Product requirement document (PRD)

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The goal of this design is to create an interior temperature calculator that represents the ideal inside temperature in relation to outside temperature variations and the insulation properties of various materials. The primary goal of the initial construction of mobile structures was to ensure that people could live there, and maintaining the proper indoor temperature is a necessary condition. As a result, this software's main function is to control the indoor temperature so that residents can live there, and its precise value can be determined by residents or supported by scientific evidence.The basic idea behind this software is to input an exterior temperature, heat, and then the material of the chosen building. The algorithm and scientific method used in the calculation will then output the best, most comfortable temperature indoors. If there are people inside, the amount of carbon dioxide they breathe will increase, which will affect the temperature. As a result, you should add a column for the number of people inside before you output the ideal temperature indoors. Following is the particular theoretical backing:

The outdoor heat load is $Q = (1.1A) + (3.4\,UA * (Ti - Ta)) + (3.4 * (1 + (0.04V) * (Ta + 273)) * (Ti - Ta))$, where Q is the outdoor heat load (W), A is the area of the building's exterior walls (m²), U is the thermal conductivity of the building's exterior walls (W/m²K), Ti is the indoor temperature (℃), Ta is the outdoor temperature (℃), and V is the outdoor humidity (kg/kg).

$$Q = U * A * (T1 - T2)/d$$

Q is the heat transfer rate, U is the heat transfer coefficient, A is the heat transfer area, T1 is the temperature at one end, and T2 is the temperature at the other end.Without windows, the following formula can be derived without considering the thickness of the material:

$$Ti=Ti+(Ta-Ti)\cdot\lambda\cdot A/(Cp\cdot V\cdot n)$$

Assuming the house is 100 square meters, V is set as 100 m^2, and A is approximately 200-400, with 300 taken here:

$$Ti=Ti+(Ta-Ti)\cdot\lambda\cdot 300/(Cp\cdot 100\cdot n)$$

Similarly, in order to obtain the U value of the material, a simple U value calculator needs to be designed:

$$U = \frac{\lambda}{d}$$

Where, U is the Thermal transmittance (W/m^2K), λ is the Thermal conductivity (W/mK), and d is the Material thickness, which is in units of m.

Similar software is already available on the market, such as the "Weather Calculator: Thermometer Weather and Indoor Temperature and Humidity Control Assistant" app in the Apple Store, which already implements the functions envisaged in this software design, such as not only analyzing weather conditions, temperature, humidity, and barometric pressure, but also calculating enthalpy, altitude, and wind power to calculate. It is also possible to calculate the comfort level and change the room temperature and humidity scientifically. The scientific foundation for this program is vast and reliable; the main algorithms and physical models have been thoroughly confirmed, as well as the data is extremely accurate. It is worth considering and learning a lot from.