

Designing and Developing Accessible Java Swing Applications

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Abstract. Existing development tools provide little out-of-the-box assistance in order to design and develop accessible ICT Java solutions for impaired users. Two new approximation simulation tools are presented in an attempt to achieve accessibility design and development of Java Swing applications.

1 Introduction

Information and Communication Technology (ICT) applications and systems are not fully accessible today. This is because accessibility does not happen on its own. Many developers and designers are not fully equipped with evidence and knowledge related to the accessibility of their products or services [1]. Existing development tools and packaged solutions give little out-of-the-box assistance or make it impossible to design and develop accessible ICT Java solutions for impaired users. It is important that the design and development of accessible ICT solutions can be supported in an automated fashion, as much as possible. Thus, developers and designers need tools that provide guidance to them in how to apply the accessibility principles.

This work presents two approximation simulation tools that can be used as plugins to the Netbeans Integrated Development Environment (IDE) [4] to achieve accessibility design and development of Java Swing applications.

2 Related Work

In order to verify and simulate the accessibility of a Java Swing application an appropriate approximation and simulation tool should be introduced as most of the existing tools support only web applications. Java Accessibility Utilities [2] contain a set of tools which can assist developers and designers in developing accessible Java applications. Java Accessibility Helper [3] is a graphical tool that helps software developers and test engineers examine main accessibility issues of Java applications. A Netbeans plugin called a11y [5] supports Java developers without any special knowledge on accessibility constraints to develop accessible Swing Graphical User Interfaces (GUI). Finally, a tool for simulating various vision impairments in developing Java Swing applications was presented in [6], aiding the designer/developer throughout the phases of the whole development process.

3 Developing Accessible Applications

An extension of the tool proposed by authors in [6] is being introduced in this paper. Two new plugins for the Netbeans IDE, namely "DIAS Preview plugin" and "DIAS Run plugin", were implemented. Color blindness, Parkinson's disease and various low vision impairments such as loss of central and peripheral vision, blurred vision, extreme light sensitivity and night blindness are approximately simulated.

The "Preview plugin" provides a visual design preview feature that allows developers and designers to realize how their implemented forms are being displayed. The plugin panel consists of two different window boxes that present the previewed and the simulated forms in addition to the impairment selector and the severity controls panels. Any action that happens in the previewed form box is being propagated to the simulated one. Also the developer/designer can be supported by the tool through the presentation of all the detected and possible accessibility errors and warnings of the simulated GUI form. Moreover, appropriate description of the potential problems as well as specific guidelines and recommendations on how to solve the detected problems (Fig. 1) can be presented. Thus the system user can select and fix any of the identified errors through an appropriate editor which is also responsible for handling the user's action.

Type	Rule	Recommendation / Description	Component
❌	Background Color	No red/green color combination for Background/Foreground should be used. Users with pr...	JTextArea1
❌	Background Color	No red/green color combination for Background/Foreground should be used. Users with pr...	JRadioButt...
❌	Preferred Size	The Width/Height should be increased so that users with Parkinson's disease will not have ...	JLabel1
⚠️	Foreground Color	No red/green color combination for Background/Foreground should be used. Users with pr...	JTextArea1
⚠️	Foreground Color	No red/green color combination for Background/Foreground should be used. Users with pr...	JRadioButt...
⚠️	Preferred Size	The Width/Height should be increased so that users with Parkinson's disease will not have ...	JDesktopPa...

Fig. 1. "DIAS preview plugin" error/warning list.

The "DIAS Run plugin" gives the developers/designers the ability to execute and run in real time their Java Swing applications and verify if the included functionalities and components contain any accessibility constraint. The plugin automatically simulates the focused by the user component. Moreover the plugin panel consists of the simulated version of the actually running application as well as the impairment chooser and the severity controls panels. Another interesting feature is that the plugin inherits the Look and Feel (L&F) that was set to the application by the developer. Also, the plugin respects the system preferences regarding the display of high contrast accessibility options and the mouse pointers. Finally, the "Run plugin" gives useful information on any Java GUI component with possible accessibility problems. Red rectangles are drawn on top of the simulated version of the running application, indicating the boundaries of the problematic GUI components found in the application. The designer/developer can get more details about a specific GUI component by clicking inside these red rectangles. Then, an information window will appear containing some information regarding the GUI component and why there is a problem with it as well as recommendations on how to fix it.

4 Conclusion and Future Work

In this work two Netbeans IDE plugins for simulating various impairments of Java Swing applications are presented. They can be used in order to assist designers/developers to introduce accessibility constraints at all stages of the designing and development process of Java Swing applications. Thus, the system users can overcome possible accessibility barriers and improve the overall quality of their applications in order to support the design for all methods. Various impairments as

well as different severity levels for each impairment can be approximately simulated. Moreover, useful information, recommendations and appropriate guidance in order to fix the detected accessibility problems are being provided for specific categories of impairments such as color blindness and Parkinson's. Ongoing work is currently being done in several fronts of the presented plugins in (1) improving the simulation outcome in order to support more impairments, (2) enhancing the information and recommendations provided about problematic components and (3) improve the simulation process with the introduction of specific personas for the further support of system users' knowledge.

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