```
%Holly Ross
%Septmeber 25, 2017
%Impeller Image Analysis

close all; clc; clear all;

Rotor = [];
ratios = [];

for k = [2 3 5 6 7 9 10]
    %Load image and convert to hsv
    Irgb = imread(['impellers/rotor', sprintf('%2.2d',k), '.jpg']);
    Ihsv = rgb2hsv(Irgb);
    image = Ihsv(:,:,3);


    BW = edge(image, 'Canny', 0.3);

    %Connect all lines of the outline of the rotor
    SE1 = strel('line',4,0);
    SE2 = strel('line', 4, 90);
    BW2 = imdilate(BW, [SE1 SE2]);

    %Fill in the rotor
    BWfill = imfill(BW2, 'holes');


    [labels,number] = bwlabel(BWfill,8);
    Istats = regionprops(labels,'basic','Centroid');
    [maxVal, maxIndex] = max([Istats.Area]);

    %Use the plotted rectanlge to find the dimensions of the circle around the
    %rotor
    x = Istats(maxIndex).BoundingBox(1);
    y = Istats(maxIndex).BoundingBox(2);
    w = Istats(maxIndex).BoundingBox(3);
    h = Istats(maxIndex).BoundingBox(4);

    %Find the dimensions of the circle of all rotors
    radius = max(w,h)/ 2;
    centerX = x + (w / 2);
    centerY = y + (h / 2);

    X = 0:(sqrt(numel(BWfill)) - 1);

    %Circle of the dimensions found that is all filled in white
    circle = bsxfun(@(centerX,centerY) centerX.^2 + centerY.^2 < radius^2, X- centerX, X' - c
enterY);
    sumInterval= sum(circle);
    sumTotalPixels = sum(sumInterval);

    %Finding the difference of the white circle and the rotor image
    airImage = circle - BWfill;

    sumInterval = sum(airImage);
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    sumGapPixels = sum(sumInterval);

    %Calculating the ratio of the total pixels to the air gap pixels
    ratio = sumGapPixels / sumTotalPixels;

    Rotor = [Rotor; k];
    ratios = [ratios; ratio];


end

Table = table(Rotor, ratios);
disp(Table)
```

```
    Rotor    ratios
    _____    _______

     2       0.34505
     3       0.15384
     5       0.27258
     6       0.33364
     7       0.17244
     9       0.14191
    10       0.16017
```

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