Quantifying physical therapy with a video-based, easy-to-use tool

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Background

Current evidence in stroke rehabilitation suggests that recovery of function can be optimised with sufficient exercise therapy [1].

Physiotherapists are currently not able to reliably estimate dose and intensity of delivered interventions to their patients in day-to-day practice.

Needs Statement

An intuitive way to track and quantify patients' movements during physiotherapy sessions to accurately track patient progress and optimise treatment plans.

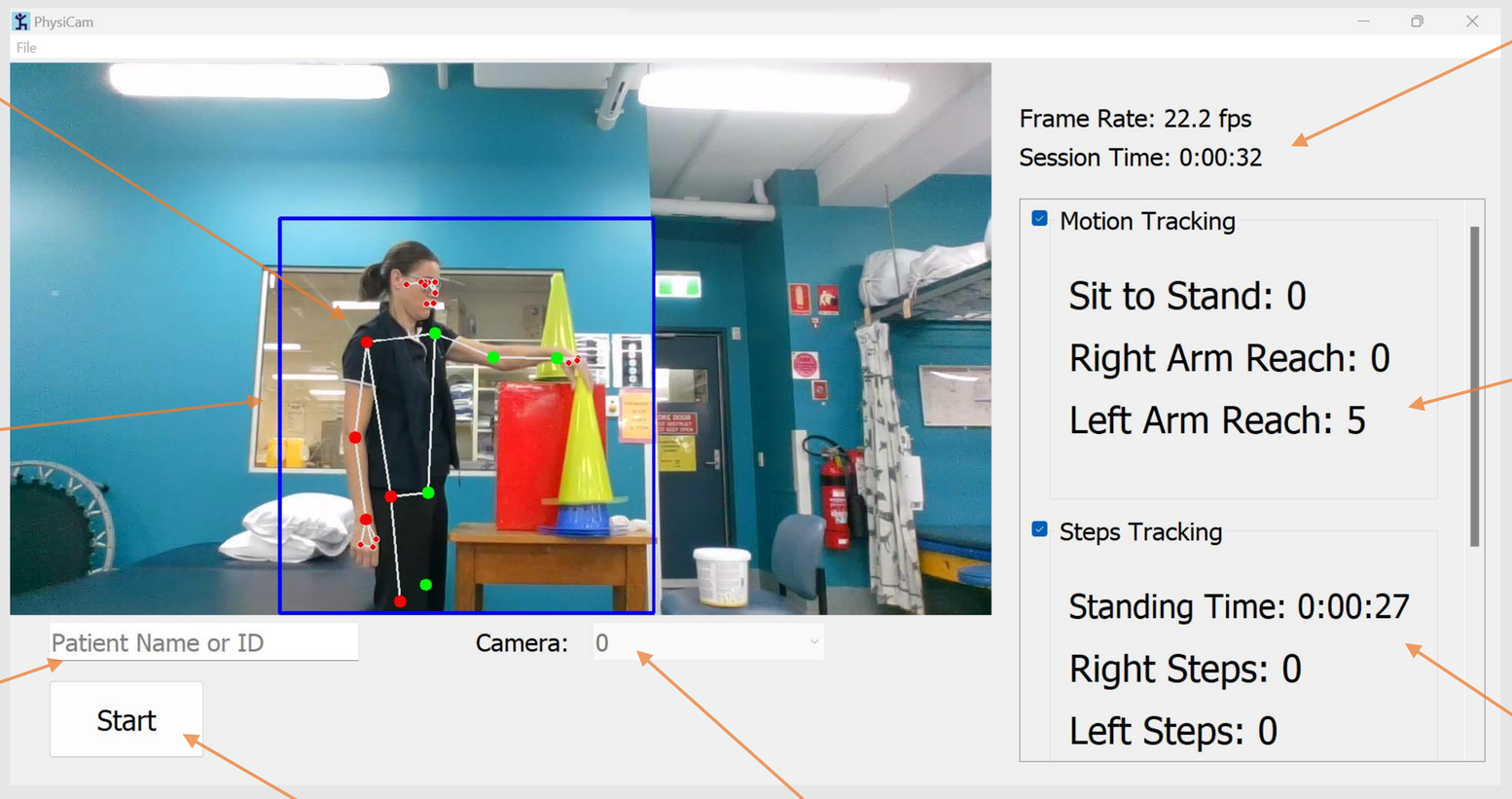
We, a team of biomedical engineers and physiotherapists, co-designed a motion tracking software tool – **PhysiCam**, to fulfil this needs statement, following 3 phases: needs refining, prototype design and conceptualization, and development.

PhysiCam Software Interface

Effortless setup and intuitive to use
Based on marker-less motion tracking via a standard webcam. Major joints and segments are overlayed on the video in real-time.

No calibration required
Automatically 'locks' on patient while disregarding other people in the background.

Keep track of patients' progress
Option to save the session under patients' name or ID number.



Simple & easy to use controls
All controls are clearly labelled and will only appear when required.

Support for multiple cameras
Easily switch between multiple cameras to change viewing angles.

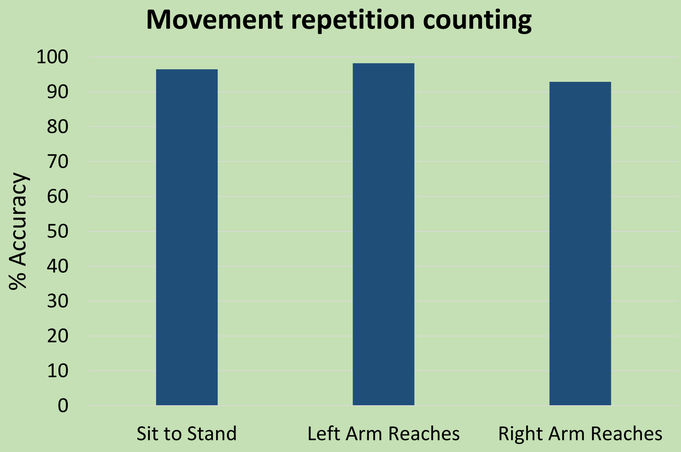
Sessions are automatically timed
The session timer allows monitoring of patients' exercise duration.

Movement repetitions are tracked automatically
Automatic tallies of movement repetitions as done by patient and detected by the tool.

Large font for convenient viewing
Tallied counts are displayed in large font, allowing monitoring of patients' progress from a distance.

Results

- Physiotherapists reported **overall positive feedback** towards use
- Users reported the tool is **"easy to use"**
- In user testing of 8 participants the system had >92% accuracy in counting repetitions



Scan for a video demo!!!

Future Opportunities

Wider variety of movements
Incorporating a wider variety of movements to give physiotherapists greater flexibility for exercise tracking and monitoring. Physiotherapists can customize movement selections based on patient needs.

Improved accuracy
Implementation of machine learning algorithms to analyse movement patterns for more accurate tracking.

Integration with wearable sensors
Integrate with wearable devices such as fitness trackers / motion sensors for more reliable tracking.

Expand to mobile app
Development of a companion mobile app to offer added convenience for physiotherapists. Patients can also use the app when exercising at home.

References

[1] Rahayu, U. B., Wibowo, S., Setyopranoto, I., & Hibatullah Romli, M. (2020). Effectiveness of physiotherapy interventions in brain plasticity, balance and functional ability in stroke survivors: A randomized controlled trial. NeuroRehabilitation, 47(4), 463-470.

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