Increasing Engagement in Environmental Citizen Science with Application to Telerehabilitation

Roni Barak Ventura
Maurizio Porfiri, PhD
Oded Nov, PhD
Preeti Raghavan, MD

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Rehabilitation

- Stroke is the leading cause of adult disability
- 795,000 Americans suffer a stroke every year.
  - 600,000 are first attacks, and 185,000 are recurrent
- Physical rehabilitation is administered to regain independence
  - Repeating motor tasks with high intensity at a high frequency improves rehabilitation outcomes
Technology-Mediated Telerehabilitation

- Convenient
- Accessible
- Cost effective
- Remotely reprogrammable
- Allows therapists to treat multiple patients simultaneously

InMotion ARM™ Interactive Therapy System
ARMin III Arm Therapy Exoskeleton
Novint Falcon
Motivational Interventions in Telerehabilitation

- Low compliance is observed among patients undergoing rehabilitation
- Game-like interfaces are developed for increasing engagement in rehabilitation exercises
Citizen Science

- Scientific research conducted by amateur, non-professional scientists
- Research tasks range from analyzing pictures of the galaxy to folding proteins
- Software typically incorporate motivational interventions
The Gowanus Canal

- Historically important passage for cargo transportation from and into Brooklyn
- Years of sewage flow and toxic waste have turned the Gowanus into one of the most contaminated canals in the U.S.
Brooklyn Atlantis

- A local initiative for environmental monitoring of the Gowanus Canal using a remotely controlled robotic boat, made by our lab
- The robot collects information about water quality and takes pictures of the canal and its surroundings

Photo Credit: Jeff Laut
Social Information Improves Performance

People spent longer and moved more in tagging as more tags were displayed.
Cooperative Citizen Science

- 2 tasks
  - Allocate tags, trash tags
- 3 conditions:
  - Isolated user
  - Cooperating peer, independent termination
  - Cooperating peer, joint termination
Patients engagement can be tuned through task assignment and the level of interdependence
Patients reduced speed after their peer has withdrawn

Suggests social presence encourages patients to perform better
Conclusion

Citizen science can increase engagement in physical therapy
- Patients’ self-esteem will be boosted
- Patients will be motivated to perform exercise more frequently
- Patients will perform exercise more intensely

Low-cost gaming systems increase accessibility to high quality physical therapy
- Devices are small, portable, and affordable
- Remote monitoring by medical professionals

Social interactions can further enhance engagement
- Alleviate loneliness and depression
Future Work

- Explore other low cost gaming systems
- Establish remote data collection for medical assessment by therapists
Thank you

Questions?