Telehealth-Mediated Physical Rehabilitation Systems and Methods

Tech ID: 33336 / UC Case 2022-809-0

BACKGROUND

The use of telemedicine/telehealth increased substantially during the COVID-19 pandemic, leading to its accelerated development, utilization and acceptability. Telehealth momentum with patients, providers, and other stakeholders will likely continue, which will further promote its safe and evidence-based use. Improved healthcare by telehealth has also extended to musculoskeletal care. In a recent study looking at implementation of telehealth physical therapy in response to COVID-19, almost 95% of participants felt satisfied with the outcome they received from the telehealth physical therapy (PT) services, and over 90% expressed willingness to attend another telehealth session. While telehealth has enhanced accessibility by virtual patient visits, certain physical rehabilitation largely depends on physical facility and tools for evaluation and therapy. For example, limb kinematics in PT with respect to the shoulder joint is difficult to evaluate remotely, because the structure of the shoulder allows for tri-planar movement that cannot be estimated by simple single plane joint models. With the emergence of gaming technologies, such as videogames and virtual reality (VR), comes new potential tools for virtual-based physical rehabilitation protocols. Some research has shown digital game environments, and associated peripherals like immersive VR (iVR) headsets, can provide a powerful medium and motivator for physical exercise. And while low-cost motion tracking systems exist to match user movement in the real world to that in the virtual environment, challenges remain in bridging traditional PT tooling and telehealth-friendly physical rehabilitation.

TECHNOLOGY DESCRIPTION

To help address these gaps in modern physical rehabilitation, UC Santa Cruz (UCSC) researchers made iVR-based systems and methods aimed at improving lives through scalable distribution and broader access, richer user experience, and better accuracy over current approaches, such as video conference. Building on their research that showed digital game environments using iVR led to significant increases in exercise compliance (>40%), UCSC investigators developed technology that leverages the internet and iVR in combination with other digital tools such as motion tracking and capture, machine learning / neural networks, and prediction models. By recording key metrics and progress, such a system could more accurately assess and guide patient recovery. It is contemplated that therapists could leverage such technology to observe/verify therapy compliance and progress (e.g., virtually track visual movements and range of motion) and provide interactive, real-time feedback on patient exercise.

APPLICATIONS

- telemedicine/telehealth
- physical rehabilitation
- physical therapy
- software

FEATURES/BENEFITS

- scalable distribution / broader access
- richer user experience / patient motivator
- better accuracy over current approaches
- easy to customize to patient

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2023/108086	06/15/2023	2022-809

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OTHER INFORMATION

KEYWORDS

telemedicine, musculoskeletal, telehealth, physical rehabilitation, physical therapy, virtual reality, VR, immersive VR, iVR, performance metrics, machine learning, neural networks, kinematic, kinematics, software, headset, head-mounted display

CATEGORIZED AS

- **Communications**
  - Internet
  - Other
- **Computer**
  - Hardware
  - Software
- **Medical**
  - Rehabilitation
- **Sensors & Instrumentation**
  - Analytical
  - Physical Measurement
  - Position sensors
  - Process Control
- **Engineering**

Additional Patents Pending

RELATED CASES

2022-809-0

RELATED MATERIALS

▶ Powell, Michael O., et al. "Predictive shoulder kinematics of rehabilitation exercises through immersive virtual reality." IEEE Access 10 (2022): 25621-25632. - 02/28/2022

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Ligament-Based Elastic Hybrid Soft-Rigid Joints

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