0.1 Mixed Dimensional Mesh

Here I show the cooling and heating effects of a rod on a plate. Here is the initial mesh: **REPLACE MESH**

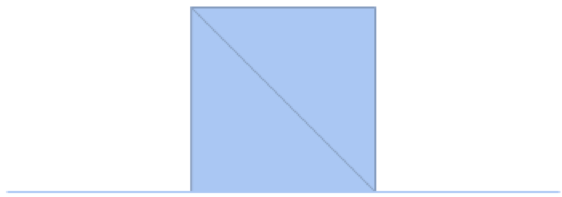

Figure 1: A line and square joined together

The topological space has 3 strata:
1) The left rod
2) The right rod
3) The square

0.2 Studying the square

The square will have a heat equation $v(x, y, t)$.
Here is the square's diffusion equation:

$$\alpha_1(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2}) = \frac{\partial v}{\partial t}$$

This is the initial condition:

$$v(x, y, 0) = -20x(x - 1.5)(x - 3)y(y - 1)$$

The boundary conditions are as follows:

$$v(0, y, t) = 0$$

$$v(3, y, t) = 0$$

$$v(x, 0, t) = 0$$

$$v(x, 1, t) = 0$$

0.3 Square without the rod

For this case, I solved the above differential equation system **WRITE MORE IF POSSIBLE**

0.4 Heat Equation Over Rod

The heat equation for the rods $u(y,t)$ is as follows:

$$\alpha_1 \frac{\partial^2 u}{\partial y^2} = \frac{\partial u}{\partial t}$$

The boundary conditions will be as follows:

$$u(0,t) = 0$$

$$u(3,t) = 0$$

The initial condition for the left rod is as follows:

$$u_1(y,0) = y(y-1)$$

The initial condition for the right rod is as follows:

$$u_2(y,0) = -y(y-1)$$

0.5 Heat Equation Over Square with rods

For this I will split the domain into three parts. At least one of each of their boundaries will be a rod and the obtained values of u_1 and u_2 will be used as boundary conditions.

0.6 Results

Here are the cooling/heating effects at 4 points on the square. It shows the time vs temp before and after the heating rods are applied.
INSERT PLOT