

RESEARCH | STACY M. BRANHAM

Overview

My research sits at the intersection of **Social Computing and Assistive Technology**, exploring how **technologies mediate colocated interpersonal relationships, specifically how they affect the physical safety and well-being of marginalized people**. The findings of my work support corporations seeking to build accessible, universal technologies that reach diverse market segments. They also support the United States government's interest in creating a more inclusive, equitable, and economically resilient society.

When we consider how technology mediates interpersonal relationships, we tend to foreground communication technology (e.g., Skype) that connects people across a distance [4,5]. There is increasing interest, however, in the ways technology *not intended for interpersonal communication* (e.g., your phone's alarm clock) mediates *colocated relationships*--people in the same town, in the same room, or on the same sofa. **How do increasingly pervasive technologies change our interactions and relationships with family, friends, colleagues, strangers, and even ourselves?** This question captured my interest in graduate school and still drives my work today.

My doctoral and ongoing work address the above question in multiple contexts for multiple user populations. I have explored technology mediation in the home [4,5,8], the workplace [7], and public spaces [1,2,13,19] within both the transgender and disabled communities. I have also studied assistive technology fabrication [9] and mobile interaction techniques [18]. Another line of inquiry focused on ethics in design research, for which I co-organized a series of workshops [6,24-26] that culminated in a guest-edited Special Issue [17]. My early work includes technology-aided knowledge capture and reuse of video media [10], whiteboard images [3], and design rationale [15,22,23]. I publish primarily within the ACM SIGCHI, SIGACCESS, DIS, and CSCW communities.

Current Research:

Colocated technology mediation of blind and sighted individuals

Funded by: NSF EAGER (IIS-1353312, \$164,982, postdoc)
Toyota Engineering and Manufacturing America (\$190,000, Co-PI)
Published in: [1,2,7,8,16,18]

Nearly 285 million people worldwide [27] and 6.8 million people in the United States [12] have a visual disability. In recent decades, technological advancements have enabled people who are blind and low-vision to live and work *independently*. However, there has been relatively little progress towards addressing *social and interpersonal* needs of this population as regards technology. This line of research asks: **how do technologies support or hinder relationship maintenance and social well-being, particularly between people with different visual abilities?**

Building from my doctoral research on technology use by couples, I ran a study [8] to understand technology use within romantic relationships where one partner is blind. The study demonstrated that inaccessible activities in the home often caused conflicts. Further, they made it difficult to carry out joint leisure activities (e.g., watching a movie together) or do favors for each other (e.g., order a gift online). Inaccessibility in the home made it harder for partners to connect. A follow-on study [7] in workplace settings revealed that even technologies specially designed to be inclusive of people with vision impairments (e.g., screen readers) were sources of social isolation (e.g., by requiring headphone use) and unfairly projected incompetence onto blind workers.

I recently concluded a project with Toyota to inform the design of a novel wearable navigation aid. An exploratory study [19] identified route features blind individuals include in directions they email to each other. Some directions described metadata not currently available in navigation apps, including tips about cultural practice of inclusivity at the destination (e.g., "the waiters there 'get' disability"). Another study [1] considered how inevitable errors made by the device might impact adoption in various social contexts. Notably, the error itself was often less concerning than reactions of sighted passersby, who might read device errors as human inadequacy, or even put the user in harm's way. Most recently, I presented work [2] revealing blind individuals' desire to interpret other *people* as they navigate (as opposed to route or architectural features) to assess physical safety threats (e.g., "she's holding a gun"). My MIPS proposal to continue this work was recently selected for funding (\$80,000, PI). Talks with Toyota to fund a spin-off project on safety, interdependence, and trust of disabled people in disaster scenarios are ongoing.

The core contribution of this body of work is the perspectival shift from assistive technologies as solitary tools of independence, to actors in the production of interdependent social configurations. The implication is that new analytic and design approaches that incorporate the social facets of assistive technology can empower, promote equality, and positively impact the emotional and physical well-being of people with disabilities.

Future Research Direction 1:

Designing technologies for intimacy, learning, and play in blind households

Funding Opportunities: NSF: CISE - IIS - CHS
SBIR/STTR (w/ companies building domestic technologies, e.g., Amazon Echo)

People with disabilities are less likely to get married and more likely to get divorced than people without disabilities [11]. In my previous research [2], I encountered people who are blind who disclosed that their marriage faced more obstacles because their partner was sighted; the technologies and activities they wanted to do together were simply not accessible to them both. I plan to investigate opportunities for technologies to better support relationship maintenance in households in which one or more family members is blind. In addition to studying adult partners, I plan to study how parents and children with different abilities play games and engage in learning activities together. My goal is to identify opportunities for promoting family connection, build assistive technology prototypes, and run field evaluations. I have an NSF CRII grant proposal (\$165,000, PI) in submission to fund this work.

