SCILAB: An open source software

Sonal Sarnaik
Assistant Professor
CSE Department,
ICEEM,Aurangabad

Shubhashree Savant
Assistant Professor,
Department of MCA
MIT(E), Aurangabad

ABSTRACT
Now a day's open source tools are used widely in companies, research institutions etc. This paper gives a small introduction of various open source tool and SCILAB which is an open source software with programs.

Keywords
SIVP; Scilab; Scilab functions; edge detection

1. INTRODUCTION
Open source software is a Free software that is available without any cost , anyone can modify it and distribute. It is also called as free open source software i.e FOSS[9]. Now a day's FOSS plays a very important role in research development area. Various applications run on FOSS, various Open source operating systems are also available such as Linux, Ubuntu, and Android etc. Examples of Open source software's are Open Clog, TREX, FreeCAD , Blender, Bitcon, Evergreen, Darktable, OpenAFS, OpenX, Opera Mail, Axim, GAP etc. used in various area such as Financial, designing ,Artificial Intelligence, Image Editor ,Mathematical background[5][6][7][8][9].

In this Paper we are going to discuss about open source software SCILAB which is widely used in medical area for different kind of analysis, such as to identify clots in the blood cells, blockage in the veins, Breakage in the bones etc. Scilab is open source software distributed under CeCILL license. It was designed in 80's as Computer Aided Control System Design and later in 90's it was named as Scilab where Scilab 1.1, the first released version of Scilab. Later in 2003 Scilab Consitorium was formed various modifications. Currently various versions of Scilab is freely available. There are various reasons for which this Scilab is used such as Maths & Simulation ,2-D & 3-D Visualization, Optimization Statistics, Control System Design & Analysis, Signal Processing, Application Development[3][4][9].

2. SCILAB
Scilab is an Open source tool covering various numerical algorithms which is used for various scientific reasons. Scilab has faster development processes, as the user directly accesses a high-level language with the help of various features provided by the Scilab Library[1][3][4][5][6][7][8][9].

In Scilab, user can create own functions with possibly overloaded operations. Users can also develop their own modules for solving possible set problems. Other languages such as Fortran and C can be combine to give more powerful results. It also interfaces LabVIEW, which is a platform and development environment for a visual programming language from National Instruments. Scilab tool can be download from http://www.Scilab.org. Following image give the idea of Scilab 5.4.0 tool[4][5][7][8][9].

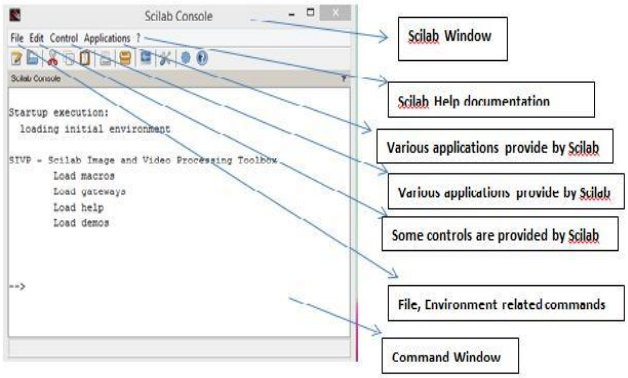

Fig.1: Scilab Tool

Scilab help is very strong, any new user can easily learn Scilab by referring this Help documentation provide in the tool itself. As Scilab is an open source tool so every day new modules are added in the toolbox which we can update from Applications. In applications Module Manager-Atoms option is there, after clicking these option atoms update its database with all the modules and user can select module as per its requirement. For example for image processing related operation one must install SIVP (Scilab Image and Video Processing toolbox) or IPD(Image processing design toolbox).Various other Scilab applications are available such as Matlab to Scilab translator, Matlab is an another image processing tool but it is not open source[9]. So one can convert their Matlab program to Scilab. Variable browser will give information about the variables used in the program. Command history will give history of all the commands. SciNotes open and Scilab program editor where we can write Scilab programs and save for future reference [1][3][4][5][6][7][8][9].

