

Usability Considerations on the JSIM Software Prototype

Carlos Huallparimachi Suarez
Domingo Rodríguez, Néstor Rodríguez (Advisors)

Electrical and Computer Engineering Department
University of Puerto Rico, Mayagüez Campus
Mayagüez, Puerto Rico 00681-9042
Carloshs @ece.uprm.edu

Abstract

In this paper we present the graphical user interface of JSIM (Java-based SAR image analysis tool environment). The prototype has a GUI developed using the Java programming language where it is possible to manipulate and view images using different image analysis operators. This GUI improves traditional interfaces by combining the user-friendliness of the menu and dialogue approach with programming capabilities. Also the creation of new operators is possible from existing operators using the interfaces.

1. Introduction

Image processing involves the manipulation of the pixels of one image. Various operations may be performed on the pixels of the original image to produce the new image. The purpose of image processing is to improve the visual appearance of images, or to prepare images for measurement of features and structures present.

JSIM is an application to manipulate SAR images, with this program we can view, edit, modify, create, save the SAR images using different image analysis operators. This work seeks to contribute to the free availability of image analysis tools for academic purposes.

In the sections that follow we provide a step by step description of the work presented in this article. We start with a description of JSIM prototype. We proceed with a basic introduction to JSIM architecture. We talk about the different interfaces of JSIM. Next, comes an usability user test and Results. Finally, we provide some conclusions and future work.

2. JSIM Prototype Application

JSIM is an acronym for Java-based SAR image analysis tool environment. JSIM was designed and developed using the Java programming language. Considering advances in information technologies, we envisioned to offer an open-source application, platform independent tool environment, for analyzing and manipulating SAR images.

The tool-environment presented here provides friendly user interfaces, where it is possible to search, manipulate and view images using different image analysis operators such as *filtering*, *detection edges*, *enhancement*, *convolution*, *correlation*, *FFT* (Fourier Fast Transform), as well as basic operators such as *load*, *save*, *zoom in*, *zoom out*, *scale*, *rotate* and *flip*. It allows also multiple files to be opened simultaneously for both viewing and editing. The Figure 1 below shows the main graphics user interface of JSIM.

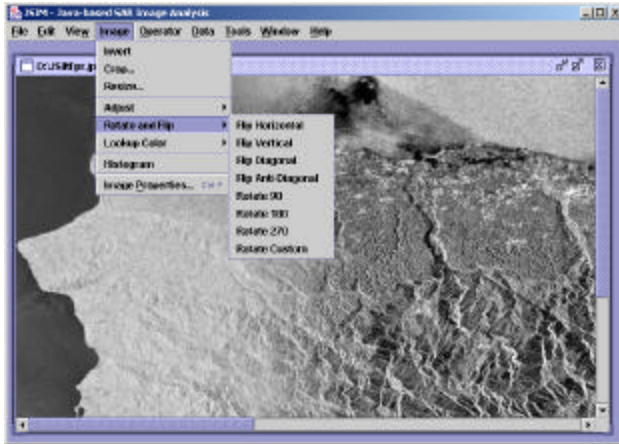


Figure 1. Graphics User Interface of JSIM.

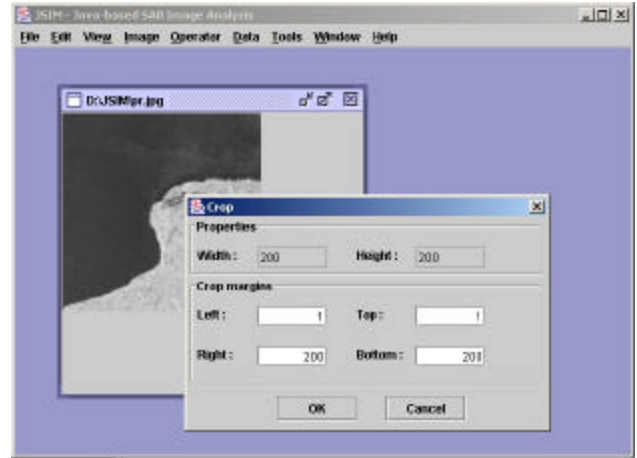


Figure 4. The Operator Crop Window.

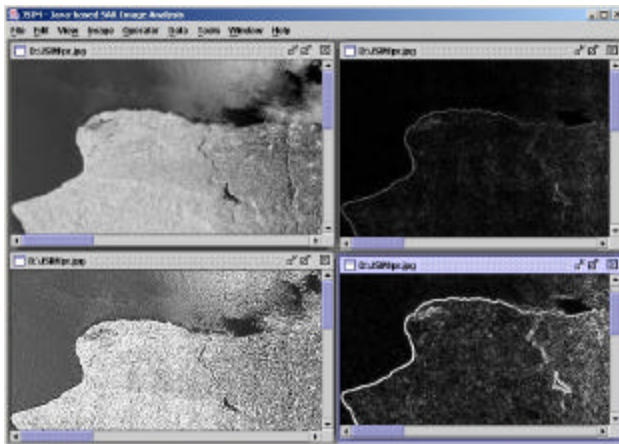


Figure 2. Interface Using Different Operators.

