Making Block Languages Accessible
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In this project graduate student Lauren Milne, working with Professor Ladner, developed Blocks4All, an iOS application that is a blocks-based programming environment that is accessible to children who are blind or low-vision. The design space was explored using suggestions from the literature, advice from teachers of visually impaired children, and human studies with blind children. Details of the studies can be found in:

Lauren R. Milne and Richard E. Ladner. 2018. Blocks4All: Overcoming Accessibility Barriers to Blocks Programming for Children with Visual Impairments. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18). ACM, New York, NY, USA, Paper 69, 10 pages. DOI: https://doi-org.offcampus.lib.washington.edu/10.1145/3173574.3173643

There is also a three-minute video in the 2018 STEM for All Video Showcase that describes the project.

http://stemforall2018.videohall.com/presentations/1078

The basic goals of the project were met, that is to develop and test a tablet-based, block-based programming environment that was accessible to young children who use screen reader or switch access. Throughout the design and develop process, we worked with seven children with visual impairments and one teacher of the visually impaired to ensure that the Blocks4All application was both usable and fun to use. A number of alternative user interface ideas were tested in human studies with visually impaired children to determine the best ways for the children to interact with the programming environment. For example, from our studies, ordinary drag-and-drop ways for developing blocks-based programs are not effective for blind children. An alternative to drag-and-drop was developed that allowed the children to select with a double-tap any programming element, then locate where it was to be inserted, then double-tap to insert the element into the program. Double-tap is a standard way the iOS screen reader VoiceOver uses as a way to select or open something. To make the output of the programs created by children accessible, we had the children program a Dash robot using the application instead of typical animations that are not accessible.

With the SIGCSE award we purchased the Dash Robot, iPad and paid for user studies.