Using telepresence robots for ICT consultancy

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Telepresence robots

- A telepresence robot is a robotic system that is capable of performing certain autonomous actions, but is remotely controlled by a human to do something remotely

- TPR **represents** the operator in the room where she has to fill a real mission and that mission is personalized

- Different from videoconferencing, (semi)autonomous service robots, industry robots or vehicle operating (e.g. cars, drones) – an avatar in physical space

SOME TELEPRESENCE ROBOTS

Ava
by Ava Robotics

Ohmni
by Ohmni Labs

BeamPro
by Awabot

Double 3
by Double Robotics

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Although the demand for Information and Communication Technology (ICT) consultants is currently growing, smaller ICT consulting companies face competitive pressure from larger international consulting firms, threatening their survival. Digital transformation with telepresence robots (TPRs) could help smaller consulting firms to address this situation, by increasing consulting efficiency while retaining direct personal contact with their customers.

We explored the feasibility of consulting via TPRs to support students who in turn used TPRs to solve their pair programming tasks. In total 12 students and 1 teacher took part in the experiment. Their feedback was collected via focus group interviews and analyzed qualitatively.

ICT consultancy

Motivation for using TPRs in ICT consultancy:

- Physical presence, on-site consultation, moving around the premises, visually inspecting devices, connections etc.

- Direct personal (often informal) interaction with the customer, understanding the customer's body language, social presence

- Flexible relocation to different sites

Pro: movement and interaction

Con: limited possibilities of physical manipulation („no hands")

high demands on internet connection, movement surface, acoustics and lighting

economic profitability (travel expenses of the consultant vs TPR)

Research questions

- RQ1: What are the challenges of using TPRs for ICT consulting?

- RQ2: What are the opportunities of using TPRs for ICT consulting?

Experiment

Location	Participant	Task
University Classroom 1	Operator	Write program code
-"-	Expert's TPR	Mediate consulting Operator
-"-	Observer's TPR	Mediate observing the consultation
University Classroom 2	Operator's TPR	Mediate writing program code
-"-	Operator's partner	Write program code
-"-	Lecturer	Evaluate program code
Expert's Home	Expert	Consult the Operator
Observer's Home	Observer	Observe the consulting situation

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Simple scenario – teacher and telepresented students

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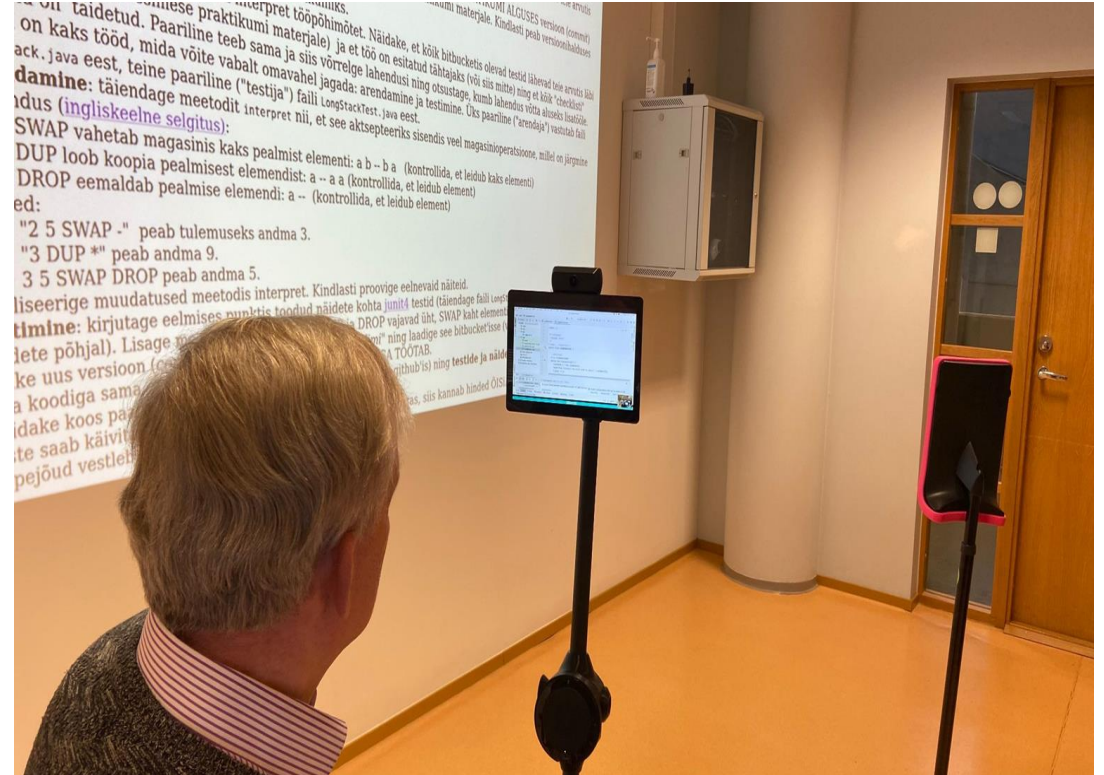
Experiment