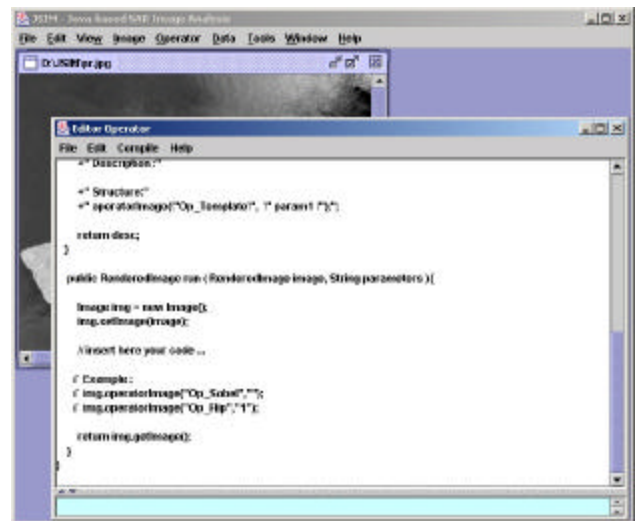


Figure 5. Create New Operator Window

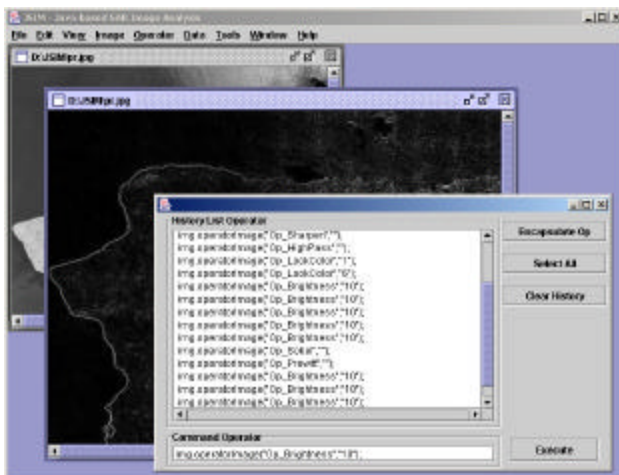


Figure 3. History List Window.

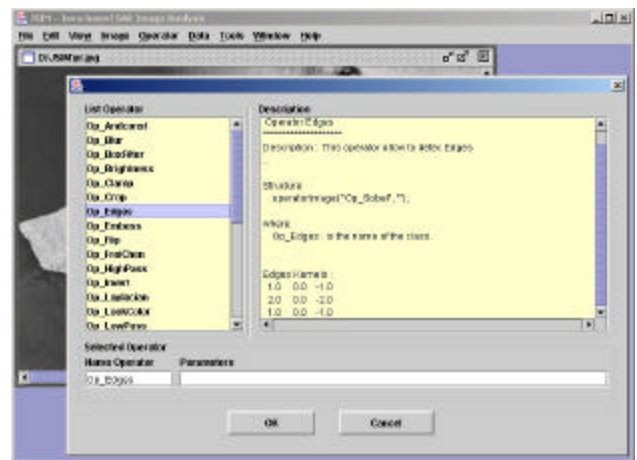


Figure 6. List Operator Window.

3. JSIM Architecture

In this work we use the client-server paradigm. Internet-based applications are built in this way, as are many high-end applications. With the client-server approach, multiple clients from a local or a remote machine can access the same application at any time. The clients have the GUI to use the operators provided in this tool. Figure 7 shows the architecture of the application to be used through Internet.

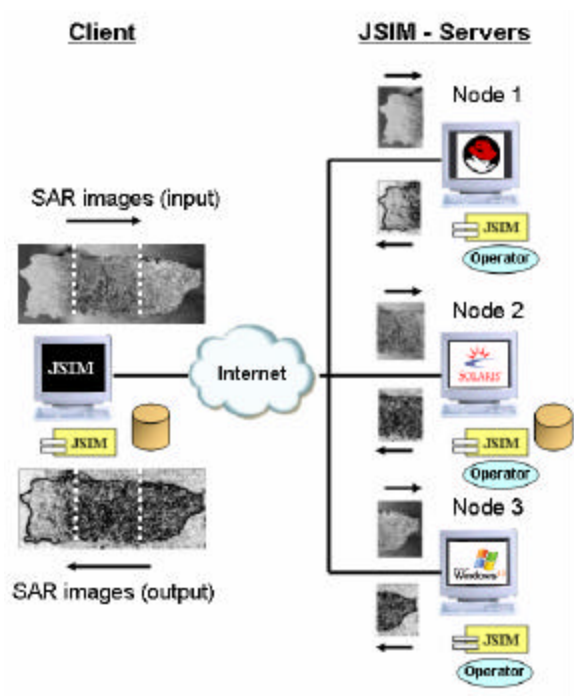


Figure 7. JSIM Architecture.

