

Selection

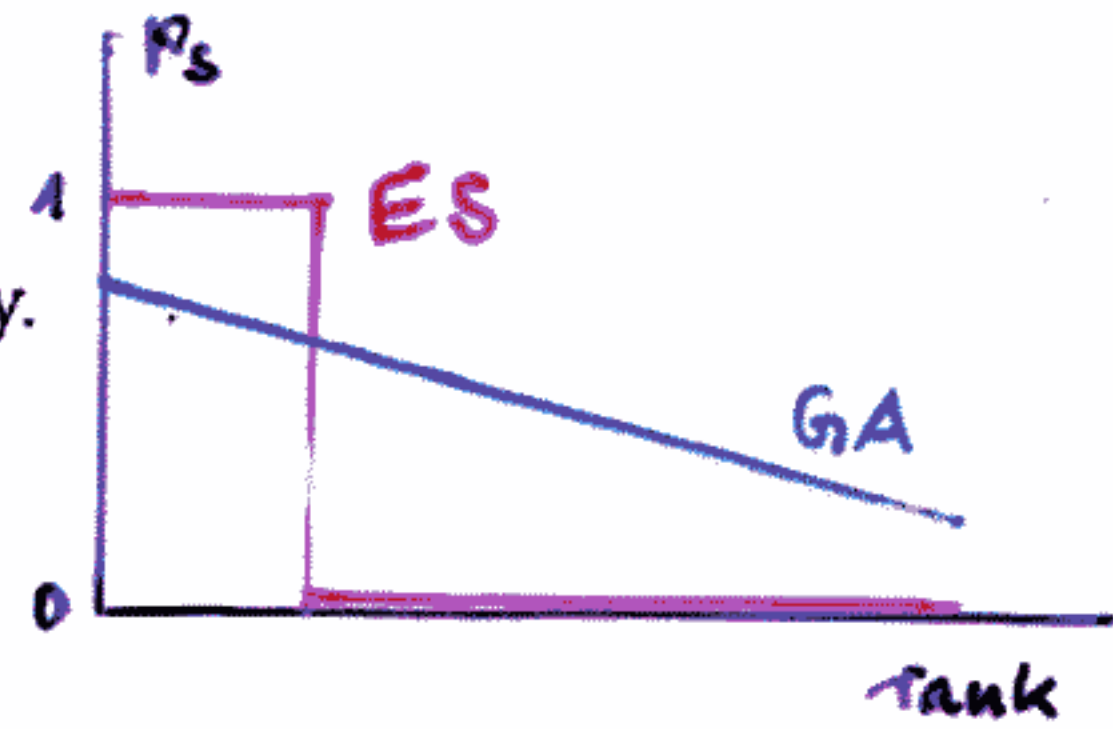
- Strictly deterministic, rank-based.
- The μ best ranks are handled equally.
- Two forms:

– $(\mu+\lambda)$ -selection:

The μ best of offspring and parents survive.

– (μ,λ) -selection:

The μ best offspring survives.



Formally: $\text{sel}_{\mu}^k(P) = \tilde{P}$, where $|\tilde{P}| = \mu$, $|P| = k \geq \mu$, and

$$\forall \vec{a} \in \tilde{P} : \nexists \vec{a} \in P - \tilde{P} : f(\vec{x}) \leq f(\vec{a})$$

- Default: (μ,λ) -selection (e.g., (15,100)).
 - Important for self-adaptation.
 - Applicable also for noisy objective functions, moving optima.
- Selective pressure: Very high.

In terms of the *takeover time* τ^* (number of generations required until repeated application of selection completely fills the population with copies of the best individual; Goldberg & Deb 1991):

$$\tau^* = \frac{\ln \lambda}{\ln(\lambda/\mu)}$$

$\tau^* \approx 2$ generations for a (15,100)-ES

1 $\tau^ \approx 458$ for a (99,100)-ES*

(cf. proportional selection in GAs: $\tau^* \approx \lambda \ln \lambda = 460$ generations!).