PAIR-PROGRAMMING WITH A TELEPRESENCE ROBOT

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CONCEPTS

- **Pair-programming** – a useful teaching and learning method for fostering beginners' programming skills and relevant collaborative teamwork skills;
- **Distributed pair-programming** – students from different geographical locations develop and write code remotely while maintaining collaboration;
- **Telepresence robots** – a robotic body that allows a person to maintain their (limited) physical and social presence over a distance;
- **Social presence** – *the ability to project one's self and establish personal and purposeful relationships*, or *the degree to which a person is perceived as a 'real person' in mediated communication*.

THE ROBOTS USED IN THE STUDY

From left to right: Ohmni, TEMI, Double 3.

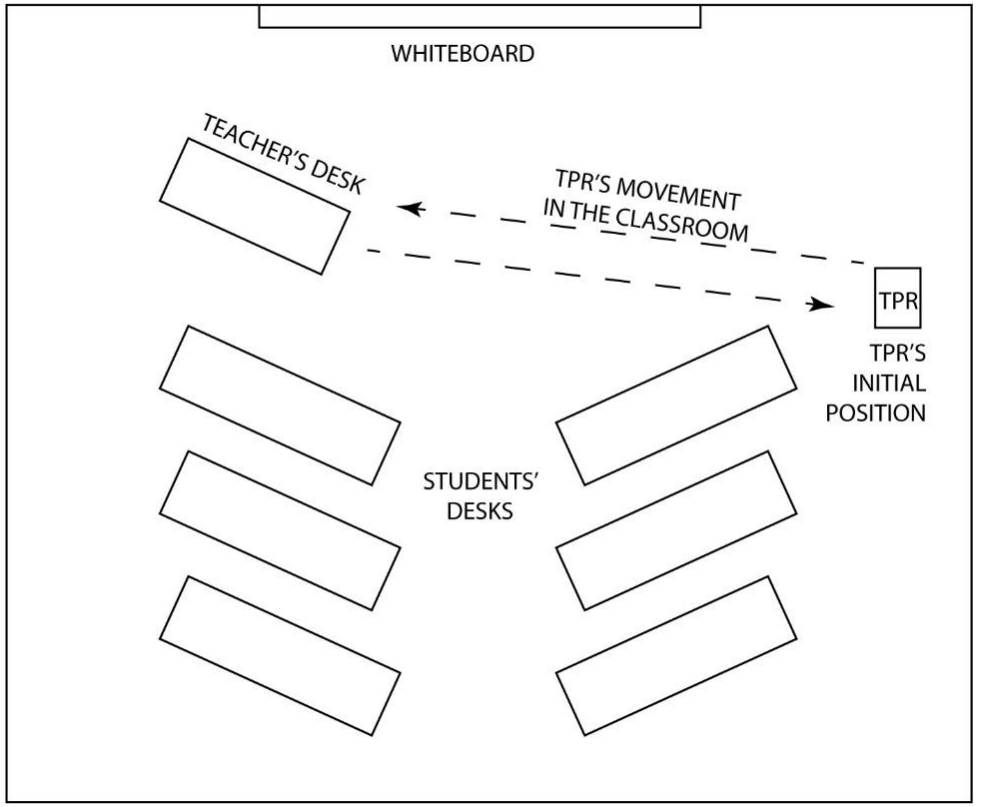
RESEARCH QUESTION

- What are the main challenges the teacher and students face while using a telepresence robot for classroom communication in a pair-programming seminar?

METHOD

- Experiment in 2 sessions
- The main course: Algorithms and Data Structures course at Tallinn University of Technology
- First session:
  - the teacher in person, 4 students via TPRs
  - students solved a task and presented their work to the teacher
- Second session:
  - the teacher via a TPR
  - all students in-person
  - students solved a task and presented their work to the teacher

METHOD



Classroom setup

METHOD

- Data collection:
  - semi-structured (Zoom) interviews
- Data analysis:
  - Transcribed with MS Word transcription service
  - Independently analyzed
  - Open-coded
  - Two researchers, coding discrepancies resolved through discussion

RESULTS

- **Preconditions**:
  - pre-planning;
  - matching robots' features with teaching needs
  - allocating infrastructure resources; adjusting teaching methods.

RESULTS

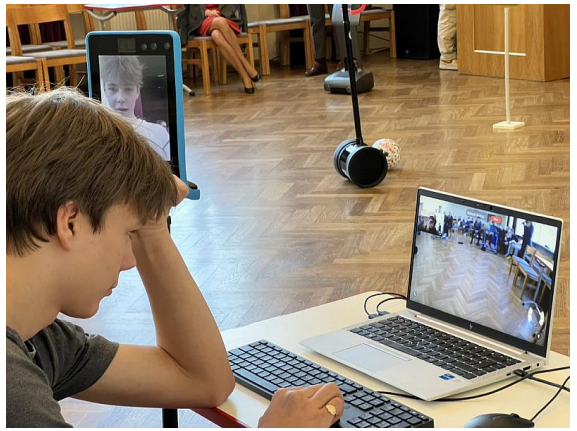
- **Justifications for use**:
  - Beneficial for students (vs reviewing the lesson later)
  - More justified for students
  - Increased social presence (able to participate in and influence the processes and discussion in the classroom), e.g.:
    - maintain eye contact
    - keep focus on the learning subject
    - facilitate active participation
  - Better for workshops and lab tasks, i.e., is more useful when there are some "missions" to fulfil in the physical room.

RESULTS

- **Robot characteristics**:
  - Camera quality and functions (resolution, auto-focus, etc.)
  - Display quality
  - Height
  - Speed
  - Movement stability
  - Obstacle detection

RESULTS

- **Problem areas**:
  - Additional time cost: initial learning about robots' features and abilities; entering Wi-Fi credentials, adjusting audio levels, developing classroom scenarios, preparing materials.
  - Need for a technical assistant to lift the robot, make necessary technical adjustments, etc.
  - Use problems:
    - sensitivity to the internet connection quality, causing loss of audio and video quality or problematically improper movement.
    - the audio settings need frequent adjustment
    - difficulties when reading texts
    - limited physical abilities (no hands)
    - limited body language



DISCUSSION

- A useful tool to enable education in certain circumstances
- Still limited (e.g., compared to Boston Dynamics' Atlas)
- Justified under certain scenarios
- Better suited for students
- Different courses may require different telepresence robot's features – i.e., different robots may be needed
- Cost may make their use impractical
- Infrastructure must match the requirements and must function impeccably
- The use of telepresence robots could
  - cause changes in teaching methods and strategies,
  - require changes in teachers' remuneration basis

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