

VRT

Vein Route Tracing

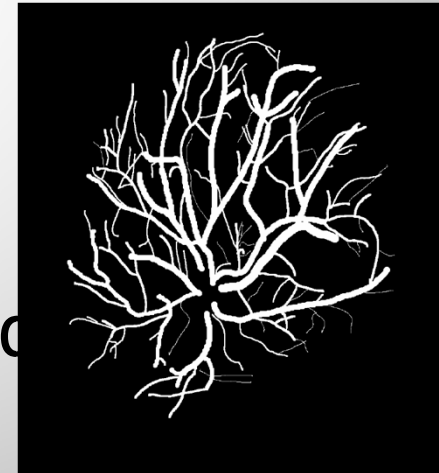
Nen Huynh, Jennifer Meyers-Giddings,
Zac Schoenrock, Marilyn Vazquez

Goal and Motivation

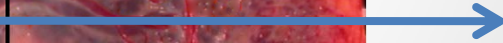
Develop a program that will pick out veins from the placenta pictures.



Producing an inter-connected graph from the placenta is the main goal of the project.



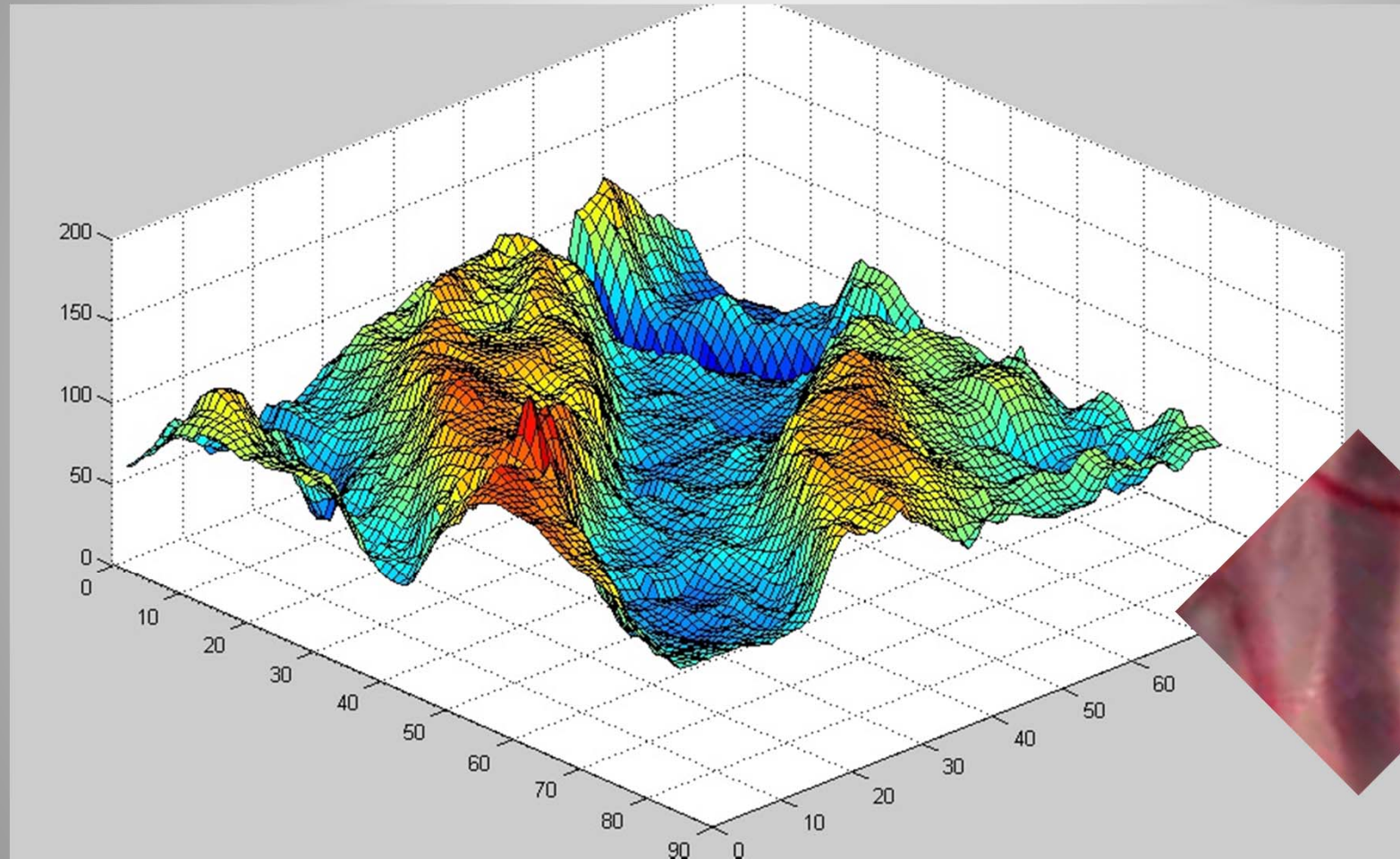
Test Subject



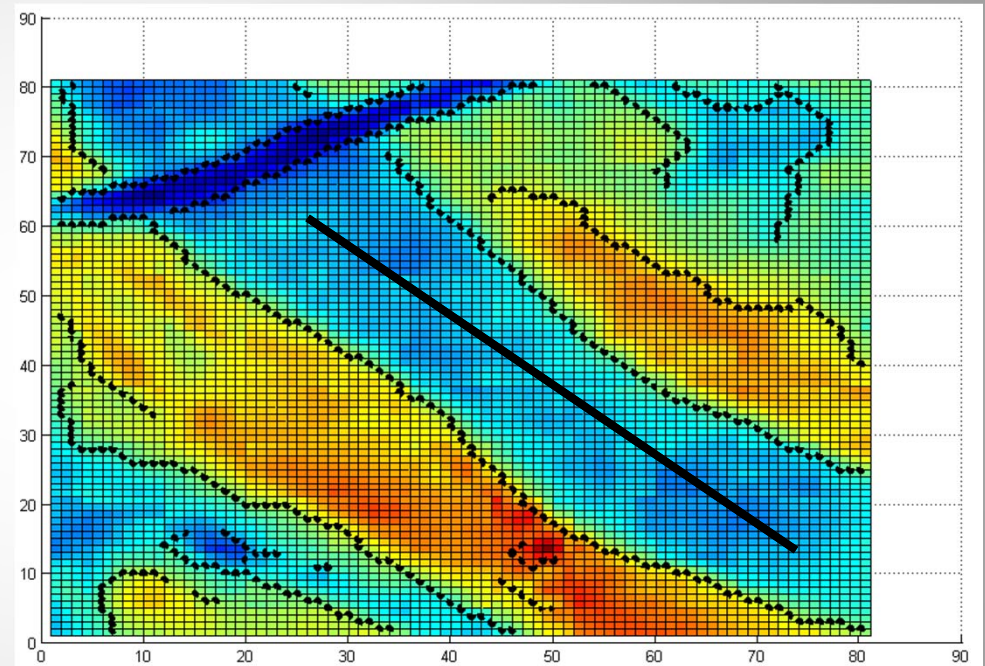
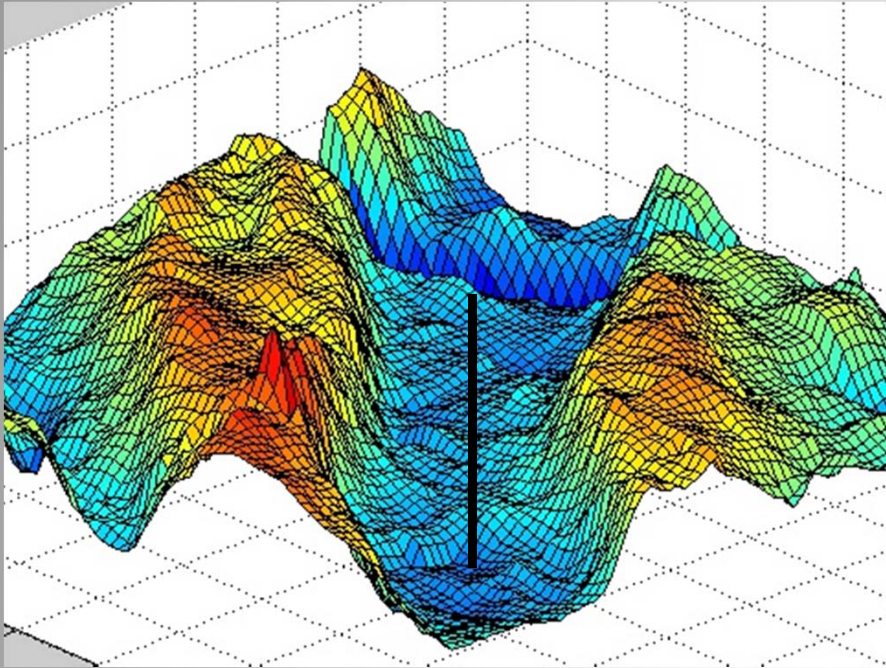
Outline of Steps to Complete Project