Future Research Direction 2:

Designing digital safe spaces for trans-identified individuals

Funding Opportunities: NIH (e.g., PA-18-169)
NSF: CISE - IIS - CHS
Social networking companies using gender recognition technologies (e.g., Facebook)

Novel technologies may have untold safety implications for marginalized populations. Consider the increasingly pervasive use of computer vision algorithms for Automatic Gender Recognition (AGR) based on images of faces, torsos, bodies, and clothing. My prior work [2] revealed that some blind individuals desired AGR technology to assess and respond to safety threats posted by strangers (e.g., “am I alone in the alley with a man or a woman?”). But, for another marginalized group facing high rates of violence [14], the transgender community, my MS thesis student and I found reactions to AGR ranging from “discomfiting” to “terrifyingly dangerous” [13]. This line of research will explore technical opportunities to empower transgender individuals as they navigate unsafe spaces in virtual and physical worlds. Inquiry will span software developers’ narratives of gender and safety, the digital material representations they produce, and how members of the trans community use and subvert these to stay safe. My goal is to provide critical methodological guidance for the user-centered design of technologies that have high potential to impact marginalized communities, including those with conflicting safety needs.

Future Research Direction 3:

Empowering people with disabilities in interactions with emergency responders

Funding Opportunities: NIH: NIMHD or NIDCD
NSF: CISE - IIS - CHS or SBE - SES - LSS
DOJ: COPS

My recent study [2] found that people who are blind desire access to visual information to more effectively communicate with police officers. The US Department of Justice outlines numerous challenges that arise when police encounter people with disabilities [21], who comprise nearly 20% of the US population [20]. As an example, police may interpret someone who is blind or hard of hearing as uncooperative if they do not respond to visual or aural commands. The 2015 Final Report of the President’s Task Force on 21st Century Policing notably calls for officer trainings that confront implicit bias and systemic deficiencies in the way police interact with people with disabilities, and adoption of new technologies that will help police better serve people with disabilities [28]. To address this need, this research will explore communication breakdowns between people with disabilities and emergency responders—including law enforcement and emergency medical technicians. My goal is to design and build novel technologies that support effective communication during high-stakes interactions to reduce physical safety threats to people with disabilities.

References

1. Abdolrahmani, A., Easley, W., Williams, M., **Branham, S.M.**, Hurst, A. "Embracing Errors: Examining how context of use impacts blind individuals' acceptance of navigation aid errors." *In Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '17)*, Denver, CO, May 6-11, 2017. 10 pages.
2. **Branham, S.M.**, Abdolrahmani, A., Easley, W., Scheuerman, M., Hurst, A. "Is Someone There? Do They Have a Gun?": How Visual Information About Others Can Improve Personal Safety Management for Blind Individuals." *In Proceedings of the ACM SIGACCESS Conference on Computers & Accessibility (ASSETS '17)*, Baltimore, MD, October 30 - November 1, 2017. 10 pages. *under review*
3. **Branham, S.M.**, Golovchinsky, G., Carter, S., Biehl, J. "Let's go from the whiteboard: supporting transitions in work through whiteboard capture and reuse." *In Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*, Atlanta, Georgia, April 2010, 10 pages.
4. **Branham, S.M.**, Harrison, S. "Designing for colocated couples." In: Neustaedter, C., Harrison, S., and Sellen, A., eds. *Connecting families: the impact of new communication technologies on domestic life*. Springer, 2013.
5. **Branham, S.M.**, Harrison, S.H., Hirsch, T. "Expanding the design space for intimacy: supporting mutual reflection for local partners." *In Proceedings of the Conference on Designing Interactive Systems (DIS '12)*, Newcastle, UK, June 2012, 4 pages.
6. **Branham, S.M.**, Harrison, S., Tatar, D., Nathan, L., Olivier, P., Thieme, A. "Co-creating and Identity-Making in CSCW: Revisiting ethics in design research." *In the Companion of the ACM Conference on Computer Supported Cooperative Work (CSCW Companion '14)*, Baltimore, MD, February 15-19, 2014.
7. **Branham, S.M.**, Kane, S. "The Invisible Work of Accessibility: How blind employees manage accessibility in mixed-ability workplaces." *In Proceedings of the ACM SIGACCESS Conference on Computers & Accessibility (ASSETS '15)*, Lisbon, Portugal, October 26-28, 2015. 9 pages.
8. **Branham, S.M.**, Kane, S. "Collaborative Accessibility: How blind and sighted companions co-create accessible home spaces." *In Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*, Seoul, Korea, April 18-23, 2015. 10 pages.
9. Buehler, E., **Branham, S.M.**, Ali, A., Chang, J., Hofmann, M., Hurst, A., Kane, S. "Sharing is Caring: Assistive technology designs on Thingiverse." *In Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*, Seoul, Korea, April 18-23, 2015. 10 pages.
10. Carter, S., Adcock, J., Cooper, M., **Branham, S.M.** "Tools to support expository video capture and access." *In Education and Information Technologies Journal*, 19(3) September 2014.
11. Choen, P.N. "People with disabilities are more likely to get divorced." March 2013. [Online]. <https://familyinequality.wordpress.com/2013/03/16/disabilities-divorce/>. [Accessed: Jun. 14, 2017].
12. Erickson, W., Lee, C., von Schrader, S. (2013). *Disability statistics from the 2011 American Community Survey (ACS)*. Ithaca, NY: Cornell University Employment and Disability Institute (EDI).
13. Hamidi, F., Scheuerman, M., **Branham, S.M.** "Gender Recognition or Gender Reductionism? The Social Implications of Automatic Gender Recognition Systems." *under review*
14. Lombardi, E.L., Wilchins, R.A., Priesing, D., and Malouf, D. (2001). "Gender Violence: transgender experiences with violence and discrimination." *Journal of Homosexuality*, 42(1). pp.89-101.
15. McCrickard, D.S., Wahid, S., **Branham, S.M.**, Harrison, S. "Achieving both creativity and rationale: reuse in design with images and claims." *In Human Technology*, 7(1), May 2011.

