

Project Description:

Careers in software development have long been challenging for individuals who are blind or visually impaired. Especially in modern integrated development environments (IDEs), the amount of information that a programmer must keep track of is significant. Individuals who are blind typically use voice output and/or Braille as a means of accessing information on the computer, with voice being more prominent than Braille. However, screen readers are a linear medium and thus limit the ability for a developer to randomly access information on screen as is often required when working with complex IDEs. The goal of this project is to explore the challenges that individuals who are blind face when doing software development, and to implement a technology-based solution to at least one significant challenge that a person with a vision impairment experiences performing specific tasks in software development.

For this project, you will be developing an add-on for the NVDA screen reader to address specific challenges faced by individuals with visual impairments with respect to programming. NVDA is a screen reader written in Python which supports additional functionality via Python-based “add-ons” – plugins that add additional user interface functionality with a focus on blind and visually impaired users. The scope of this effort will be based on existing work published by the clients (Dr. Guario Salivia and Dr. Flint Million) involving Braille-based interaction with a specific assembly language IDE used in some computer science education courses. This project will expand the scope of this work to include the Python programming language. The vision of the project is to further improve the experience for software developers who are blind in writing effective code and collaborating with others on programming projects.

In addition, you will work with the clients to conduct a research study exploring programming challenges faced by blind programmers. The client will provide you with a research protocol and will recruit participants for the study. You will conduct interviews with the participants, collect and analyze data and synthesize results with support from the clients. Depending on the results of this study, you may also have the opportunity to implement a solution to a challenge identified in the research by extending your NVDA add-on.

This project will involve developing or improving many valuable skills:

- Software development in Python (implement a software-based solution using the NVDA screen reader)
- Human-centered design and human-computer interaction
- Assistive technology (understand the challenges visually impaired programmers face and the tools used to aid them, use UI/UX and user-centered design principles to improve accessibility)
- UI automation techniques
- Research skills (IRB process, collecting data, data analysis)

Deliverables	Type of work	Activities	Resources	Tech Skills	Priority
IRB CITI Training	Research ethics and process training	Create an IRBNet account, complete the CITI training and upload the completion certificate to IRBNet.	CITI training, IRB, client, faculty coach	Reading, ethics, research	High
Research Study Results – raw data collection and data analysis	Research skills	Interview participants with visual impairments recruited by client following client-provided research protocol. Collect and analyze data using well-established data analysis techniques.	Client, faculty coach, IRB	Research (Data collection, Data analysis)	Medium-high
UI Design Analysis Document	UI/UX Design, human-centered design, human-computer interaction	Produce a document describing the interaction model and functionality of an add-on to enhance accessibility of programming. Must apply HCI principles.	NVDA documentation, Internet resources, client	Requirements analysis, user-centered design, user sensitivity	High
MVP	Software development and documentation	Develop an MVP of an NVDA add-on to implement a strategy for improving the experience of software developers who are blind. The add-on will implement functionalities identified by client.	NVDA documentation, development libraries selected by team with support of client/SME	Software development in Python, screen readers, assistive technology, plugin development via API interaction	High
Testing Suite	Test planning, test reporting and execution	Create unit and integration testing for the developed add-on.	Testing tools for languages and tools being used	Test planning, test execution, test documentation	Medium-low
Improved MVP based on research	Research-informed software design and development	Design and develop an improved, extended MVP that incorporates functionality identified by data analysis as important.	Data collected from research phase, client, faculty coach, Internet resources	User-centered design, client and user sensitivity, software development in Python	Low