1. Create topographical map
2. Identify edges of veins
3. Build list of points within veins
4. Characterize points within vein
5. Connect points within the same vein

Topographical Map (Intensity Map)



Identify Edges of Veins

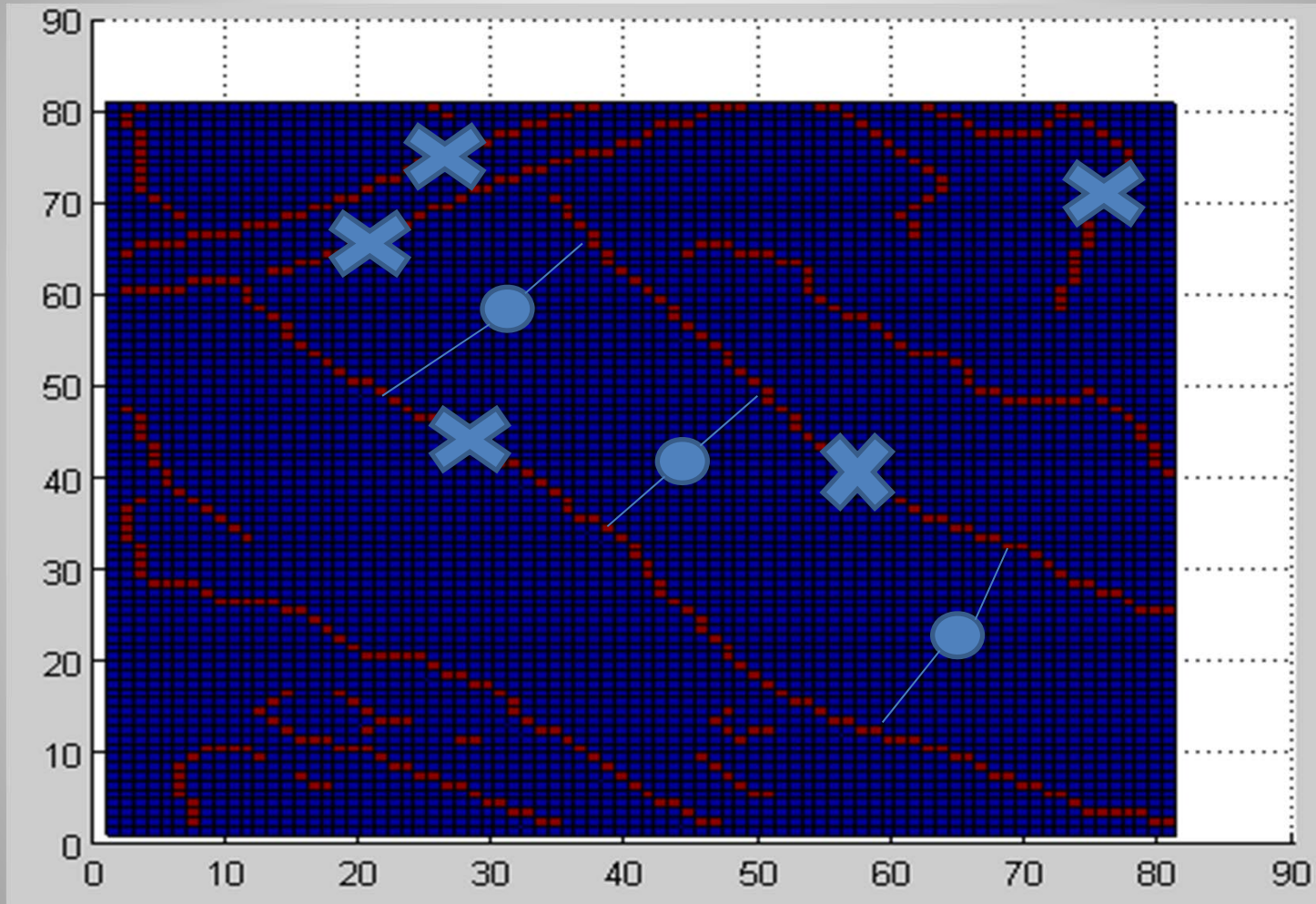


Canny Edge Detection

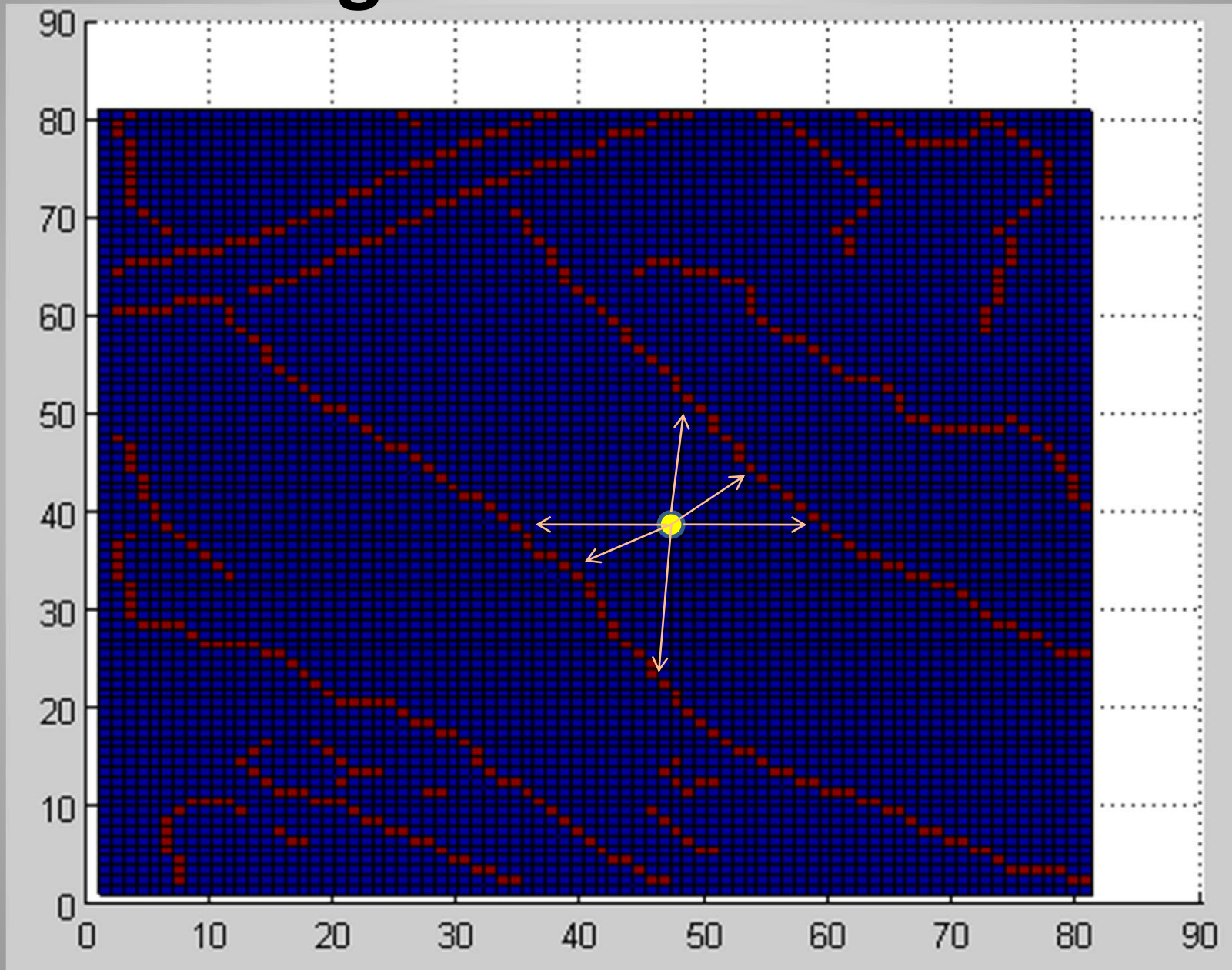
