Looking Forward: Vision-Related Access and Assistive Tech
Midterm Response
Raksha Ravimohan, Tianyue Wu, Elizabeth Betts, Mithru Vigneshwara Swarna
March 26, 2018

Accessibility Research for P5.js Project

Historical Overviews

Computing has always been a highly visual process, and a great deal of work has been done on technologies that make PCs and other devices usable by those with visual impairments. At the same time, the process of programming computers without perfect eyesight has not received quite as much attention or made as much headway. Speaking generally, research going into developing languages and teaching tools don't consider accessibility in the first line development effort. New programming resources are typically launched in a visually-based form, without integration of assistive tools such as screen readers.
Our goal is to both reach out and conduct user testing with interest groups and to add more features to the P5js Accessibility Library.

Social Impact

The slow development of teaching resources has inhibited creativity and innovation and has prevented persons with low vision who are interested in computer science from pursuing higher income job opportunities in the field.

Relevant Technological Interventions

1. **P5 Accessibility:**
    a. Accessibility preferences settings
        i. Plain Text Output - This describes the visual content present in the canvas in list form. Each element can be selected so as to get more details
        ii. Table Text Output - Here the visual content in the canvas is laid out in the form of a table based on where each element is - the elements can be selected so as to get more details.
        iii. Sound Output - This mode explains the movement of the objects present in the canvas. Top to Down movement is represented by a decrease in frequency and left to right by panning the stereo output.
    b. UI
        i. Landmarks of the development environment (Navigation bar, Console Region, etc)
        ii. Shortcuts
    c. Error Reporting
        i. Lint Region (With beeping sound)
        ii. Console Region

2. **Educate Method: Microsoft Project Torino -** This is an inclusive physical programming language for children with vision impairments.This can motivate the development of programming languages specifically for children, so they can learn coding both within and outside of school. The vast majority of these existing languages require vision to either enter code (for example, through drag and drop) or experience the result of running the code (such as by watching an animation of robots moving).
3. **Multi-sensory approach -** Programming languages like Quorum/HOP, along with Sodbeans debugger have a multisensory approach i.e the information conveyed by the screen reader is replaced in order to make it more precise, concepts are explained using tactile materials and a community is created to share information and learn about coding.

Our Focus and Ideas

- Making the p5 reference accessible (Mithru & Liz)
- Adding features to the library (Raksha)
- Making and testing tutorials (Tianyue)
- Make the debugging process more clear (Mithru)

Reference

1. P5: https://gist.github.com/MathuraMG/e86666b7b41fbc8c078bad9aff3f666d
2. Microsoft Project Torino:
    a. https://www.microsoft.com/en-us/research/project/project-torino/
    b. https://hxd.research.microsoft.com/work/torino.php
    c. https://www.microsoft.com/en-us/research/wp-content/uploads/2017/03/Torino_Camera_ready_06_04_17-1.pdf
3. Quorum: https://quorumlanguage.com/learn.html

Conversation with a person who is blind about how they code
https://groups.google.com/forum/#!topic/comp.lang.scheme/ibP8pJE6ktw

Java programming tool for people with blindness
http://cs.winona.edu/cscap/papers/assets2000.pdf

Tools of a blind Programmer (look at IDEs section)
https://www.parhamdoustdar.com/2016/04/03/tools-of-blind-programmer/
https://www.parhamdoustdar.com/2016/03/27/autobiography-blind-programmer/

T.V. Raman who worked on Emacspeak and ChromeVox
https://en.wikipedia.org/wiki/T._V._Raman

Accessible languages :
https://www.washington.edu/doit/what-are-some-examples-accessible-programming-languages

Developer Problems & Issues:
Khaled Albusays, Stephanie Ludi, Matt Huenerfauth. Interviews and Observation of Blind Software Developers at Work to Understand Code Navigation Challenges. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*, Pages 91-100, Baltimore, Maryland, USA, 2017

Curriculum Resources:
https://www.washington.edu/accesscomputing/resources/teach-access
https://www.washington.edu/doit/resources/popular-resource-collections/accessible-technology

Jeffrey P. Bigham, Maxwell B. Aller, Jeremy T. Brudvik, Jessica O. Leung, Lindsay A. Yazzolino, Richard E. Ladner. Inspiring Blind High School Students to Pursue Computer Science with Instant Messaging Chatbots. In *Proceedings of the 39th SIGCSE technical symposium on Computer science education*, Pages 449-453, Portland, OR, USA, 2008.

Social Impacts:
Andreas Stefik, Christopher Hundhausen, Derrick Smith. On the Design of an Educational Infrastructure for the Blind and Visually Impaired in Computer Science. In *Proceedings of the 42nd ACM technical symposium on Computer science education*, Page 571, Dallas, TX, USA, 2011.