Automated Angiogenesis Quantification

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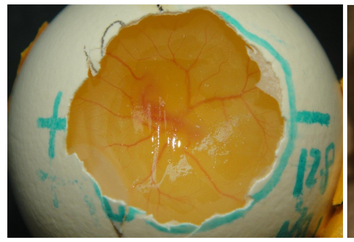
Motivation

Currently, manual methods are used to quantify the effect of a stimulant for angiogenesis, the process of growing new blood vessels. This process is often time consuming and prolongs the study of any particular stimulant. We hope to simplify this process by using imaging processing algorithms.

Day 0



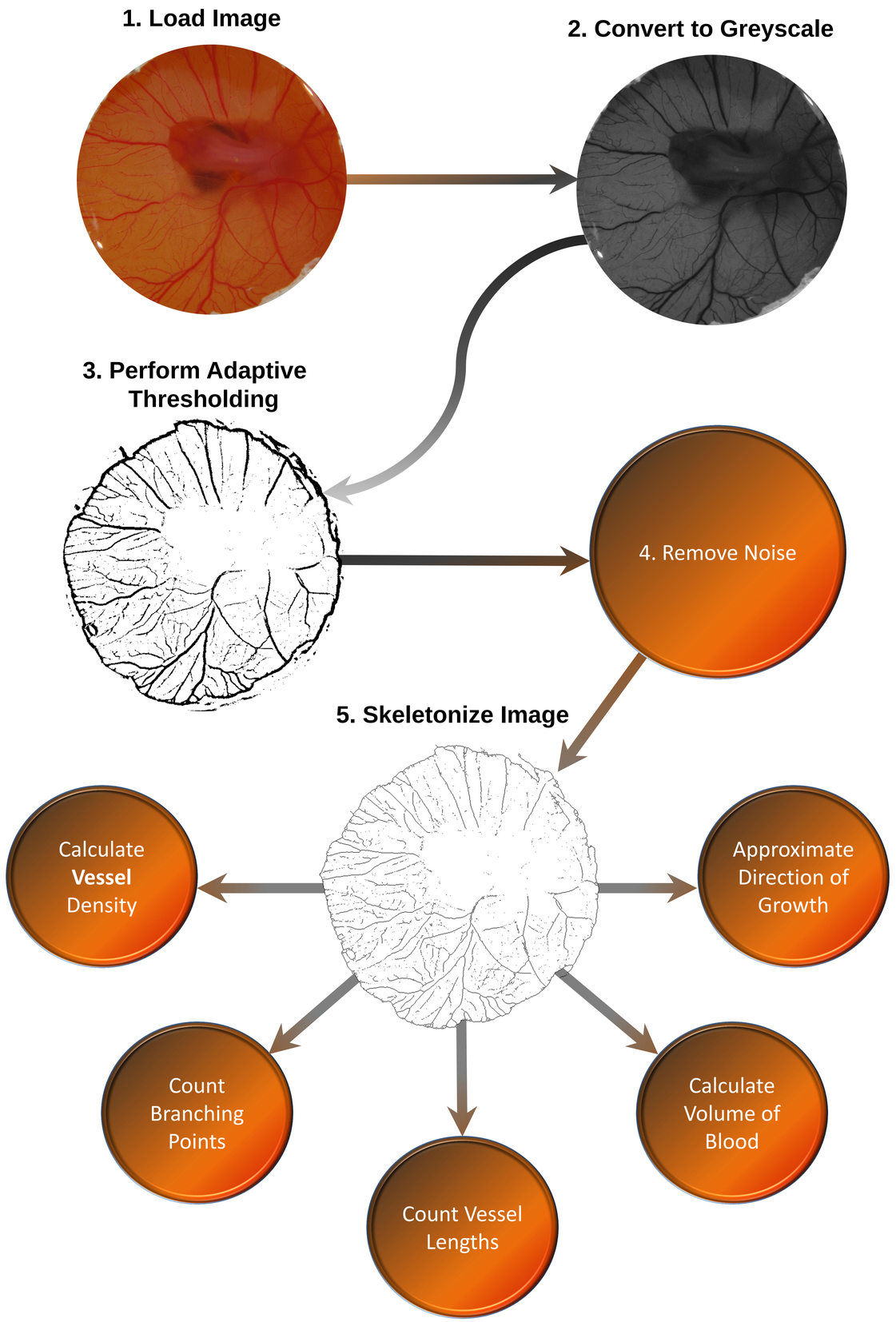
Day 1

Day 2

Research Objectives

For a given CAM image, we would like to determine the following:

- the number of blood vessels
- the number of branches
- the direction of growth
- the length of blood vessels
- the volume of blood vessels



Findings

From preliminary processing, we have learned the following:

- When converting the image to greyscale, using the green channel produced the best initial contrast of blood vessels
- When performing adaptive thresholding, using a block size of 17 and a constant reduction factor of 10 produced the most optimal image that removed uninformative areas while retaining much of the blood vessels
- We are still trying to find an optimal noise removal algorithm that will not remove too much information
- To perform the skeletonization, we applied the Hilditch algorithm, which produced an accurate structure when the thickness of blood vessels is not too large

Future Research

Development of the software is still in its early stages. We are still assessing what can and cannot be accomplished using computer vision. If an automated approach using computer vision of still images is a reasonable method for angiogenesis quantification, the next step would be to analyze a sequence of images to model the growth factor.

Acknowledgments

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