Robots

Preparation – Janika instructs the consultants

Preparation room for students

Student with his telepresented partner

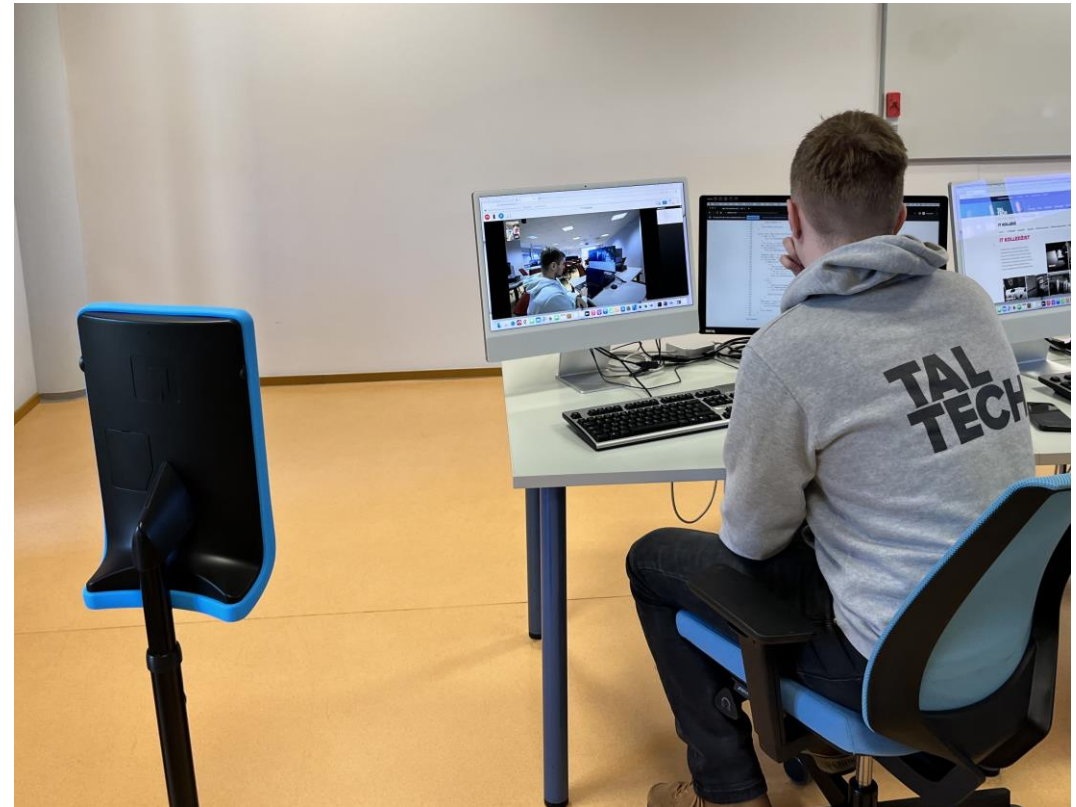# Consultation in action

Operator, consultant and observers
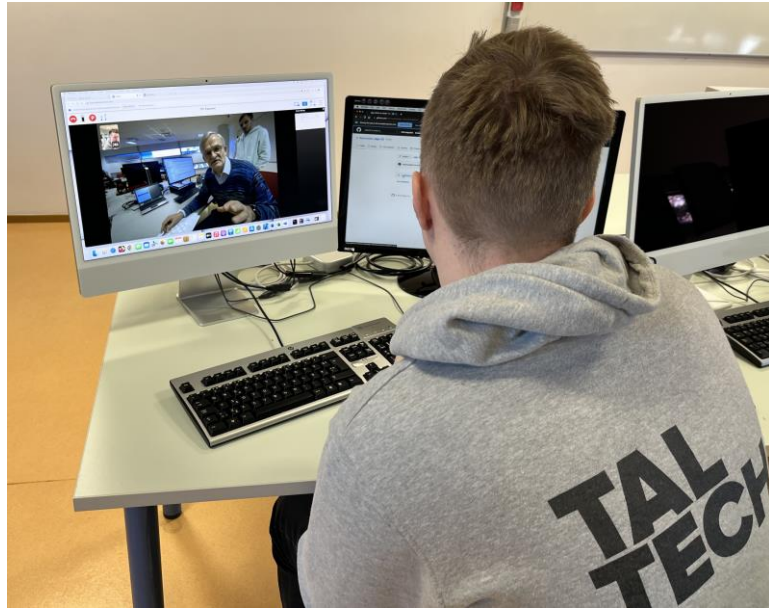

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Consultation in action

How to relocate the robot?

Presenting the pair programming work to the teacher

Different views – operator, student, teacher, observer

When the robot was not used

Students use other tools to fulfill the task

Challenges

- stress due to not being able to use fingers to command the keyboard directly

- limited hearing and seeing

- problems of audio and video, mostly caused by insufficient internet connections

Opportunities

- both Operators and Experts considered TPRs as promising tools for ICT consultation

- TPRs were easy to learn (contrary to initial expectations)

- compared to videoconferencing, TPRs can improve consultant's independence and provide better ability to supervise various activities that are taking place around a physical room

- TPRs improve social presence for TPR-mediated people, it is easier for TPR-mediated consultants to observe body language of physically present persons

- TPRs become justified when activities have a connection to the physical room, if they extend from the logical space into the physical one (for example, in lab activities)

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Triangles in teacher's workspace and student's workspace

Student, telepresented student and teacher

Telepresented student, student and student's computer

Summary

Although the use of TPRs was sometimes frustrating due to problems with audio and video, or due to TPRs' inability to manipulate physical objects, the participants found their use justified in occasions where consulting activities extended into the physical room (e.g., lab supervision).

TPRs were reported to improve social presence of TPR-mediated persons and facilitated making consulting contacts and decisions. However, for screen-based activities, the participants preferred classical methods, such as screen sharing.

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Creativity Matters research group
https://cm.taltech.ee/