Heat Transfer Project Proposal

Topic

Analyze solutions of the fin heat transfer equation under various constraints—such as space, material volume, etc.—and find an optimal fin design for such conditions.

Group Member

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Objectives

1. Analyze the solutions of the fin heat transfer equation based on different constraints and try to find out the optimal designs.
2. Based on the designs derived from the mathematical equation, construct the fins in Solidworks environments.
3. Using Solidworks' simulation tools to simulate the consequence of our design in a given situation.
4. Use Python library SymPy to help solve the differential equations.

Expected Results

1. Obtain an optimal design under various given constraints.
2. Compare with other (not optimal design) fins in the simulation environment and find out our design could really improve the heat transfer.
3. Analyze the results numerically.

Possible Difficulties

1. We could not obtain the optimal and certain design based on the mathematical equation and method.
2. Solutions to the fin equation may be very complex and involve non-elementary functions.
3. It takes time to learn the heat transfer simulation.

$$\frac{d^2 T}{dx^2} + \left(\frac{1}{A_c} \frac{dA_c}{dx} \right) \frac{dT}{dx} - \left(\frac{1}{A_c} \frac{h}{k} \frac{dA_s}{dx} \right) (T - T_\infty) = 0$$