# GUI Explanation – Smart Cooling Fan System

The GUI (Graphical User Interface) for the Smart Cooling Fan System allows users to interactively run thermal simulations by inputting key parameters such as ambient temperature, load percentage, initial temperature, maximum temperature, and simulation time. Once the simulation starts, the system visualizes real-time data using 2D plots for temperature and fan speed, and an optional 3D surface plot. User inputs are handled through edit text fields, while output plots are shown in designated axes panels. The GUI simplifies the simulation process by integrating all logic under a single button trigger, eliminating the need for manual script execution. Data is also automatically exported to Excel for review. This interface was fully implemented using MATLAB’s GUIDE tool.

**Code Summary Table**

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| --- | --- | --- |
| File Name | Purpose | Inputs / Outputs |
| mainGUI.m | Main GUI controller for the simulation | Inputs: GUI fields Outputs: Plots, Simulation Results |
| mainGUI.fig | GUI layout design (created with GUIDE) | N/A |
| get\_user\_inputs.m | Retrieves input values from GUI fields | Inputs: GUI components Outputs: Variable values |
| initialize\_system.m | Initializes simulation state and parameters | Inputs: Parameters struct Outputs: Initialized state |
| simulate\_smart\_fan.m | Runs simulation loop, adjusts fan speed, updates temperature | Inputs: State, Parameters Outputs: Updated State |
| fan\_speed\_to\_numeric.m | Converts fan speed strings to numeric values for plotting | Inputs: Fan speed strings Outputs: Numeric levels |
| publish\_script.m | Runs and publishes a simulation report | Inputs: Parameters Outputs: HTML/PDF report |