How it works....

Build a List of Strong Points

Game Plan



Getting Points in the Center

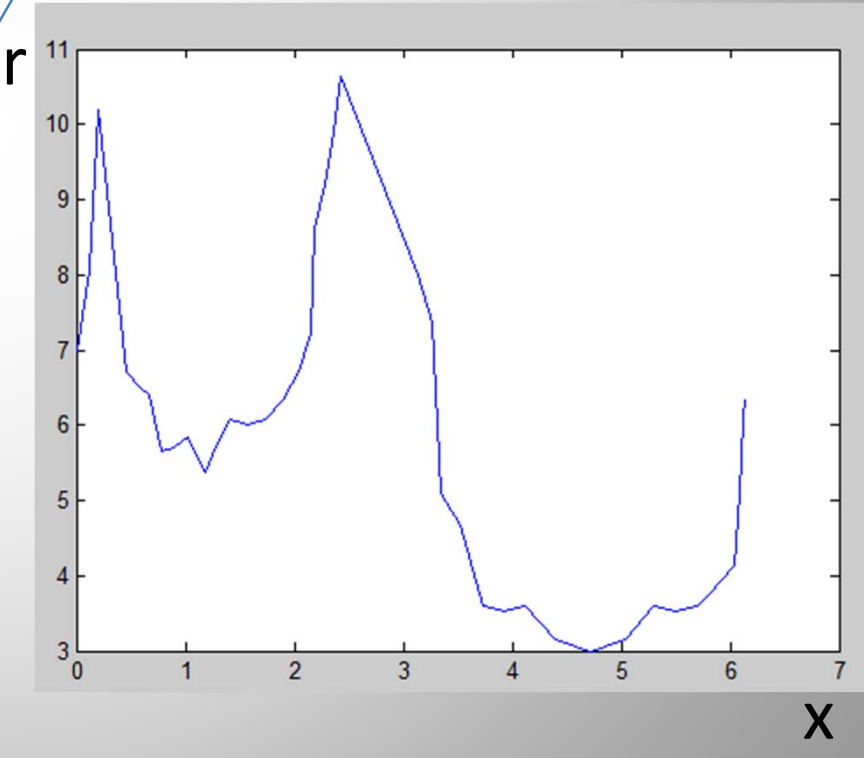


Build a List of Strong Points

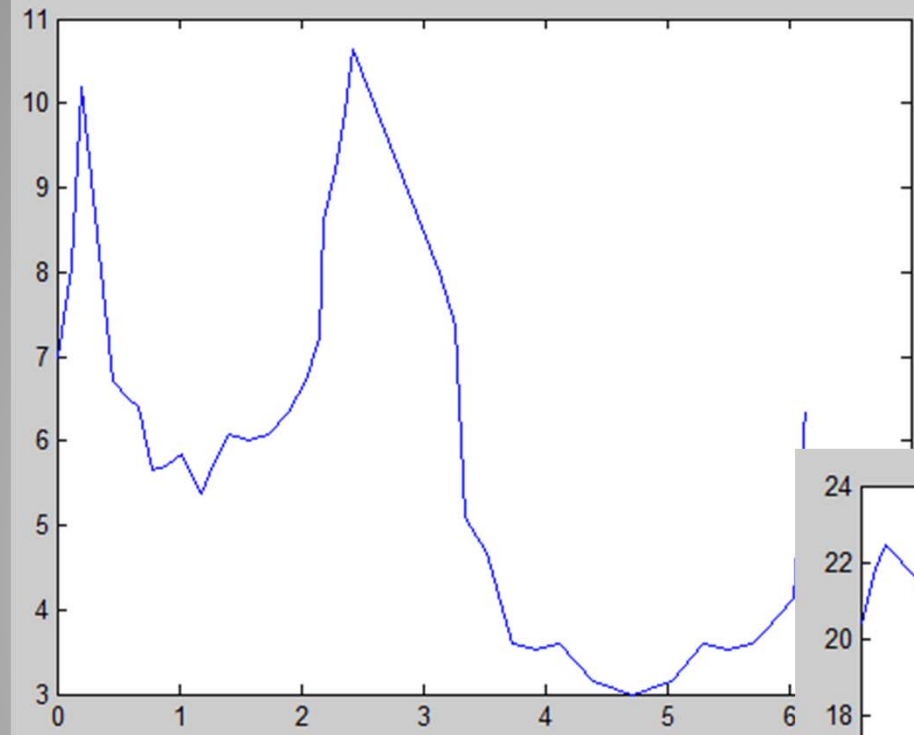
Array Plot

Angle	Distance
X_1	r_1
X_2	r_2
.	.
.	.
.	.
.	.
.	.
X_i	r_i
.	.
.	.
.	.
.	.
.	.
.	.
X_n	r_n

(X_i , r_i)