The components of JSIM are:

1. **JSIM - Server:** set of Java-servlet application.
2. **Client Access:** interacts with user application.
3. **Image Database:** contains the SAR images, these can be distributed on the network.
4. **Operators Agents:** algorithms to act on SAR images.

4. Interface to View History List

JSIM has an interface to view history list operators. The operators are classified in four groups.

The creation of new operators is possible from existing operators which have been initially defined as default. The new operators are encapsulated as a sequential command. The advantage and value adding of this option is the economy of time, when reusing a set of operators.

5. Interface to Add New Operator

For the unique option or feature of adding new operators to the tool-environment, a template class was designed as shown in Figure 8. Using this template class the users can create their own algorithms to analyze SAR images. The new operators can be added to the system as part of the library of operators. When the users want to use their operators the system will invoke them dynamically once they have been compiled and attached to the system. The system provides for the interchange of operators among users.

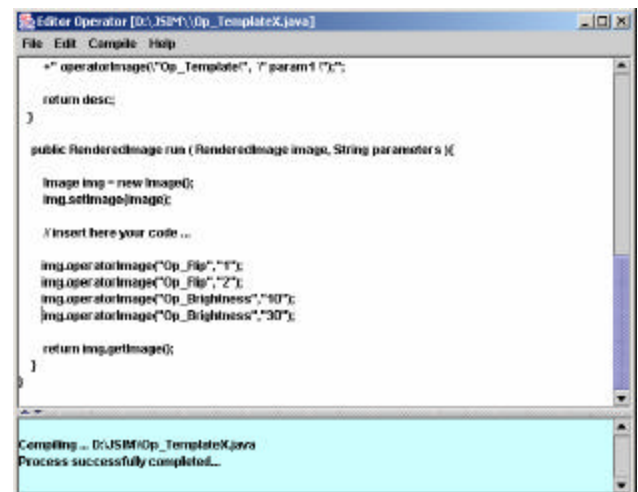


Figure 8. Interface to create new operators.

6. Usability

The user interface is important to a software system's usability. A good interface design and help systems increase user productivity, affective and decrease training.

6.1. Test Goals

- Determine the capacity of JSIM prototype to manipulate and analysis SAR images.
- Establish if the users understand the functionality of the interface.
- Determine the creation the new operators using the environment.
- Evaluate user satisfaction with respect to the system.

6.2. List of Task

Figure 9 shows the User Cases of JSIM, in this diagram we can observe the different tasks and/or actions that is possible to used.

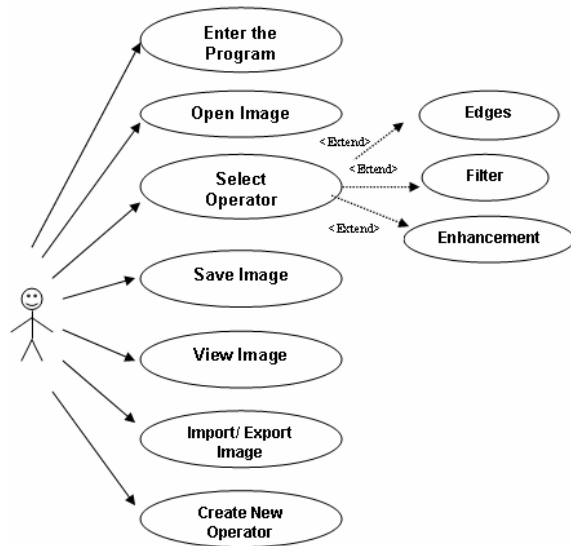


Figure 9. User Cases of JSIM.

7. Conclusions and Future Work

The main purpose of the proposed usability test is that the user just focuses his attention

on the analysis of the images through this application. The objective is that the user doesn't spend time on training or trying to figure out how to perform a given task. All users' attention must be on creating new algorithms with out any difficulty caused by the application interface design. This test is intended to reveal all vulnerabilities of the graphical interface. Once all vulnerabilities are identified, the application will be redesigned to fulfill all deficiencies founded.

References

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- [2] Dilia Beatriz Rueda, Domingo Rodriguez, "A Sar Algorithm Development Environment Using Matlab", CRC 99 Computing Research Conference, Mayaguez, Puerto Rico, December 1999.
- [3] Carlos Huallparimachi, Domingo Rodriguez, "Java-based Tool for Synthetic Aperture Radar Image Analysis," IEEE Proceedings of the 3rd International Symposium on Image and Signal Processing and Analysis, ISPA03, Rome, Italy, Sept. 2003.