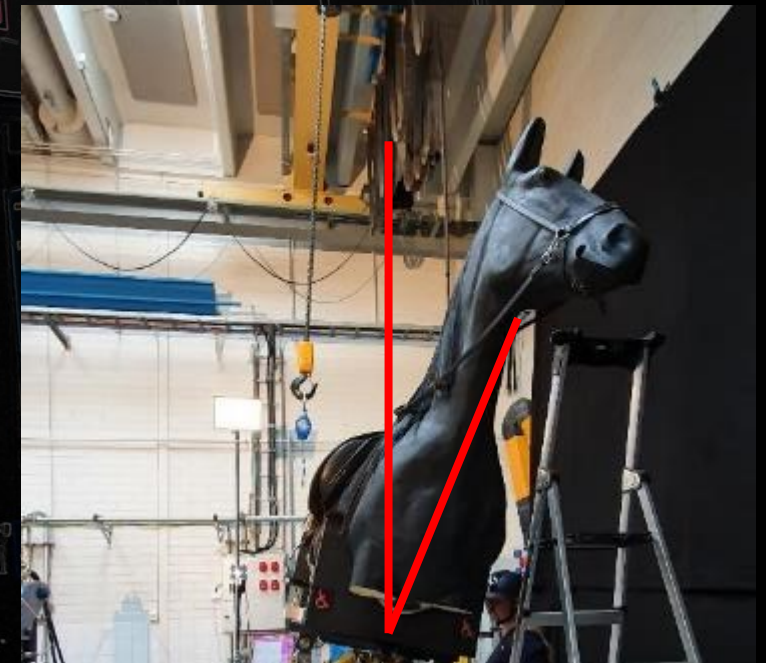
A fully programmable PoC here means individual horse motions can be measured and implemented realistically by PoC, and the motions can even be adjusted online on platform to present richer features of motion

PoF can perform all kinds of horse gaits, including

- walk
- trot
- collected canter
- extended canter
- gallop
- and show jump

All according to the original project plan!

Still on proofing level 😊, next actions will include cycle of product development



LAB Deliverables

Initial commercialization preparation project plan designed in LAB with LUT has been carried out and there exist **1-3 potentially viable paths to market** using projects results

Established potential partner network

Good understanding of market dynamics and power balance as well as critical components supply chain, all crucial details for establishing new business activities

New company is expected to kick off after project activity to carry on the progress

Two work packages, main goals:

WP2 -> Understanding the concept and applicable markets

WP3 -> Identify best ways to commercialize the project results

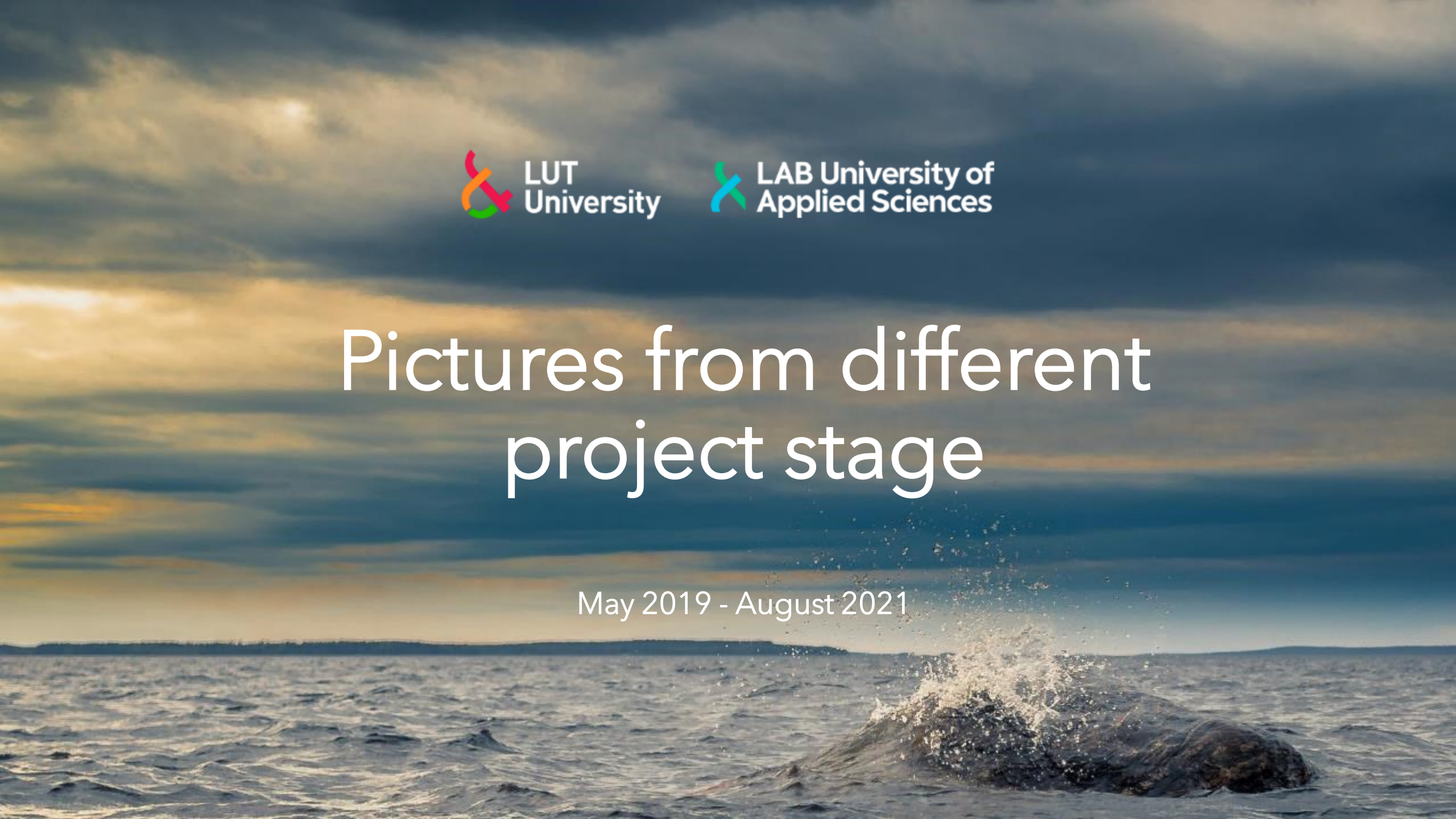
Publications

- 3 Masters theses
 - Design of robotic horse head and neck mechanism (Ivan)
 - Development of electronic system for horse-rider interaction in a simulator (Amirali)
 - Development of shell and supportive structure for a horseback riding simulator (Vadim)
- 2 Bachelor thesis's (LAB)
 - Saddle support (Andrei)
 - Making commercialization possible (Joni)
- 2 patent applications (pending)
- Blogs
 - [LAB Focus blogi: Simulaatioteknologian hyödyntäminen hevosurheilussa.](#)
- [Suunta blogi: Perinteinen maailma kohtaa uuden teknologian.](#)
 - + 1-2 to come as a final report will be written (incl. LUT Group communications)
- Videos
 - Should be visible online by end of 2021



