AuralStudio: A Multisensory Development Environment With a Novel, Bytecode-Compiled Programming Language

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According to the World Health Organization, nearly 300 million people worldwide suffer from visual impairments, a number which is only expected to grow in the coming years. In the U.S. alone, nearly 70% of the visually impaired are not currently employed. On the other hand, computer science, which has been enjoying tremendous growth for decades, has largely excluded several disabled groups, the most prominent of which are the visually-impaired. Current development environments and programming languages are simply not accessible enough for the visually-impaired; less than 1% even attempt to learn to code. AuralStudio seeks to solve this issue through the creation of a new programming language and a development environment that: 1) includes a novel, Turing-complete, bytecode interpreter, 2) eliminates the mouse/keyboard, 3) provides multi-sensory feedback with a control pad, 4) highlights code's inherently hierarchical nature with acyclic digraphs, and 5) redesigns error messages for brevity/clarity. AuralStudio is tested on blind and low-vision students at a flagship government school for the blind, and is shown to significantly improve programming times, reduce bugs and provide a far more accessible and immersive development experience overall. Test results indicated no statistically significant difference between development time (from file creation to output) between visually-impaired and sighted students. This project shows that given the right tools, it is possible for the visually-impaired to not only foray into software development, but to be effective, efficient programmers; this work opens several doors for those with impaired vision, and the disabled overall, so that everyone is able to participate in the software revolution.

Awards Won:
Second Award of $2,000
U.S. Agency for International Development: USAID Science for Development First Award - Education and Youth
IEEE Foundation: IEEE 25th Anniversary Award