



Alliance for Person-centered Accessible Technologies (APAcT)

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Wearable Haptic Cyber-Physical System for Extending Motor Rehabilitation

Problem Space: Patients with loss of limb mobility from brain damage are currently serviced by costly, clinic-based therapy over extended periods of time.

Study: Design, implement and evaluate a wearable cyber-physical system for motor rehabilitation to augment therapy for stroke patients outside of the clinic. Constraint-induced (CI) movement therapy provides rehabilitation for patients who neglect use of a limb due to loss of mobility from damage to brain areas related to motor function. Since the motor disability is neurological, it may be rehabilitated through continued use of the limb, exploiting the brain's neuroplasticity.



Goals: Leverage wearable, state-of-the-art motion sensors, haptic actuators for biofeedback and remote monitoring so stroke patients may engage in increased practice and receive daily feedback affordably in their homes rather than periodically over costly scheduled clinic visit.

Increasing Participation of Individuals with Physical Disabilities in STEM Fields

Problem Space: Individuals with disabilities are underrepresented STEM fields

Study: Social cognitive theoretical framework used to develop interview protocol, survey and artifact collection; non-random sample gathered via snowball method. Questions: (1) What is the nature of critical experiences and relationships identified by individuals with physical disabilities as integral to their participation in STEM? (2) What role(s) did / do accessible technologies play in the successful recruitment and retention of individuals with physical disabilities in STEM fields? (3) What kinds of / roles for accessible technologies do these successful STEM specialists report will best support / encourage / foster the participation of today's students with physical disabilities in STEM?

Goals: to inform policy and technology development for individuals with disabilities to increase participation in STEM fields based on data gathered from STEM specialists with disabilities

SCIENCE
Geology, biology, physics, comp sci, biogeochemistry, medical, aerospace, chemistry, agronomy, fisheries, soil, hydro, veterinary, environmental, mineral resources, energy, policy

TECHNOLOGY
Geospatial, biotech, web dev & design, cyber security, analyst, programmer, IT, robotics, aerospace ed, agriculture, software, policy, development, database admin

ENGINEERING
Mechanical, aerospace, bio-eng, civil, software, electrical, geo-eng, policy, manufacturing, robotics, exploration, environmental, marine, computer, network, solar, quality

MATHEMATICS
Actuary, applied, biomath., biostatistics & epidemiology, comp sci, quant finance operations research, statistics, tech writing, auditor, risk management, analyst, policy

ABSTRACT

APAcT IGERT

The "Alliance for Person-centered Assistive Technologies" (APAcT) IGERT was recently awarded to the research partnership of Arizona State University (ASU) and California State University Long Beach (CSULB). The APAcT IGERT brings together teaching and research faculty and graduate students from computer science, engineering, disabilities studies, policy, education, public health, science and technology from ASU and CSULB to implement a novel person-centered approach to research on design, development and application of accessible technologies. Accessible technologies are those designed to support individuals with cognitive and/or physical disabilities in all aspects of their lives. The explicit goals of this IGERT include designing, developing and implementing person-centered technologies and practices in order to ensure that each person with a disability is included as a fully participating member of society. Our presentation highlights the current research projects of the first APAcT IGERT Fellow cohort. This first cohort is comprised of graduate students in computer science, policy and science education. Each project is highly interdisciplinary with implications for policy, business, education, public health, design and technology.



REFERENCES

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- [3]H. Levin, H. Eisenberg, and A. Benton, "Mild Head Injury in Sports," New York: Oxford University Press, 1989, pp. 257-276.
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User-Centric Devices for Remote Monitoring of Gait for Individuals with Parkinson's Disease

Problem Space: Freezing of gait developed through Parkinson's Disease

Study: The freezing of gait and consequent stutter steps are common symptoms of individuals who have Parkinson's Disease. Mobility issues related to Parkinson's Disease have always been difficult to treat. Conventional treatments employ medications but offer only limited symptom mitigation. Mobility therapies are significantly more successful, however they must be integrated into patients' lifestyles as ongoing therapy rather than in a limited rehabilitative program. The progress of Parkinson's related gait freezing can be detected by dissimilar step lengths as well as a shortened overall stride length. Recent research has found that using cueing devices to help establish step rhythm holds promise for reducing this major disabling symptom of Parkinson's Disease.

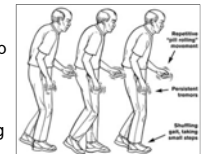


Image at right: Parkinson's patient exhibiting shuffling gait Image credit: dana.org

Goals: Develop a multipurpose user-centric device to measure step length to (a) inform the user if they need to increase the length of their steps in order to slow the progression of gait freezing and (b) report gait-data to the attending medical specialist for analysis and feedback.

Institutional Policies to Manage Support for People With Disabilities

Problem Space: Institutions must balance a legal obligation to provide accommodations for people with disabilities with practical limits on resources.

Study: The Americans with Disabilities Act and Individuals with Disabilities Education Act (ADA & IDEA) mandate that educational institutions that accept federal funds must provide various accommodations for people with disabilities. How are legal mandates enacted by the expert practitioners of the University Disability Resource Center (DRC) to become accommodations? What epistemic, technological, social, and ethical resources do the staff of the DRC draw upon in working within the broader university? How do the clients of the DRC experience their interactions with these professionals? How is the negotiation of conflicting interests managed? How are the principles of person-centeredness being applied?

Goals: To robustly describe the functioning of the disability resource center, and inform future policy development.

Ethnography
The techniques of turning the ephemera of lived experience into reliable knowledge. Ethnography has been used to understand cultures ranging from remote tribes, to underrepresented groups, to working scientists.