Pictures from different project stage

May 2019 - August 2021



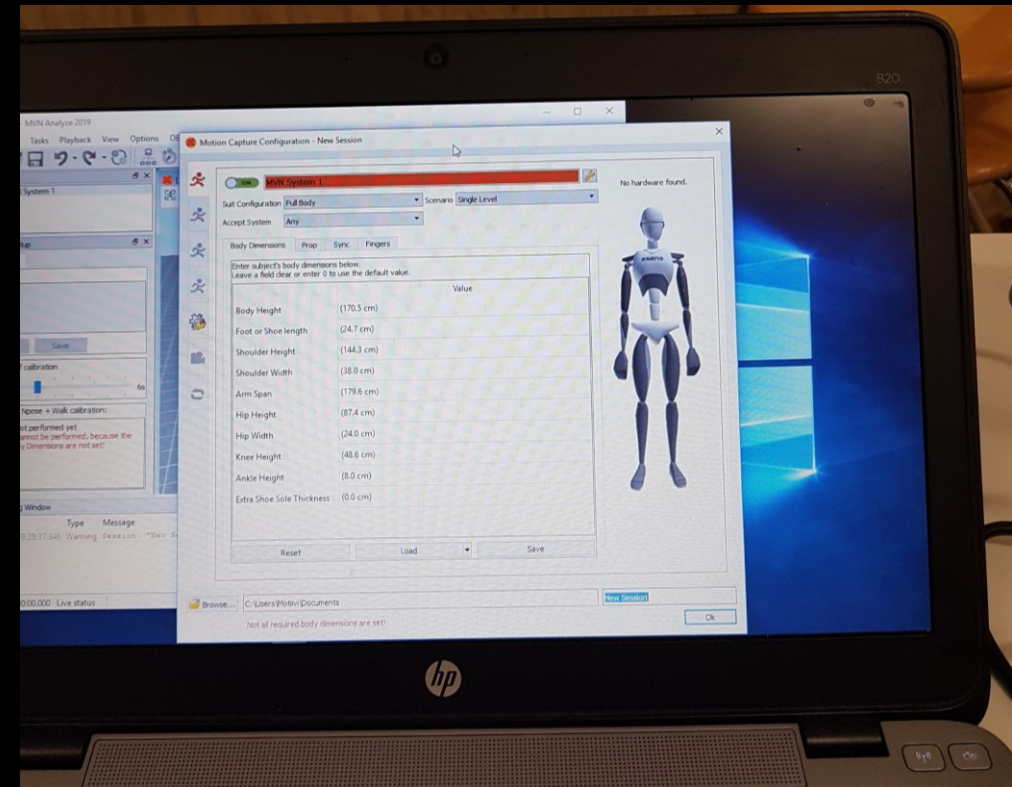
Visits

Harjun Oppimiskeskus

RC Lappeenranta



Rider measurements with Xsens suit



Initial Riding Tests



Testing with different ideas for PoC



Asko, Maria & Elisa doing
Xsens body suit



Testing the motion data collection concept

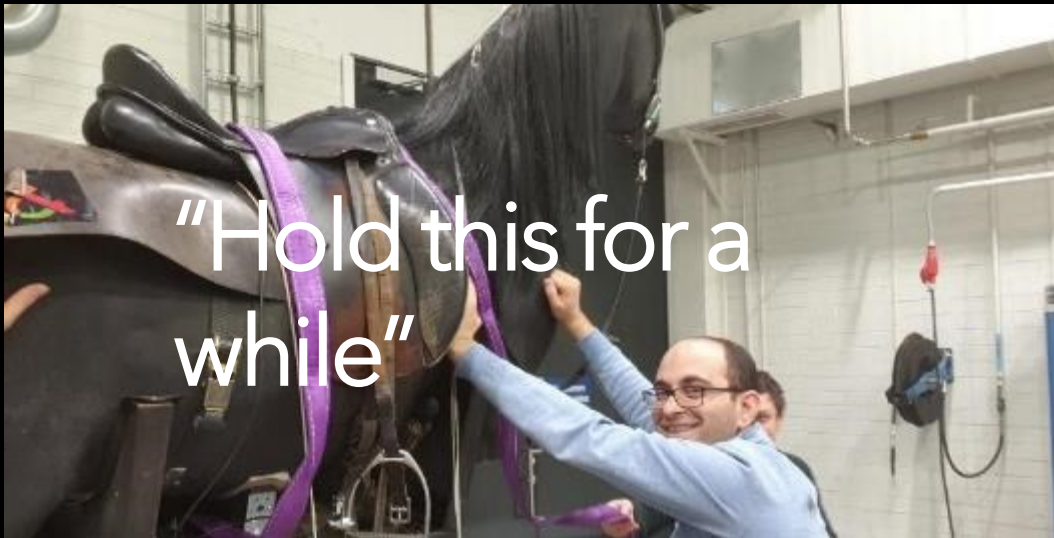


Testing the actual horse riding





Safety is a very important factor!



"Hold this for a
while"



100 KG test
Pushing the limits
of platform

31 May 2021

Harjun OPK visit, test users feedbacks



16. June 2021 – Horse motion capture session



16. June 2021 – Final horse motion capture, jump



20.8.2021 - Final user tests & jump verification



Nobody was breathing during picture 😊

and

we had masks for whole session

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