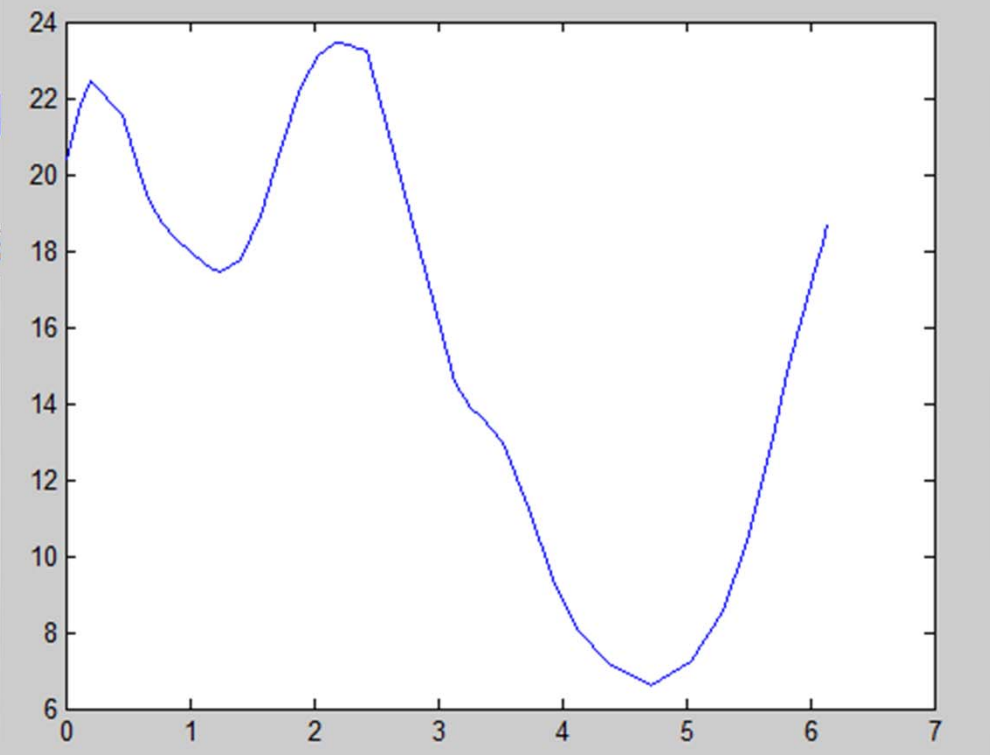


Build a List of Strong Points

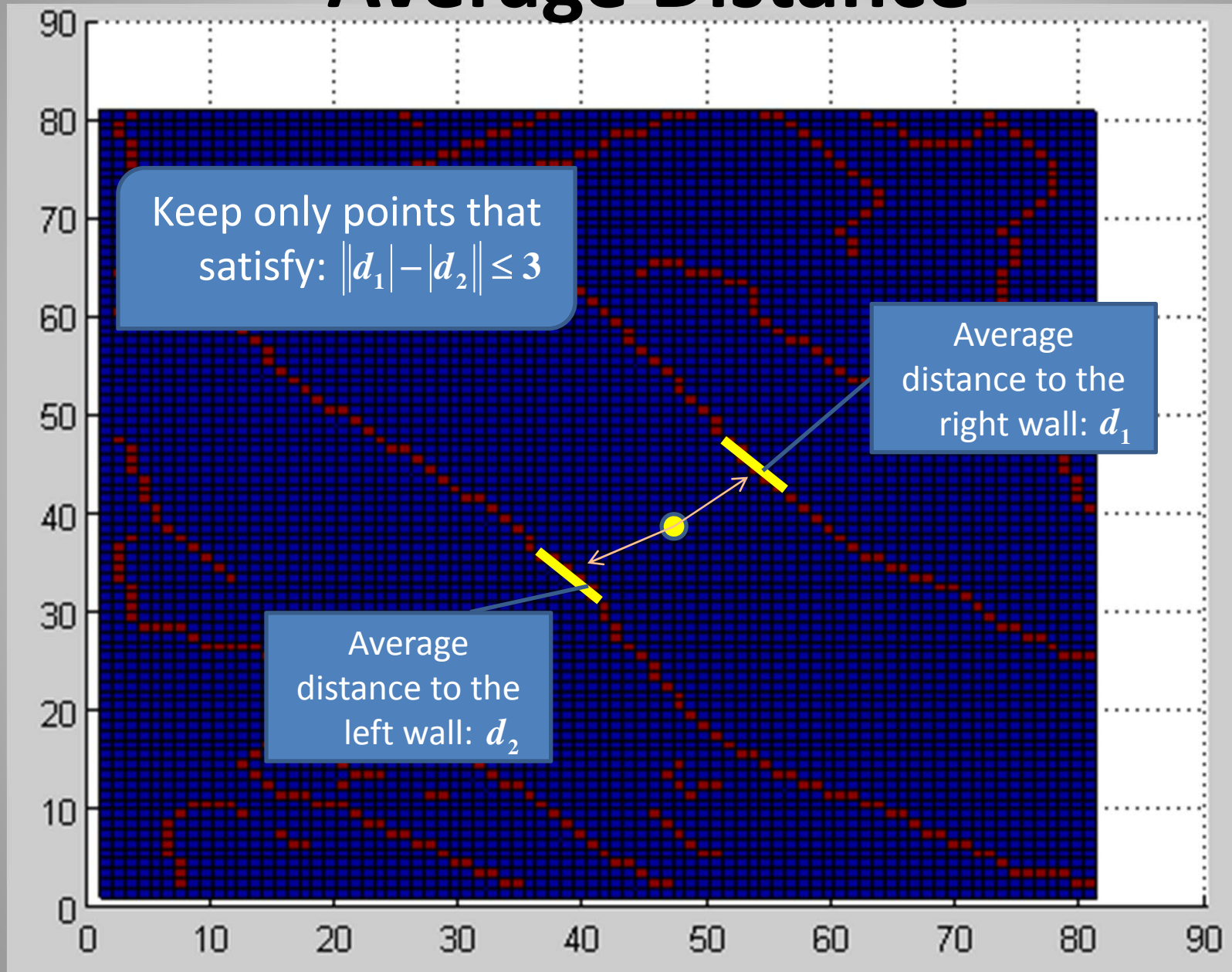


Before Smoothing

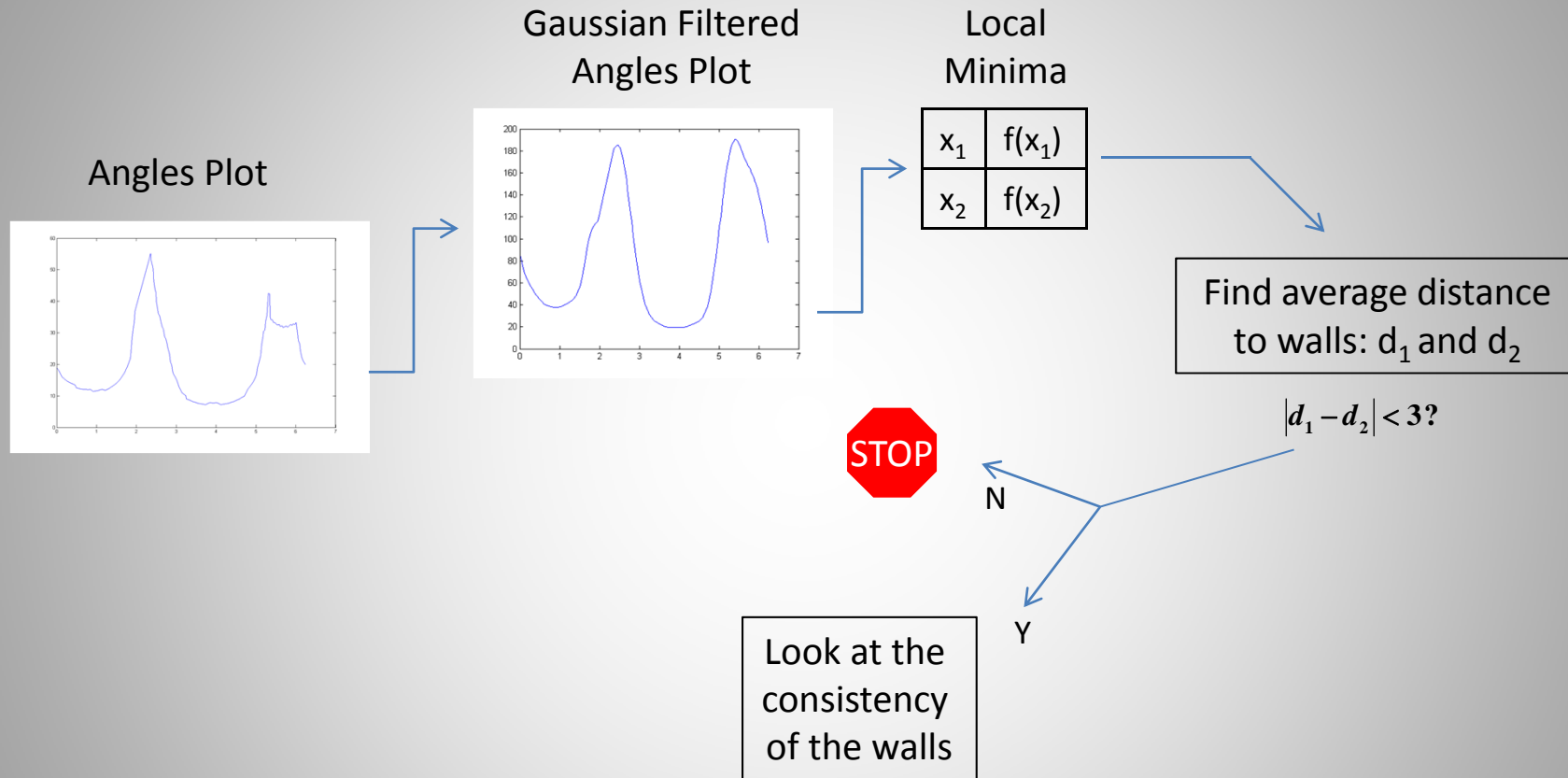
After Smoothing



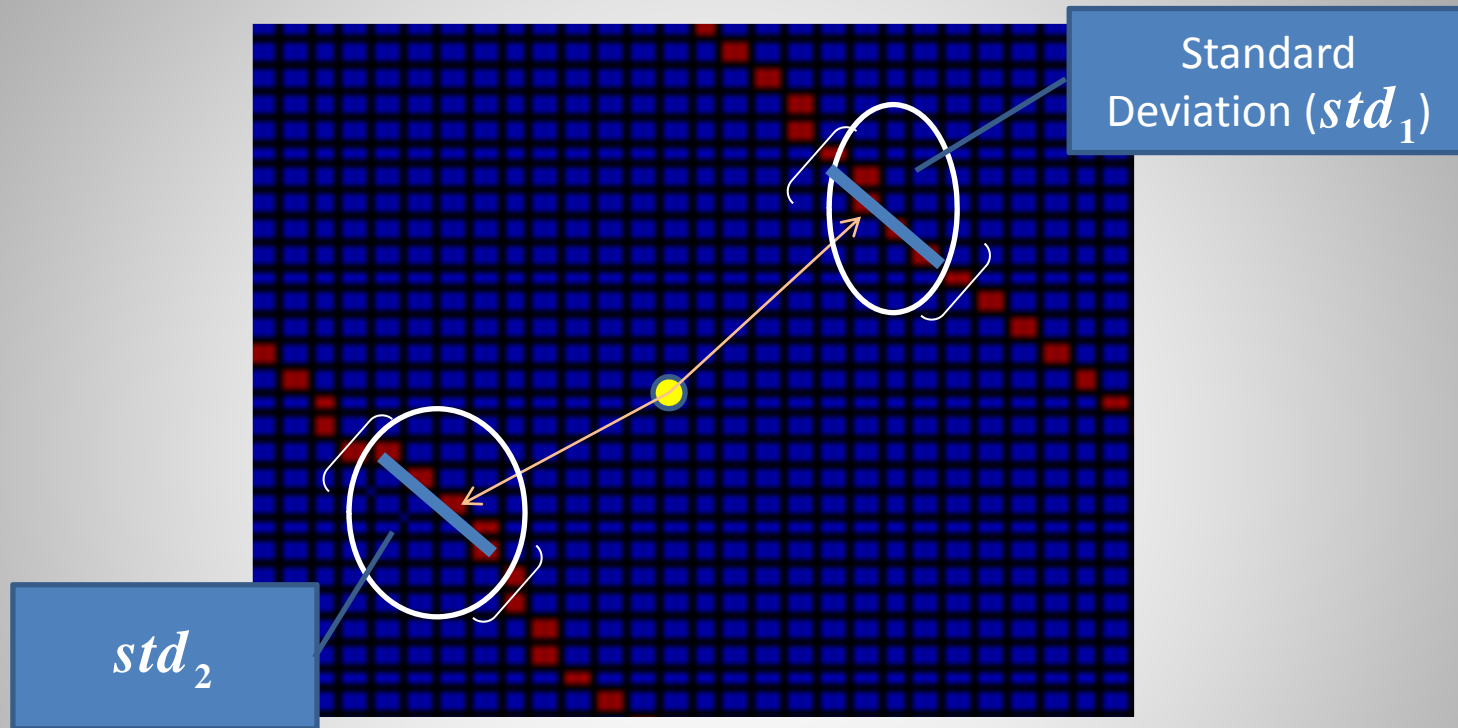
Average Distance



