

Modeling wound healing using MATLAB

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Introduction

The concept of a wound is very easy for most people to be understand without needing any formal definition. Looking at any photo with a wound it is fairly obvious for humans to know where a wound is located and what part of the photo is actually normal skin.

In this project we treated the way the protein, keratin, covers a wound as a diffusion process and model it using a numerical way to solve partial differential equations known as the ADI method.



Partial Differential Equations

A *partial differential equation* is a differential equation which contains multiple variables and their partial derivatives. Partial differential equations are abbreviated PDEs and are used to model many real world events.

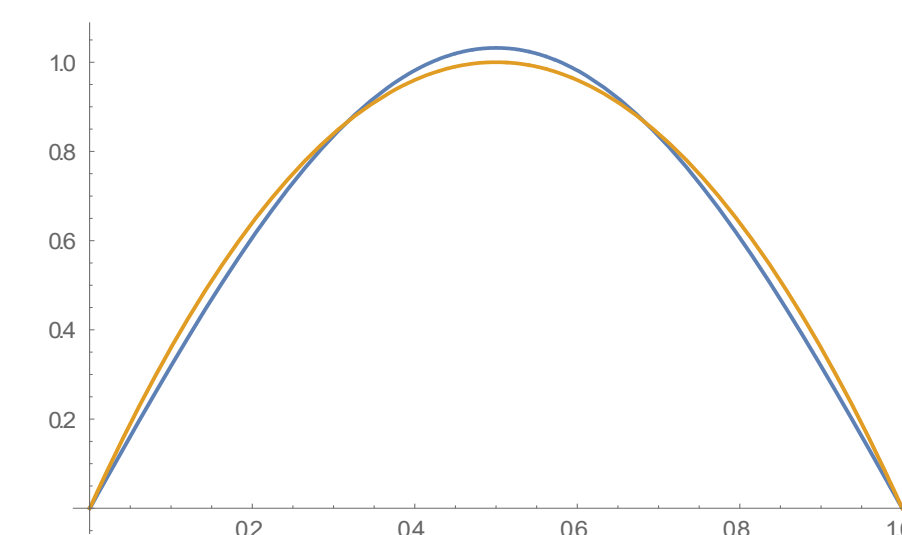
To solve many PDEs one is required to know the boundary conditions and initial conditions.

Example:

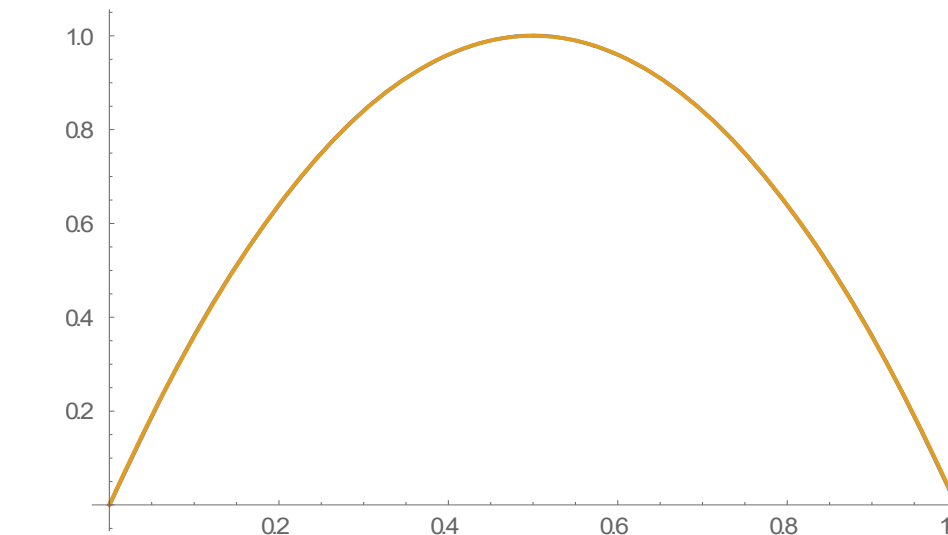
$$\begin{cases} u_t(x, t) - u_{xx}(x, t) = 0, & 0 < x < 1, t > 0 \\ u(0, x) = u(1, t) = 0, & t > 0 \\ 4x - 4x^2, & 0 < x < 1 \end{cases}$$

Solution to above equation approximation to initial condition:

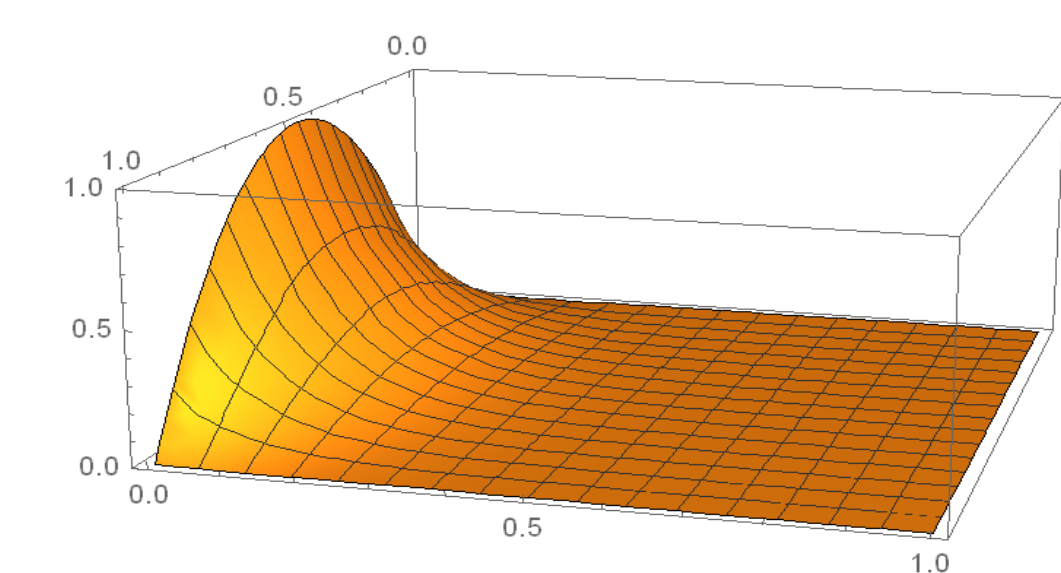
N=2 terms



N=10 terms



Solution model through time t.



Procedure

Did coding and created gui figure using MATLAB.

Made a way to attempt to find boundary of the wound from initial photo.

Numerically approximated solution to partial differential equation modeling the wound healing process using the ADI method with the ability.

Used difference in contrast levels in photo to try to make machine detect accurately where the wound is located.

Am in the process of comparing models given by PDE and the actual photos of wound through time to try to improve model and change necessary parameters to get a more accurate result.

Results

Figure of program running:

