Identifying Accessibility Barriers to Robotics Research

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Motivation

We spotlight the under-representation of individuals with physical motor impairments in the robotics field, as we tackle barriers which hinder participation and propose solutions to foster inclusion and empowerment in our research community.

Robotics Research

Communication Barriers

- Significant communication divide between those with personal/secondary experience of physical disability and those without
- Can lead to misunderstandings, biases, and unintended discrimination, further marginalizing those with physical disabilities
- Despite the development of accessible robotics tools, lack of outreach leaves many unaware
- Participation of individuals with disabilities in research attests to their capabilities but often gets overshadowed by communication gaps
- It is incumbent on the academic research community to address these issues, reducing individual obstacles and feelings of insecurity

- Advocacy groups can help bridge communication gaps by promoting awareness about the abilities of individuals with disabilities within the robotics community, and conveying advancements in robotics to those with motor impairments
- Highlighting the connection between individuals' disabilities and the research is essential for full involvement

Knowledge Barriers

- Knowledge barriers often arise due to limited awareness of research opportunities, especially for individuals without ties to established research institutions
- A lack of understanding about what robotics research entails also contributes to these barriers
- Individual background and interests greatly influence awareness and understanding
- Researcher-end user engagements may unintentionally obscure understanding of robotics research due to limited technical explanations
- Such strategies, aimed at preventing participant bias, inadvertently distance end-users from academic discourse and obscure the research process

Physical Barriers

- Physical accessibility is a significant hurdle for individuals with motor impairments in robotics research
- Barriers include hands-on tasks for robotics interaction, limited accessible research facilities, and demanding travel requirements
- Widely used robotics tools often lack accessibility-centric designs and require precise dexterity
- Inconsistencies between systemic and institutional policy implementations perpetuate accessibility barriers, despite guidelines such as the U.S. Fair Housing Act

- Upholding the Seven Principles of Universal Design can broaden access to robotics
- Physical barriers can be alleviated with personal resources or support networks, and the use of assistive technologies like alternative interfacing systems and robotic assistance

Technology Barriers

- Researchers should prioritize disseminating findings to both the public and academic circles
- Informative newsletters and regular follow-ups can deepen the connection of individuals with disabilities to the scientific community
- Extending outreach to K-12 education and using non-academic platforms like social media can raise awareness about potential research involvement among people with disabilities

Cost Barriers

- Individuals with motor impairments face heightened financial burdens due to additional 'disability tax' on top of the already high cost of entry into robotics research
- Additional expenses can include private transportation, prepared food, and extra healthcare and accessibility devices
- This financial strain can lead individuals to prioritize employment over higher education
- This situation perpetuates a cycle limiting access to STEM careers for individuals with motor impairments
- The existing system therefore amplifies economic disparities for those with physical disabilities

- The cost barrier can be mitigated through open-source and shared resources like community-funded maker spaces.
- Accessible educational robotic kits that are affordable (under $100) and physically accessible can foster creativity and self-confidence, reducing the initial cost of entry into robotics research for people with physical motor impairments.

Technology Barriers

- Despite improvements in assistive technologies, more innovative tools are needed to actively engage individuals with disabilities in assistive robotics research.
- These tools should aim to empower individuals beyond solely enhancing their quality of life.
- Presently, accessible software and tools often lack complete functionality compared to their less accessible counterparts.
- Examples include some Command Line Interfaces (CLIs) versus Graphical User Interfaces (GUIs).
- This limitation restricts individuals reliant on accessible versions from fully utilizing these resources.

- Robotics kits should be straightforward to assemble, using snap-on, click-in, or pressure-fit fittings, cables, and connections.
- Use of mixed reality is inevitable but needs to be nurtured with accessibility as one of its core principles (not an afterthought)
- These kits should be programmable via commonly available devices, like smartphones or tablets, to promote intuitive engagement and increased accessibility.
- Kits should be modular, allowing users to work on different projects by reassembling the blocks, such as motors, in various configurations.

Conclusion

- Don't need to know or be able to do all aspects of robotics to be a robotics researcher (none of us do!)
- Need to focus on each individual's abilities and foster their interests and strengths
- Accessibility needs to be at the core, not an afterthought
- Robotics research becomes inclusive through virtual interaction, design and simulation