

# NeatVision - Visual Programming for Computer Aided Diagnostic Applications

[Keynote Address]

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With the ever-increasing capabilities of medical scanners, the quantity and quality of data to be handled is increasing significantly. Computer Aided Detection (CAD) / Diagnostics (CADx) is one possible way to deal with such information overload as it assists radiologist undertake their tasks in an increasingly pressurised work environment. This talk will begin by introducing a range of CAD / CADx applications undertaken by the Vision Systems Group at Dublin City University to illustrate how such systems can be employed in this support role.

It is clear that the development of robust and accurate CAD / CADx tools relies heavily on the incorporation of computer vision techniques into the imaging task. The development of such computer vision based CAD / CADx tools is not a trivial task and requires significant expertise and high quality easy to use development tools, and it is this latter issue that will be the main focus of this talk. One approach to this task is through the use of visual programming to develop the necessary computer vision modules for CAD / CADx, such as those dealing with the analysis of shape, colour (for standard imaging applications) and texture. Extracting useful information from images is a difficult task and as such requires a flexible application development environment. The visual programming environment outlined in this talk (NeatVision) is one such system. It aims to provide novice and experienced CAD / CADx developers with access to a multi-platform (realised through the use of Java) development system. The NeatVision environment provides an intuitive interface, which is achieved using a drag and drop block diagram approach (see Figure 1). Each image processing operation is represented by a graphical block with inputs and outputs that can be interconnected, edited and deleted as required. NeatVision (Version 2.1) is available free of charge and can be downloaded directly via the Internet, see Figure 2.

While users may have had some prior programming language development experience, the level of competence can vary significantly. A number of difficulties arose from using a standard programming language (such as 'C'). From a technical perspective, it is clear that the support and maintenance of such libraries of functions for a wide range of operation systems is impractical. The multi-platform capabilities of Java led us to consider this as a viable alternative. But more importantly from a development point of view, we wanted to avoid the situation whereby novice developers spent a significant proportion of their time on the issues relating to the actual programming language. Instead we want the focus to be on the development of novel CAD / CADx approaches.

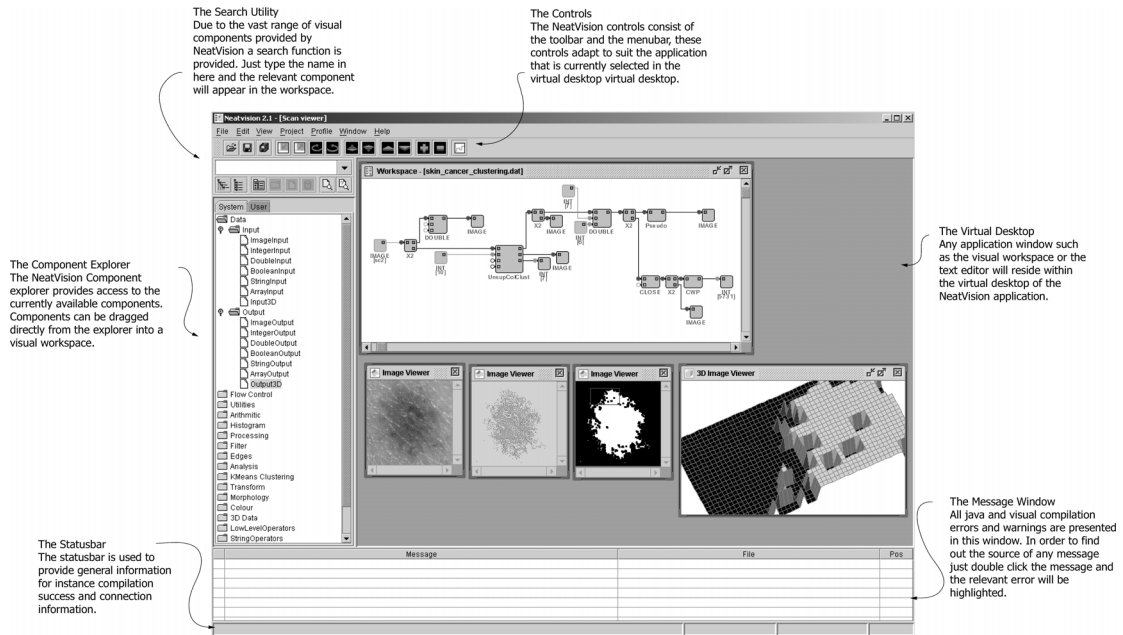


Figure 1: Key features of the NeatVision environment.