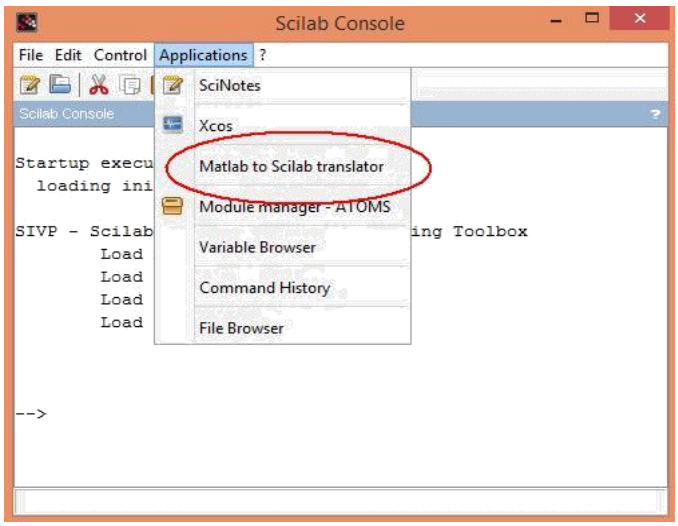

Fig.2: Scilab Features

Scilab provided various inbuilt function to read, display, write and so on to perform work on image. Following program gives idea how image is read and shown in Scilab [1] [4][5][6][7][8][9].

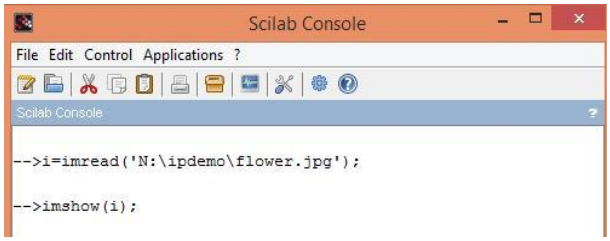

Fig.3: Scilab Command

Fig.4: Scilab Output Window

Similarly various functions provided by the Scilab can be applied on the image to get the desired output. Basically all these functions are applied on the image to enhance the image, change certain sections in image , modify the image, to get some information from the image etc. Digital Image processing gives the detail description and explains various processing techniques which are used in various applications such as in Medical, Astronomy, Educational, etc. Some of the techniques are explained in the next section.

2.1 SCILAB Functions

There are various inbuilt functions which we can use as per our requirements. Following table gives the description of such function [3][4][5][6][7][8][9].

Table 1: Scilab Basic Functions

Sr.no	Function	Use
1.	modulo(m,n)	To calculate mod
2.	primes(n)	It will give all the prime numbers upto n
3.	imread( )	Reads the image file
4.	imwrite( )	Saves the image file
5.	rgb2gray	Converts color image into grey image
6.	imshow( )	To display an image
7.	imresize( )	Resize the input image
8.	immultiply(im1, im2)	Multiply im1 and im2 image
9.	imhist( )	Gives Histogram of the image
10.	imcrop( )	It crops the Image
11.	Etc…….	

3. IMAGE PROCESSING OPERATIONS

A moment be capture through a digital camera and store in the form of image. This Image is the set of n number of pixels with unique location and some values which is responsible for its visibility in digital medium[10].So we can change, enhance, modify an image by working on pixel position or values which is present on the pixel this process is called as Image processing. There are various image processing techniques such as image noise removal, image segmentation, morphology, color image processing, edge detection, etc[1][2][3][5][10].

3.1 Image Segmentation

Image Segmentation is the process in which image will be divided in multiple segments for analysis/data extraction based on the abrupt changes or discontinuity of pixels in the image. There are two ways on which this segmentation is depend, Similarity and discontinuity. There are various methods through which this segmentation can be processed, such as Threshold based segmentation, color based segmentation, texture based segmentation etc[3][4][5][10].

a. **Edge Detection**

In image processing edge detection technique is used to find the edges/boundaries from in input image. Edge detection is based on 1st order derivative and 2nd order derivative. Following program shows how edge is identified from the input image[1][2][3][4][5][7][8][10].

