

Secant Algorithm

This algorithm is implemented in C++ in Rts in the class *RSecantLineSearchAlgorithm*. One approach to find the root of the function

$$f(x) = \frac{dF(x)}{dx} = 0 \quad (1)$$

or the solution to the minimization problem

$$x^* = \arg \min \{F(x)\} \quad (2)$$

is to repeatedly determine the root of the secant (“chord line”) between values x_{lower} and x_{upper} that the solution is assumed to lie within.

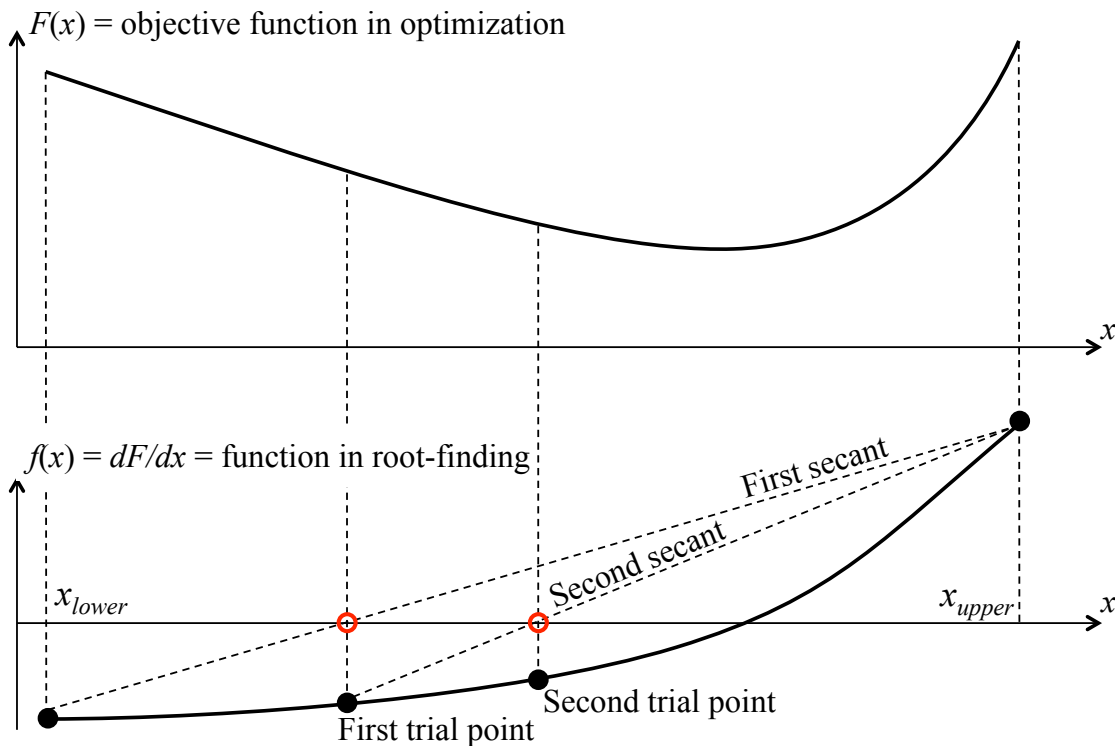


Figure 1: Sequential trial roots in the secant algorithm.

Given the value of $f(x)$ at those two x -values the line of the secant is defined by the triangle equality

$$\frac{x_{upper} - x_{lower}}{f_{upper} - f_{lower}} = \frac{x_{trial} - x_{lower}}{0 - f_{lower}} \quad (3)$$

Solving for x_{trial} yields the formula

$$x_{trial} = x_{lower} - f_{lower} \cdot \left(\frac{x_{upper} - x_{lower}}{f_{upper} - f_{lower}} \right) \quad (4)$$

which is recursive because at each step either x_{lower} or x_{upper} is replaced by x_{trial} , depending on where the solution lies; if $f(x_{lower})$ and $f(x_{trial})$ have different signs then the solution is to the left of x_{trial} , and vice versa.