Algorithm for Image Processing

1. Cut Image
   - Open image you want to cut.
   - Four sliders control are there for, selecting on each direction.
   - After selecting system will cut area that is out of selected region.

2. Solid fraction
   - Open image from selected folder
   - RGB= calculate pixel (selected image) return RGB of each pixel of an selected image
   - If RGB <= threshold value then solidfraction ++
   - Solid percentage(solid fraction) displays Solid fraction of an image in %

3. Convert image to black and white
   - RGB= calculate pixel (selected image) return RGB of each pixel of an selected image
   - Define white pixel variable
   - If RGB <= threshold value then
     call convert white (RGB)
     White Pixel++=1
   - else
     Call convert black (RGB)

4. Determination of bubble density
   - Call calculate white portion (white pixel, total pixel)
   - Results white pixel fractions in percentage with respect to total pixel.

5. Calculate Diameter
   - Call open image (file name) by opening an image.
   - Select manually the bubble by dragging mechanism provided by the system.
   - Also, name the bubble by clicking on it.
- Enter necessary parameters of real dimension and press calculate diameter
- It will call calculate diameter(x,y,xl,yl) routine and gives diameter and center of the selected bubble, its places result in \( v_x, v_y \).
  where \( v_x \) and \( v_y \) are virtual diameters.
- Give multiplication factor in X (owidth) which results in scale of width with respect to original equipment.
- Give multiplication factor in Y (oheight) which results in scale of height with respect to original equipment.
- Get actual diameter (\( d_x, d_y \)) results, by multiplying with corresponding multiplication factor (\( m_x \) and \( m_y \)).
  \[ d_x = v_x \times m_x \] \[ d_y = v_y \times m_y \]

6. Determination of centroid:
- Centroid was found using matlab inbuilt dipumb command. Blue dot appears inside the bubble represents centroid.
- Software calls centroid routines from matlab for each image and results
- By clicking this notation manually clicking on each and every bubble,
- Software inserts data of centroid x and centroid y into backend.

7. Determination of bubble rise velocity
- Fetch images from related folder.
- Software (System) gets selected images centroid from database (Which is previously stored in find centroid steps).
- Compare this centroid with reference to base and calculate its difference that is between two centroids in pixels.
- Divide this value (the difference) by time inserted in time boot and finally shows velocity of particulars bubble in m/sec.