notes grand model

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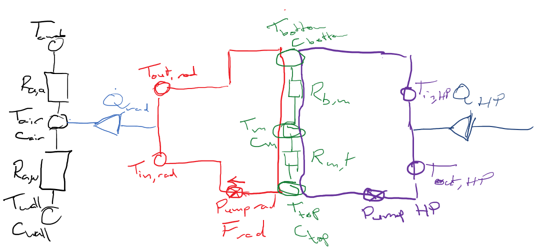

T_{amb} : given as piece wise constant function, in interval $[t_i, t_{i+1})$ $T_{amb} = T_{amb_i}$

$$T_{air} : \quad C_{air} \cdot \frac{dT_{air}}{dt} = -\frac{1}{R_{aa}}(T_{air} - T_{amb}) - \frac{1}{R_{aw}}(T_{air} - T_{wall}) + \dot{Q}_{rad}$$

$$T_{wall} : \quad C_{wall} \cdot \frac{dT_{wall}}{dt} = \frac{1}{R_{aw}}(T_{air} - T_{wall})$$

$\dot{Q}_{rad}$: radiator equation:
$$\dot{Q}_{rad} = C_{rad} \cdot \left(\frac{T_{in,rad} - T_{out,rad}}{\ln\left(\frac{T_{in,rad} - T_{air}}{T_{out,rad} - T_{air}}\right)} \right)^n$$

also:
$$\dot{Q}_{rad} = \underset{\substack{\Uparrow \\ \text{in kg/s}}}{F_{rad}} \cdot c_{water} \cdot (T_{in,rad} - T_{out,rad})$$

when $T_{in,rad}, T_{air}, F_{rad}$ are known we have 2 eq. with 2 unknowns $\dot{Q}_{rad}$ and $T_{out,rad}$

question: when do you solve this system? Do you need to solve this within the time interval $[t_i, t_{i+1})$?

$T_{rad,in} = T_{top}$

$T_{rad,out}$ should follow from equations above

$$T_{top} : \quad C_{top} \frac{dT_{top}}{dt} = \frac{-1}{R_{m,t}}(T_{top} - T_m) + F_{HP}\, c_{water}(T_{out,HP} - T_{top}) + \max(F_{rad} - F_{HP}, 0)\, c_w (T_m - T_{top})$$

$$T_m : \quad C_m \frac{dT_m}{dt} = \frac{1}{R_{m,t}}(T_{top} - T_m) - \frac{1}{R_{b,t}}(T_m - T_{bottom}) + \max(F_{HP} - F_{rad}, 0)\, c_w (T_{top} - T_m) + \max(F_{rad} - F_{HP}, 0)\, c_w (T_{bottom} - T_m)$$

$$T_{bottom} : \quad C_b \frac{dT_{bottom}}{dt} = \frac{1}{R_{b,t}}(T_m - T_{bottom}) + F_{rad}\, c_w (T_{out\,rad} - T_{bottom}) + \max(F_{HP} - F_{rad}, 0)\, c_w (T_m - T_{bottom})$$

$$T_{in,HP} = T_{bottom}$$

$$T_{out,HP} : \quad \dot{Q}_{HP} = F_{HP}\, c_w (T_{out,HP} - T_{in\,HP})$$

$$\dot{Q}_{HP} = f(T_{in\,HP}, T_{out\,HP}, T_{in\,source}, T_{out,source}, \ldots)$$

Heat pump function

Also here the question is: when to solve this equations?