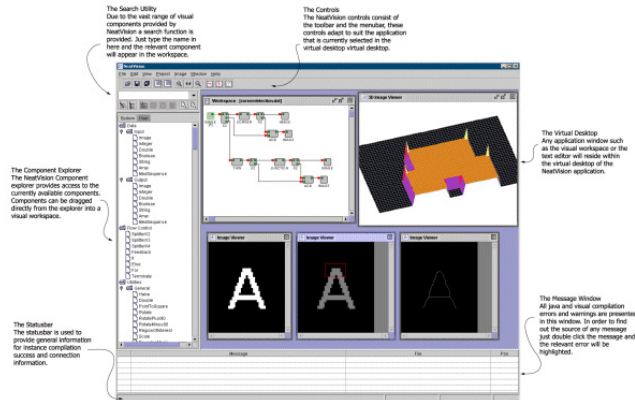


An Image Analysis & Software Development Environment

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NeatVision is a **free** Java based image analysis and software development environment, which provides high level access to a wide range of image processing algorithms through well defined and easy to use graphical interface. NeatVision is in its **second** major release. **New features include:** A full developers guide with **method listings** and **programme examples**, DICOM and Analyze medical image sequence viewers, URL control, feature fitting, supervised and unsupervised colour clustering, DCT, Improved FFT, 3D volume processing and surface rendering.

NeatVision contains **over 290** image manipulation, processing and analysis algorithms. Users can extend the core NeatVision library using the developers interface, a plug-in which features, automatic source code generation, compilation with full error feedback and dynamic algorithm updates. NeatVision is primarily an image processing application and offers an extensive range of image analysis and visualization tools (these include zoom, pseudo colour, intensity scan, histogram and 3D profile mesh). In addition, the ability to read and write a wide range of image file formats is supported.

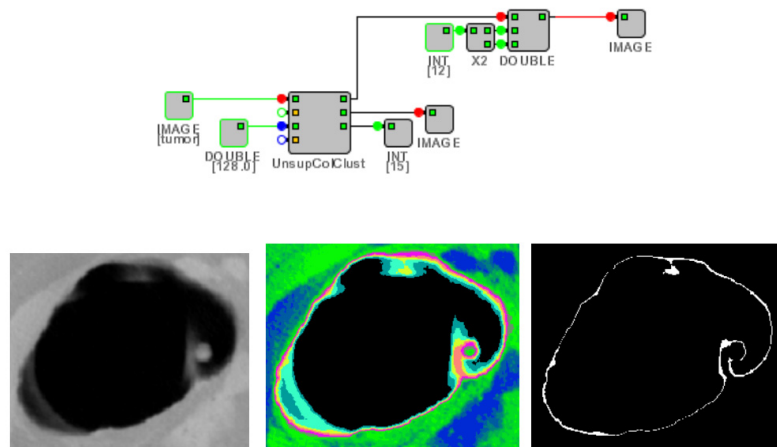


How can I get my free copy?

NeatVision can be **downloaded** and evaluated for 30 days prior to registration. Users can **register online** and a unique username and password will be automatically issued.

Figure 2: NeatVision.com web site.

This talk will also outline a number of CAD / CADx sample applications developed using the NeatVision environment. These will include: CT colon region segmentation (Figure 3), brain region segmentation and measurement, biliary tree region extraction for MRCP (Magnetic Resonance Cholangiopancreatography) and the calculation of the ejection fraction from MR cardio images. By examining these applications we clearly illustrated the power and flexibility of NeatVision as a CAD / CADx development tool.



**Figure 3:** Sample NeatVision application. (Top) NeatVision workspace. (Bottom left) Original DICOM image. (Bottom middle) Pseudo colour display of the regions automatically clusters using an unsupervised approach. (Bottom right) A single cluster region is selected and isolated.

**Acknowledgments:** This research work was done in conjunction with Robert Sadleir and Dr. Ovidiu Ghita was financed in part by the EU Fifth Framework Programme (IST: Accompanying Measures, Project OSMIA - Open Source Medical Image Analysis) and Science Foundation Ireland (SFI).

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