Indian Institute of Technology Patna
Department of Mechanical Engineering

ME396 - ENGINEERING PRACTICUM

PROJECT NAME :

Software to measure the dimensions of the selected objects in an image

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Problem Statement :

We are creating an Image processing interface using python tools, an interactive web interface and Matlab.

Introduction :

In this project, we would like to present to you an Image processing interface that is made using the python tools and modules and a Web interface and another in Matlab, one in which we give our input image file and with a specified scale we select the boundary of the object we wish to measure on the image and in another we select the scale and we measure the dimensions along the selected part.. Now after the image runs through the code gives us the required output of measurements such as Area, perimeter, Major axis length, and Minor axis length.

How Does This Work :

This Project has two parts.

1) A python based Web-interfaced software. It contains several components each has a task to do.

➢ **The Web interface and Python programme:**
- This is a web interface made using HTML, CSS, and Bootstrap to give a fresh feel to the user. This is where the user will give the desired input image which is accessed from the system.
- Next is specifying the scale. The image processing software measures the images in pixels. (Every image is a matrix of pixels)
- First we input the scale value mentioned on the magnified SEM image.
- Then the image is returned to part of the software which contains the Image processing code.
- Then the code converts pixels to metric length conversion through the scale we used.
- Further it shows the length of the selected part above the line in cm.(centimeters)
- This is mainly used to measure microscopic or magnified images like SEM images.

➢ **Image processing code made in Matlab:**
- This part imports some modules and libraries for image processing and Matplotlib for plotting the output and measuring the pixels' intensity.
- Using these, the input given image is read and converted to an RGB valued matrix of pixels.
- A digital image is a two- or three-dimensional matrix and can be classified into Binary, Gray, or RGB color images. For example, an RGB image is a 3 Dimensional matrix that has 3 independent image planes whose primary

colors are Red, Green, and Blue respectively stacked on top of each other, basically a matrix. The matrix element is called a pixel. Each pixel data is just a number representing the RGB data value. Each pixel data value has 3 components showing the combination of intensities stored in each RBG plane. Each component can have 256 values ranging from 0 to 256.

- But we convert the RGB image to a Grayscale then Binary image. Now the pixel can either have a value of 1 -when it's part of the pattern-, or 0 -when it's part of the background- i.e. there is no grayscale level. (We will assume that pixels with value 1 are black while zero-valued pixels are white). In order to identify objects in a digital pattern, we need to locate groups of black pixels that are "connected" to each other. In other words, the objects in a given digital pattern are the connected components of that pattern.

- Then they are identified or filtered based on the threshold intensity of the RGB components.
- But to measure the area inside the selected boundary, we have to convert the RGB to Grayscale Black and white then to Binary.

➢ **Measuring the area inside the selected boundary:**

- The Binary turned image now has each pixel with a value of 1 or 0, where 1 is the object and 0 is in the background.
- Now among the pixels inside the selected boundary, we have to find the pixels with value 1 and similar pixels connected to it, which gives the pixels covered by the object.
- Calculating the number of pixels along the selected boundary gives us the perimeter of the object.
- A maximum number of pixels calculated in a column or a row gives the Length of the major axis while a minimum number of pixels calculated gives the length of the minor axis.
- But what we receive is the output in pixels but we need the output in the metric system.

➢ Converting the pixels into a metric system:

- We have specified a scale (from pixels to mm or cm) in the user interface which will be used and equated for all the pixels, that gives the result in the required metric system.

The Resources Used :

➢ Front End :

- HTML
- CSS
- NUMPY

- PYTHON
- MATLAB
- FLASK

➢ **TASKS COMPLETED IN THIS SEMESTER:**

- Completed the Matlab programme for macroscopic objects dimensions measurement.
- Added variable scale, The distance from which the image is taken.
- Failed to successfully convert the scale of distance for accurate dimensions.
- Successfully added the Distance scale, So that the Program can become more dynamic and give more accurate results based on the distance difference.
- Started working on making a similar program in python for measuring the microscopic images. (similar to ImageJ)
- Failed to successfully add the measuring through mouse pointer function.
- Successfully added the measuring through mouse pointer function.
- Failed in proper scale conversion of measured data through mouse pointer.
- Successfully converted the scale measured through the mouse pointer.
- Successfully measured the dimensions between selected points and was able to convert scale to give accurate results.
- Created an Interactive web interface for Python program for measuring microscopic images.
- Failed to integrate the Web interface with the program due to problems in taking the values measured by mouse pointer.
- Successfully integrated the Web interface with the Python program that can measure the dimensions of images in microscopic analysis.