Program

```
a =
imread('N:\ipdemo\sci.jpg');
g=rgb2gray(a);
e=edge(g,'sobel');
imshow(e);
```

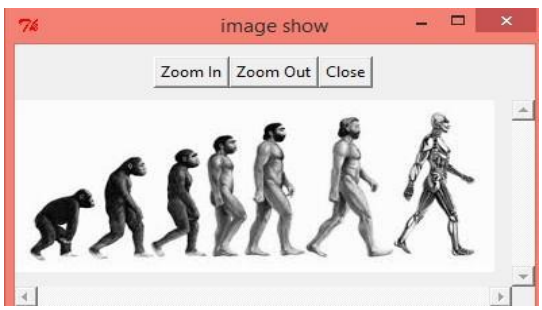

Fig.5: Output of above Program

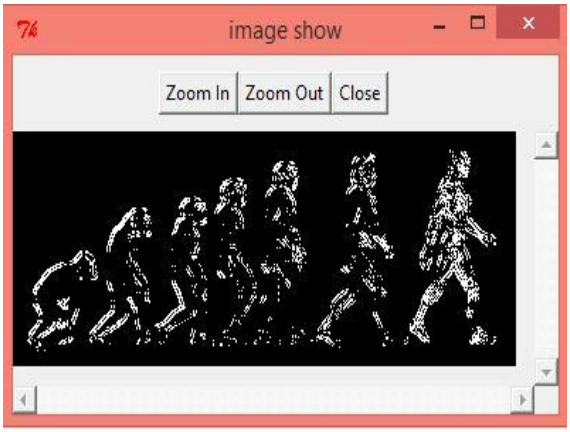

Fig.6: Image showing Edges

Some important edge detection operators are Sobel, Prewitt, and Robert. Following program gives the demonstration of such operators (on an medical image of sonography) with its possible output. This program is implemented in SCILAB 5.5.2 version with IPD toolbox [3][4][5][7][8][10].

Program

```
a = ReadImage ('N:\ipdemo\baby.jpg');
 a = rgb2gray(a);
c = edge(a,'sobel');
d = edge(a,'prewitt');
 e = edge(a,'log');
f = edge(a,'canny'); ShowImage(a,'Original Image');
title('Original Image')
figure ShowImage(c,'Sobel') title('Sobel')
figure ShowImage(d,'Prewitt') title('Prewitt')
figure ShowImage(e,'Log') title('Log')figure
ShowImage(f,'Canny') title('Canny')
```