Strong Point Decision Tree

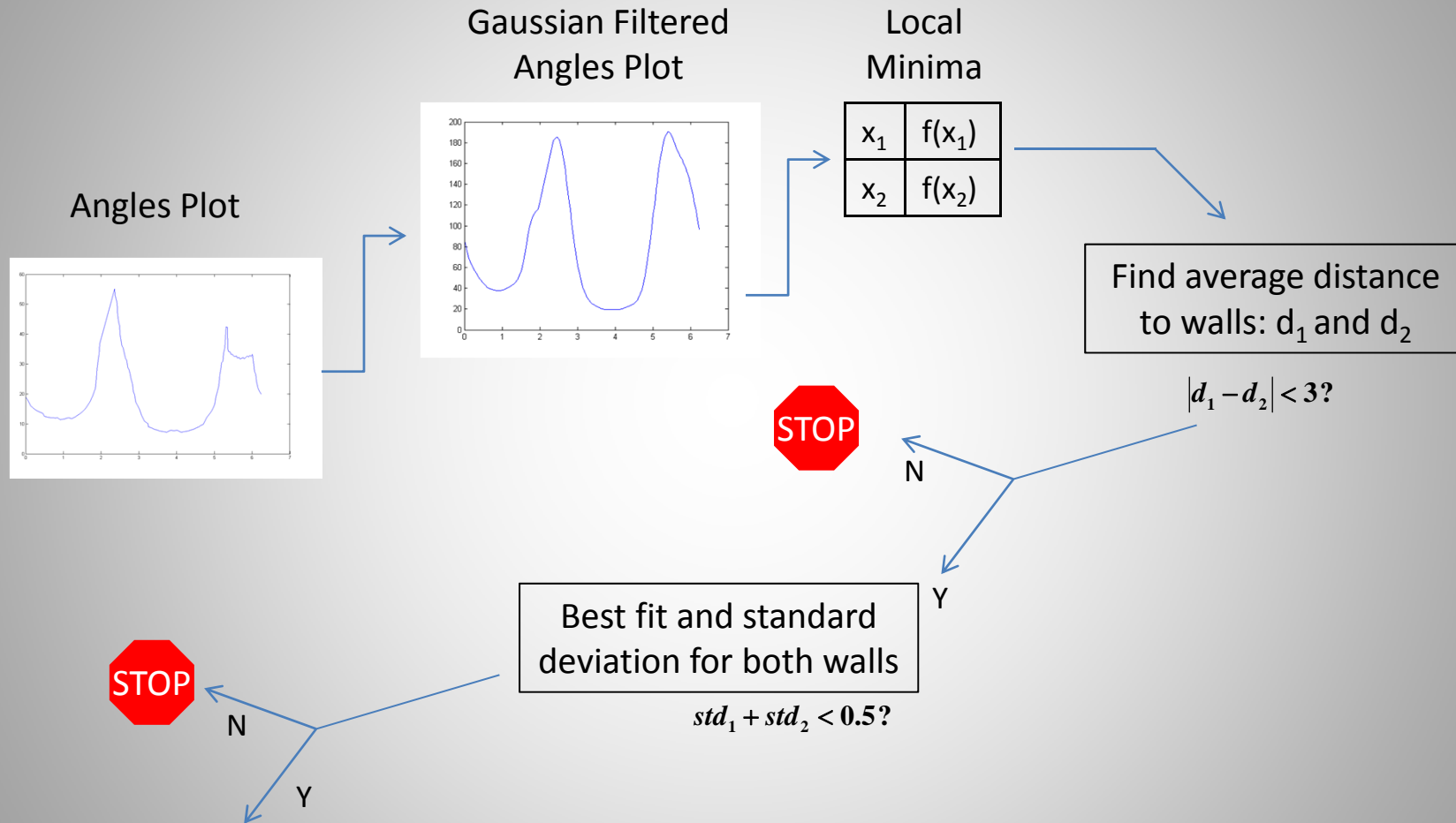


Points in Between Consistent Walls

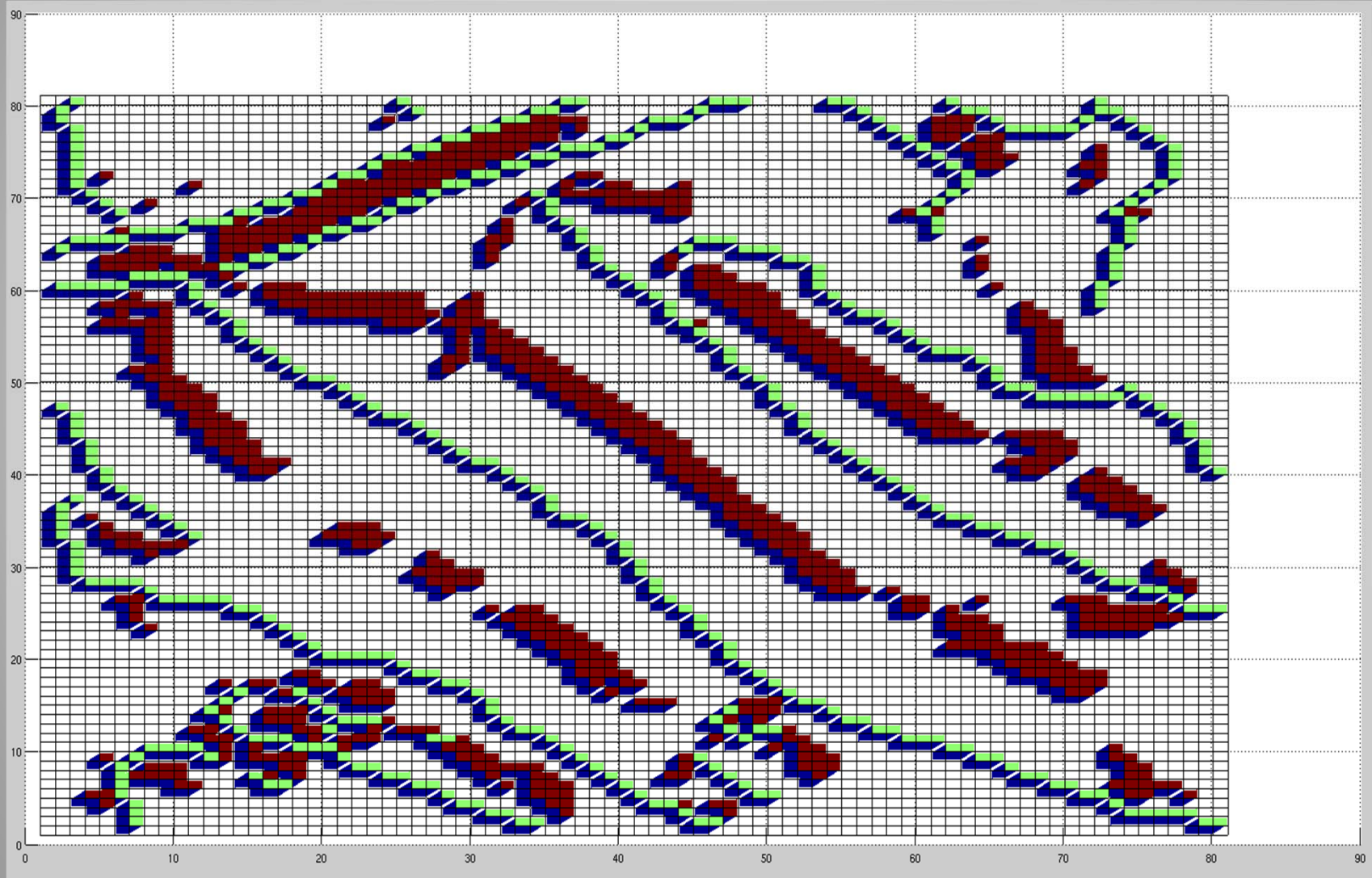


Restriction:
 $std_1 + std_2 \leq 0.5$

Strong Point Decision Tree



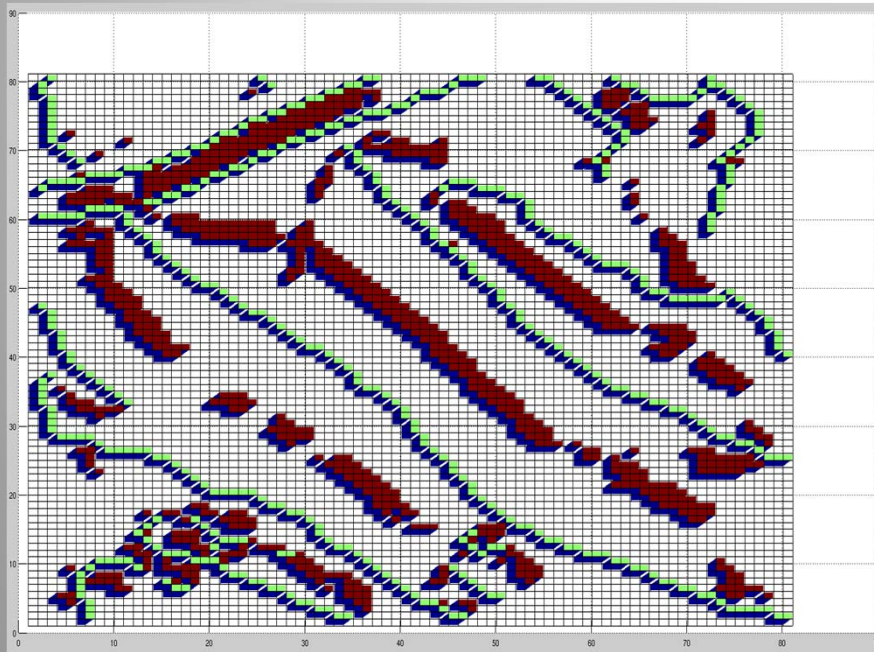
