

Pseudocode for a $(1 + 1)$ -ES

ALGORITHM 1 $((1 + 1)$ -ES)

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t := 0;
initialize  $P^{(t)} = \{(\vec{x}, \sigma)\}$ ;
evaluate  $f(\vec{x})$ ;
while ( $T(P^{(t)}) = 0$ ) do
     $(\tilde{\vec{x}}, \tilde{\sigma}) := \text{mut}((\vec{x}, \sigma))$ ;
    evaluate  $f(\tilde{\vec{x}})$ ;
    if ( $f(\tilde{\vec{x}}) \leq f(\vec{x})$ )
        then  $P^{(t+1)} := \{(\tilde{\vec{x}}, \tilde{\sigma})\}$ ;
        else  $P^{(t+1)} := P^{(t)}$ ;
    t := t + 1;
od

```

σ -modification according to Schwefel:

After every n mutations, check how many successes have occurred over the preceding $10 \cdot n$ mutations. If this number is less than $2 \cdot n$, multiply the step length by the factor $c = 0.85$; divide it by 0.85 if more than $2 \cdot n$ successes occurred.