Fig.7: Image showing Edges

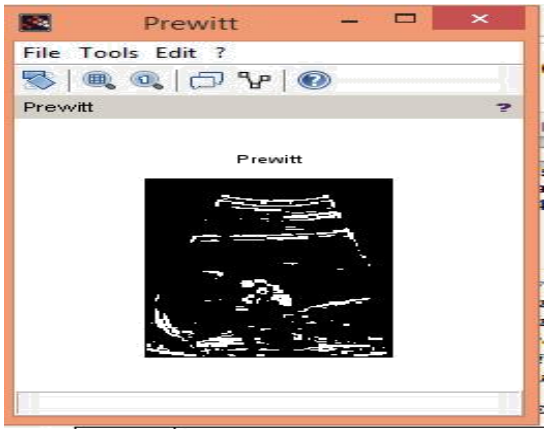

Fig.8: Output of Prewitt operator

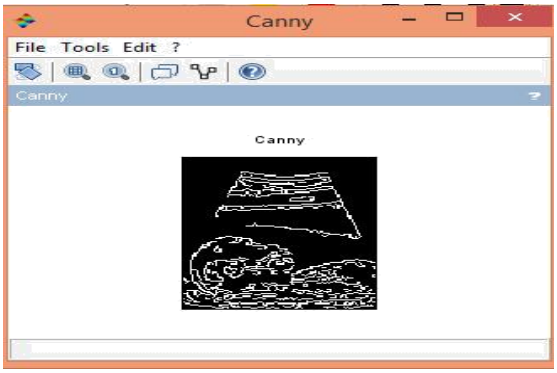

Fig.9: Output of Canny operator

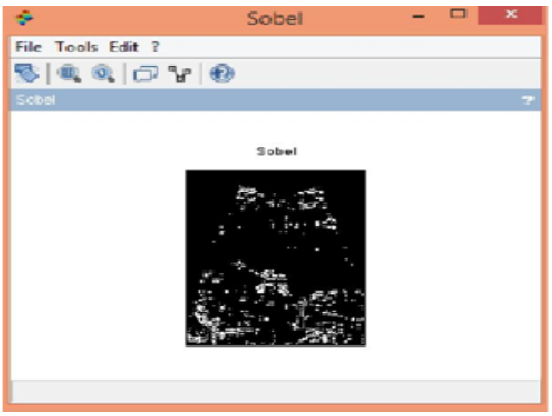

Fig.10: Output of Sobel operator

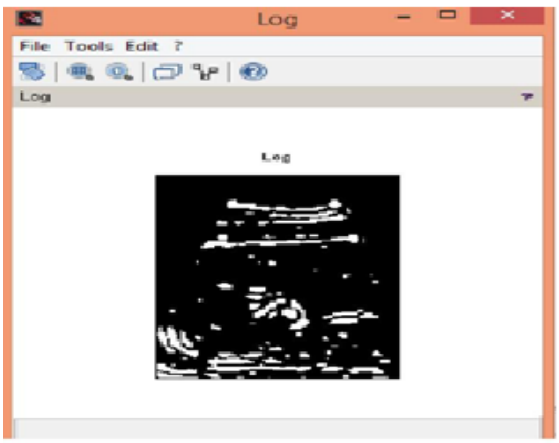

Fig.11: Output of Log operator

In the same way there are various areas where image segmentation, edge detection is used such as for medical diagnosis[3][4][10]. For example, to find cracks in the bones, to identify clots in the body tissue, in MRI images, etc [3][4] [10]. Another very important Image processing technique is Morphology. Morphology is the different approach which uses to analyze and improve the image quality to get the proper output[4][5][7][8][10].

4. CONCLUSION

This paper has given the overview of SCILAB software which is an open source and can be used for various research, commercial educational, designing, application developments, etc. In future Scilab can be used more rigorously in Medical field as it has various advance features and it give additional information of an image which will be helpful for any doctor give proper treatment to patient. Along with this Tool is used in various other research area such as by satellite to extract the proper information for the earth image captured by satellite.

5. REFERENCES

[1] J.Mehena,"Medical Images Edge Detection Based on Mathematical Morphology",Department of Electronics & elecommunication Engg. DRIEMS, Tangi, Cuttack.

[2] Dr. John Schmeelk,"EDGE DETECTORS IN ENGINEERING AND MEDICAL APPLICATIONS", Virginia Commonwealth University, Qatar.

[3] Greg Madey,Vincent Freeh,Renee Tynan,"THE OPEN SOURCE SOFTWARE DEVELOPMENT PHENOMENON: AN ANALYSIS BASED ONSOCIAL NETWORK THEORY",Computer Science & Engineering,University of Notre Dame

[4] Lukas Bulwahn, Tilmann Ochs and Daniel Wagner,"Research on an Open-Source Software Platform for Autonomous Driving Systems",Petuelring 116, 80809 Munich, Germany

[5] Ramachandran, H "Image and video processing toolbox in Scilab", CSI Communications (2012).

[6] Ricardo Fabbri,Odemir Martinez Bruno,Luciano da Fontoura Costa,"Scilab and SIP for Image Processing",Brazil

[7] Shiqi YU and Shulin SHANG,"Scilab Image and Video Processing Toolbox",Free Software Association,Institute of Automation, Chinese Academy of Scienses

[8] Shubhashree Savant (Kadam),"SIVP: SCILAB Image and Video Processing Toolbox",MIT(E),Aurangabad.

[9] http://www.Scilab.org/ platform

[10] Rafael C Gonzalez, Richard E Woods "Digital Image Processing", Pearson,Third Edition.