Results



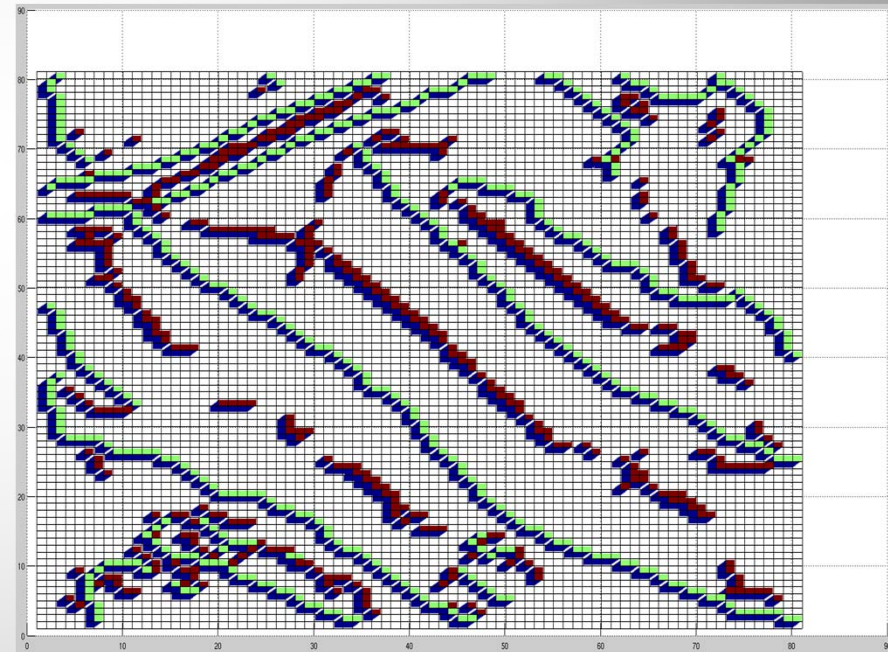
Getting a Cleaner Image

Applied morphological operation “thin” to the binary image

Before “thinning”



After “thinning”



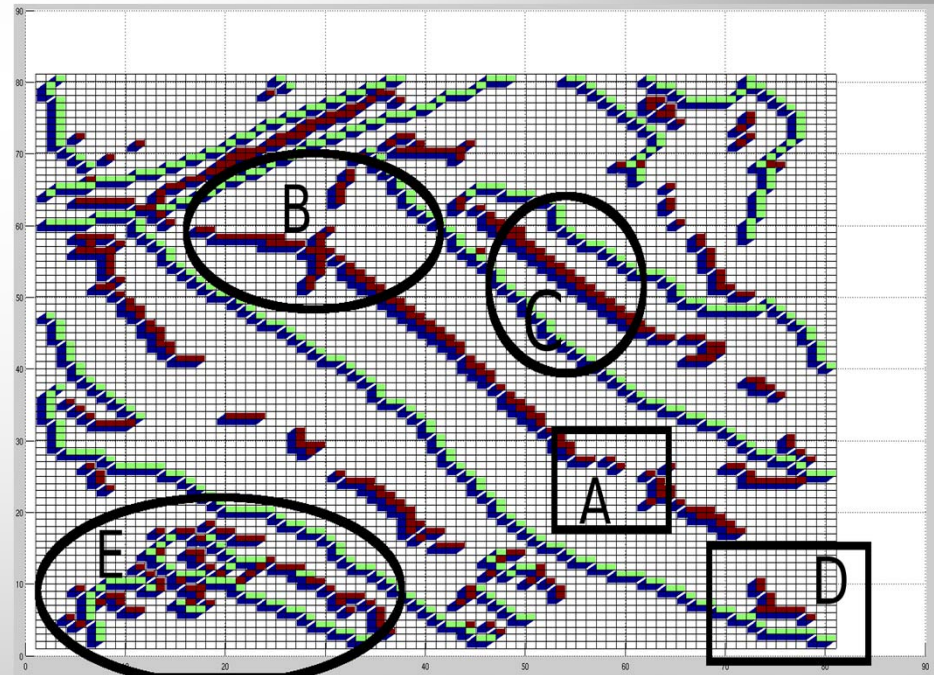
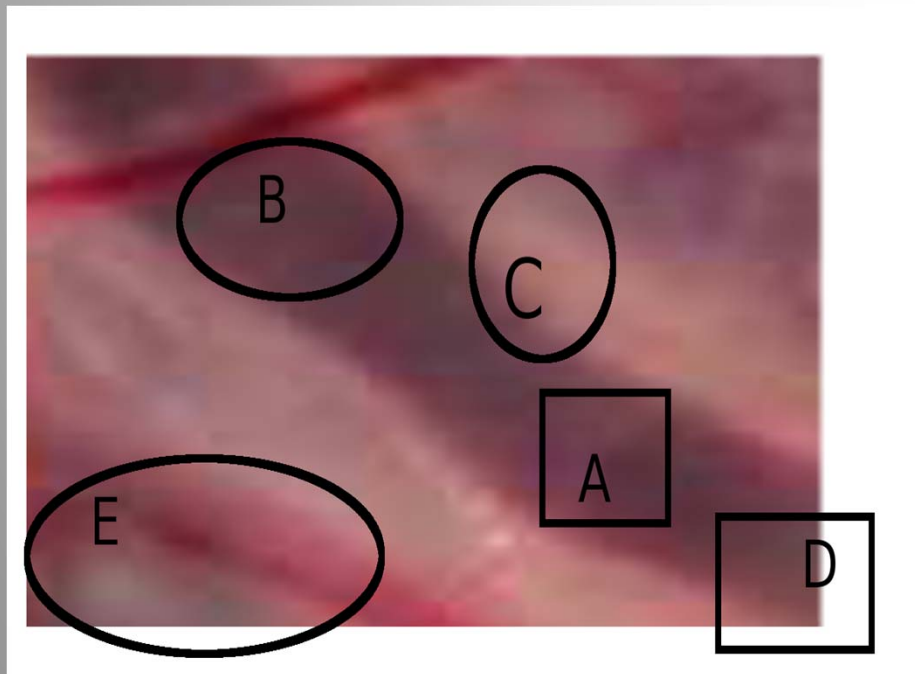
Characterize Points within Vein

1. Position
2. Width
3. Angle
4. Depth

$$(i, j, w, \theta, d)$$

Connect Points within the Same Vein

- Choose stats to automate decision of whether 2 points are in same vein
- Multi-variable correlation

