ATi 3D Vessel Defects

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Project Description

- Client: ATI (Aneuvas Technologies, Inc.) and its CTO, Tim Becker.
- Purpose: MATLAB algorithm to identify, measure, and locate vascular defects.
- User: Untrained medical professionals to view and analyze basic shape of the aneurysm
- The Importance/Impact: Decrease required training for medical professionals to find potentially deadly aneurysms/ vascular defects.
- Outcome: Streamline vessel defect analysis. Decrease medical care cost for at risk patiences.

Background

- Computer-assisted diagnostics (CAD) has been around since 1990s
- CAD is used all throughout different body images, lung, colon, brain, etc.
- Cons: many of these are expensive and hardware specific
- Heavily based in detecting and recognizing patterns
- DICOM (Digital Imaging and Communications in Medicine)- standard file type [5].
- CTA or Ct Scan is the primary tool used to take images especially of vasculature. (Dr. Duberg)
- Vessel Defects: constricting or ballooning of vessel walls ei. aneurysms

Figure 1: CT Scanner

Customer Requirements

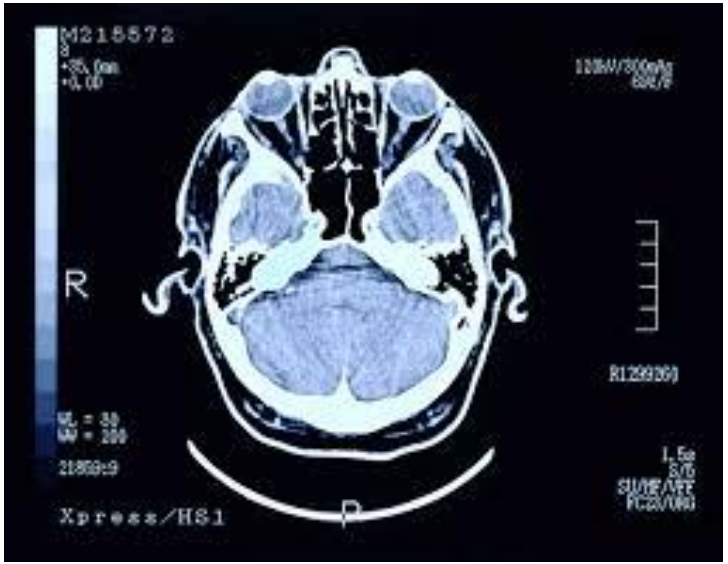
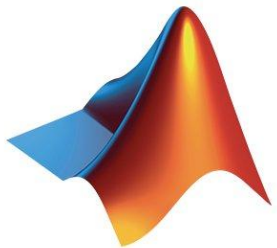


Fig. 2: CT Scan

- Develop an Algorithm that extracts aneurysm measurements and location from DICOM files
- Use MATLAB (or similar) as image processor
- Develop a user friendly interface for untrained medical professionals
- Set up and experiment to validate size of aneurysms
- Recommended:
  - Process DICOM files directly in less than 5min
  - Distinguish between the different tissue layers (aneurysm sac, parent vessel, surrounding vasculature)

Engineering Requirements

- Calculate volume of aneurysm
  - Units: m^3
- Define location of aneurysm
  - Units: x, y, z coordinates in meters
- Processing time of application
  - Units: seconds to complete analysis



```
%% Read in Image
Img = imread ('Test Image 1.jpg');

%% Display Image
figure
imshow(Img)

%% Change to B&W
Img1 = rgb2gray(Img);
%% Find high Intensity areas
HImg1 = max(max(Img1));
[iRowH,iColH] = find(Img1 == HImg1);

%imtool(HImg1);
hold on
plot (iColH,iRowH, 'r*')

%% Find low Intensity areas
LImg1 = min(min(Img1));
[iRowL,iColL] = find(Img1 == LImg1);

%imtool(LImg1);
hold on
plot (iColL,iRowL, 'b*')
```

Figure 3: Current MATLAB code progress

References

[1] Softneta, 2020. *DICOM Library - About DICOM Format*. [online] Dicomlibrary.com. Available at: <https://dicomlibrary.com/dicom/> [Accessed 14 September 2020].

[2] Cancerresearchuk.org. 2020. *CT Scan | Tests And Scans | Cancer Research UK*. [online] Available at: <https://www.cancerresearchuk.org/about-cancer/cancer-in-general/tests/ct-scan> [Accessed 14 September 2020].

[3] Yang, L. and Foran, D., 2020. *Automated Image Interpretation And Computer-Assisted Diagnostics*. [online] PubMed Central (PMC). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/mid/NIHMS472601/> [Accessed 15 September 2020].

[4] Twitter.com. 2020. *MATLAB (@MATLAB) On Twitter*. [online] Available at: <https://twitter.com/matlab> [Accessed 14 September 2020].

[5] Lifewire. 2020. *What's A DICOM File And How Do You Open One?*. [online] Available at: <https://www.lifewire.com/dicom-file-2620657> [Accessed 14 September 2020].