16. Metatla, O., Jouffrais, C., Bigham, J., **Branham, S.M.**, Serrano, M., Thieme, A., Kane, S., and Brulé, E. "Inclusive Educational Technologies: Emerging Opportunities for People with Visual Impairments." *In Extended Abstracts, ACM SIGCHI Conference on Human Factors in Computing Systems (CHI EA '18)*, Montréal, CA, April 21-26, 2018. *to appear*
17. Nathan, L., Thieme, A., Tatar, D., & **Branham, S.** Special Issue Editorial: Disruptions, Dilemmas & Paradoxes: Ethical Matter(s) in Design Research. *Interacting with Computers (IwC)*, 29(1), October 2016.
18. Oh, U., **Branham, S.**, Findlater, L., Kane, S. "Audio-Based Feedback Techniques for Teaching Touchscreen Gestures." *In Transactions on Accessible Computing (TACCESS)*, 7(3), November 2015.
19. Scheuerman, M., Easley, W., Abdolrahmani, A., Hurst, A., **Branham, S.M.** "Learning the Language: The Importance of Studying Written Directions in Designing Navigational Technologies for the Blind." *In Extended Abstracts, ACM SIGCHI Conference on Human Factors in Computer Systems (CHI EA '17)*, Denver, CO, May 6-11, 2017. 7 pages.
20. US Census Bureau. "Nearly 1 in 5 People Have a Disability in the U.S., Census Bureau Reports," July 2012. [Online]. <https://www.census.gov/newsroom/releases/archives/miscellaneous/cb12-134.html>. [Accessed: Jun. 14, 2017].
21. US. Department of Justice. "Commonly Asked Questions About the Americans with Disabilities Act and Law Enforcement." https://www.ada.gov/qanda_law.pdf. [Accessed: Jun. 14, 2017].
22. Wahid, S., Branham, S.M., McCrickard, D.S., Harrison, S. "Investigating the relationship between imagery and rationale in design." *In Proceedings of the Conference on Designing Interactive Systems (DIS '10)*, Aarhus, Denmark, August 2010, 10 pages.
23. Wahid, S., Branham, S.M., McCrickard, D.S., Harrison, S. "Picking up artifacts: storyboarding as a gateway to reuse." *In Proceedings of the Conference on Human-Computer Interaction (INTERACT '09)*, Uppsala, Sweden, September 2009, 14 pages.
24. Waycott, J., Davis, H., Thieme, A., **Branham, S.**, Vines, J., Munteanu, C. "Ethical Encounters in HCI: Research in Sensitive Settings." *In Extended Abstracts, ACM SIGCHI Conference on Human Factors in Computing Systems (CHI EA '15)*, Seoul, Korea, April 18-23, 2015.
25. Waycott, J., Munteanu, C., Davis, H., Thieme, A., **Branham, S.M.**, Moncur, W., McNaney, R., Vines, J. "Ethical Encounters in Human-Computer Interaction," *In Extended Abstracts, ACM SIGCHI Conference on Human Factors in Computing Systems (CHI EA '17)*, Denver, CO, May 6-11, 2017. 8 pages.
26. Waycott, J., Munteanu, C., Davis, H., Thieme, A., Moncur, W., McNaney, R., Vines, J., **Branham, S.M.** "Ethical Encounters in Human-Computer Interaction." *In Extended Abstracts, ACM SIGCHI Conference on Human Factors in Computing Systems (CHI EA '16)*, San Jose, CA, May 7-12, 2016. 8 pages.
27. World Health Organization. "Visual impairment and blindness Fact Sheet N°282," January 2014. [Online]. <http://www.who.int/mediacentre/factsheets/fs282/en/index.html>. [Accessed: Jan. 10, 2014].
28. World Health Organization. "The World Health Report 2000 - Health Systems: Improving Performance," January 2014. [Online]. <http://www.who.int/whr/2000/en/>. [Accessed: Jan. 10, 2014].