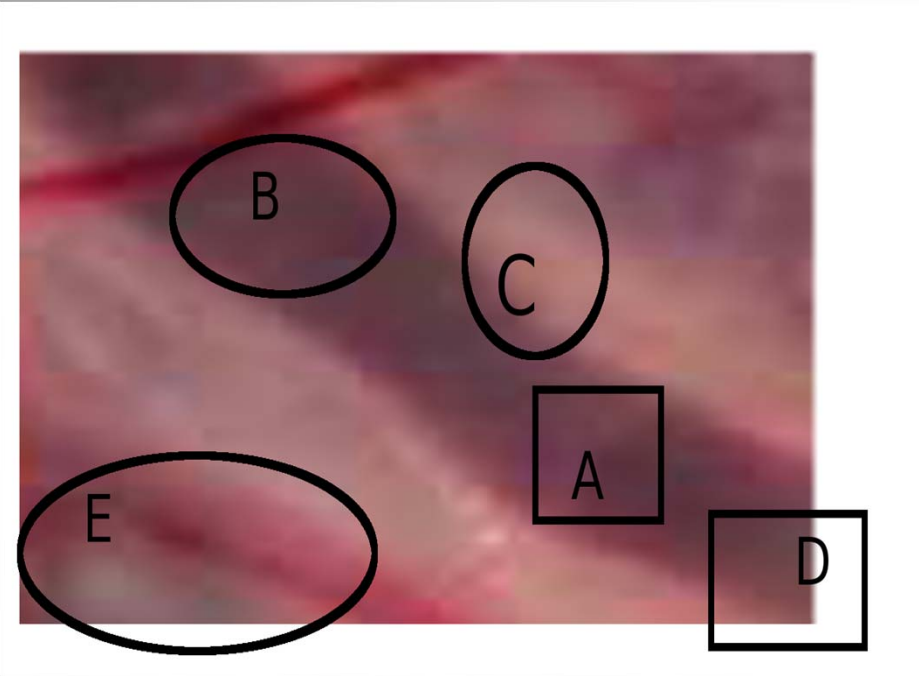
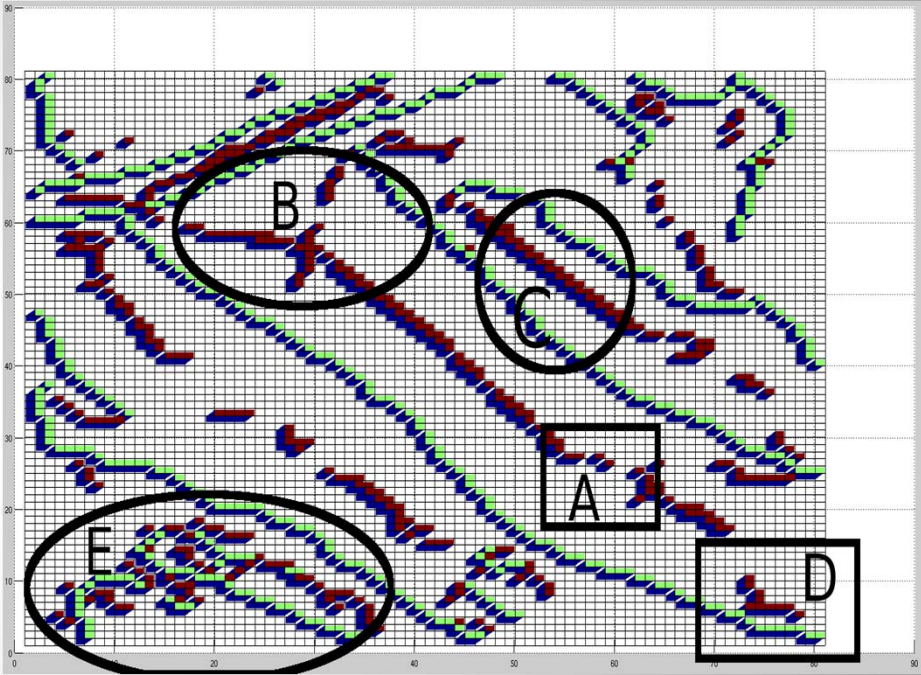


Difficulties



Legend for the edge detection image:

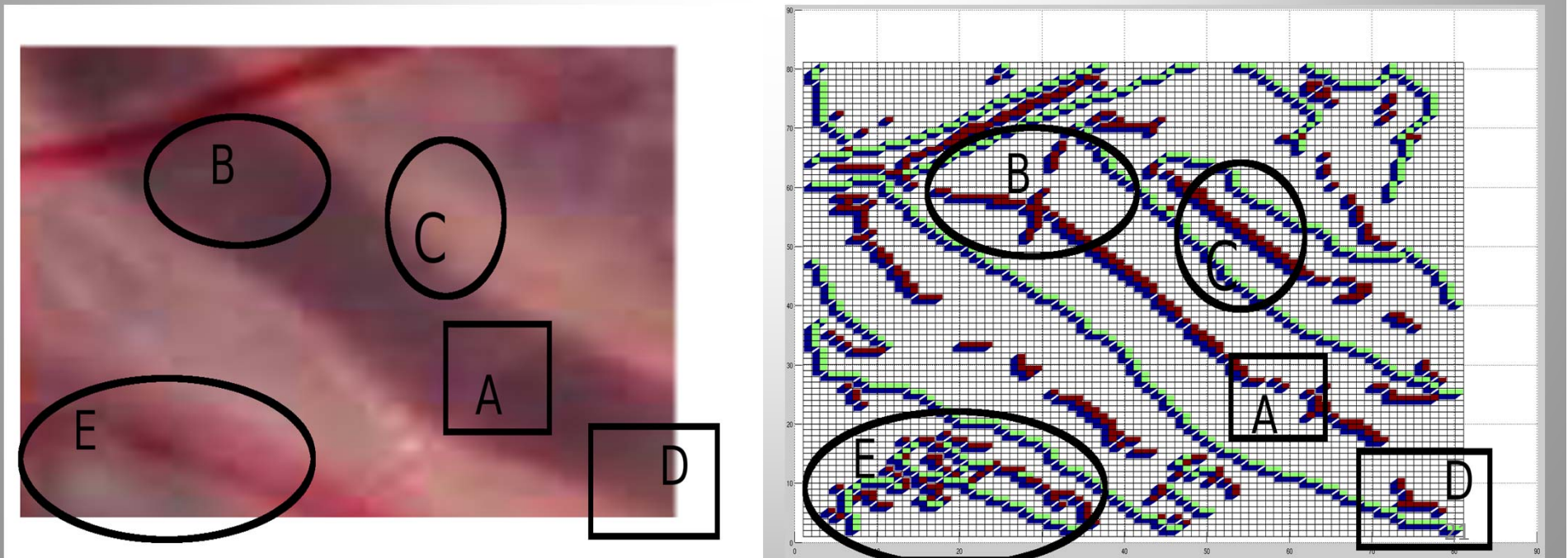
- Green square: Edges
- Red square: Strong Points



Future

Continuing on toward original goal

- Better detail on small veins
- Apply to any picture
- Apply to larger pictures



Future

Expand scope

1. Efficiency
2. Other Techniques
3. Work on connecting strong points
4. Allow user interface to edit results
5. Apply to other fields such as road detection

Acknowledgments

- Professor Chang
- Doctor Carolyn Salafia
- Mathew Aggleton, Ph.D.

Questions?

