

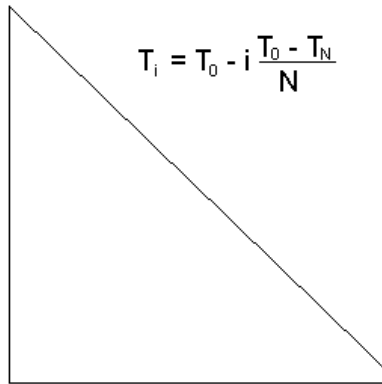
|                    |   |                    |
|--------------------|---|--------------------|
| $\beta\tau\lambda$ | <h1>Simulated Annealing Cooling Schedules</h1> <p><b>Brian T. Luke, Ph.D.</b></p> | $\beta\tau\lambda$ |
|--------------------|---|--------------------|

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**Figure 1:** Various cooling schedules that can be used with a Simulated Annealing optimization.  $T_i$  is the temperature for cycle  $i$ , where  $i$  increases from 0 to  $N$ . The initial and final temperatures,  $T_0$  and  $T_N$  respectively, are determined by the user, as is  $N$ .

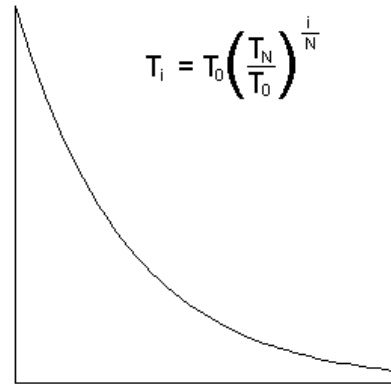
Cooling Schedule 0

$$T_i = T_0 - i \frac{T_0 - T_N}{N}$$



Cooling Schedule 1

$$T_i = T_0 \left( \frac{T_N}{T_0} \right)^{\frac{i}{N}}$$

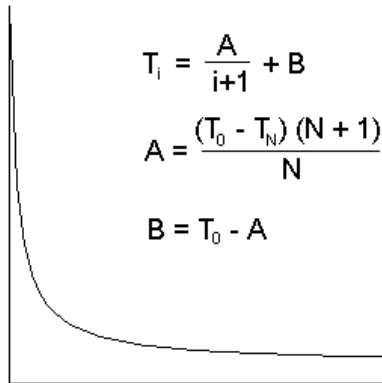


Cooling Schedule 2

$$T_i = \frac{A}{i+1} + B$$

$$A = \frac{(T_0 - T_N)(N+1)}{N}$$

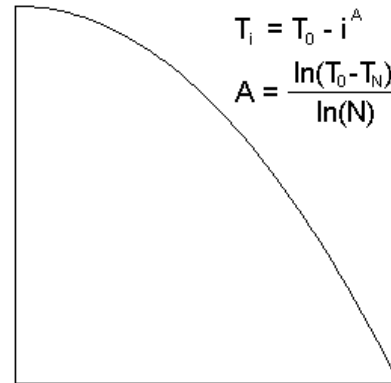
$$B = T_0 - A$$



Cooling Schedule 3

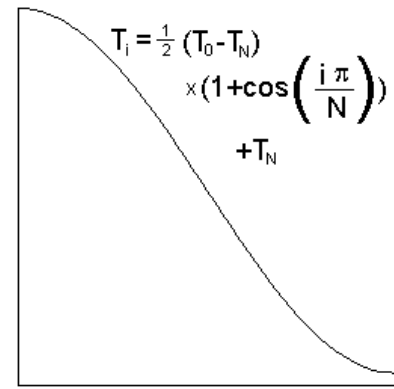
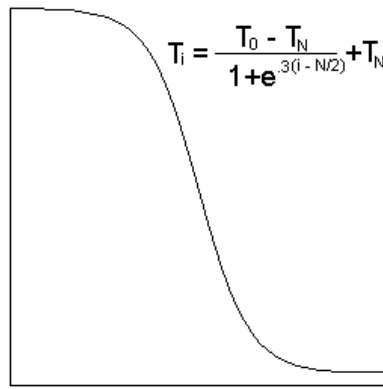
$$T_i = T_0 - i^A$$

$$A = \frac{\ln(T_0 - T_N)}{\ln(N)}$$

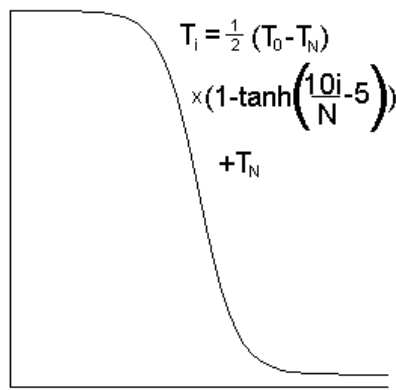


Cooling Schedule 4(sigmoid)

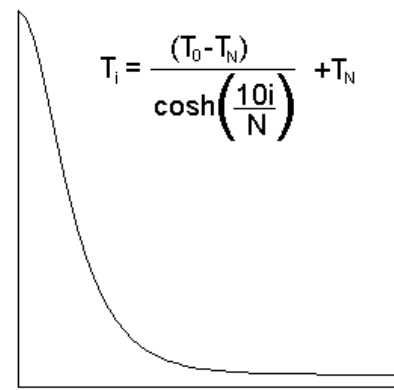
Cooling Schedule 5



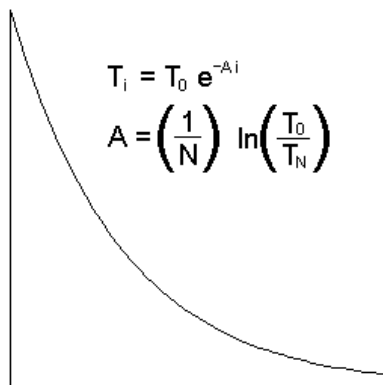
Cooling Schedule 6



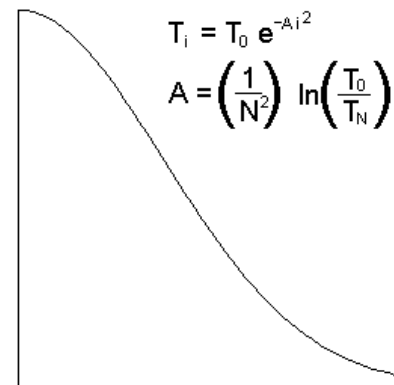
Cooling Schedule 7



Cooling Schedule 8



Cooling Schedule 9



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