Introduction to Evolutionary Algorithms

Presentation · November 2016

DOI: 10.13140/RG.2.2.13850.64964

CITATIONS
0

READS
1,468

1 author:

Shahin Rostami
Bournemouth University
31 PUBLICATIONS **294** CITATIONS

SEE PROFILE

Evolutionary Computation

an introduction to evolutionary algorithms

Who am I?

- Dr. Shahin Rostami
- Lecturer in Computational Intelligence at the Bournemouth University
- Ph.D. thesis:
  “Preference Focussed Many-Objective Evolutionary Computation”

Presentation overview

- Why Evolutionary Computation?
- What is it?
- How does it work?
- Further reading

Why Evolutionary Computation?

- Exciting applications in many fields:
  - **Concealed weapon detection**
  - Medical scan classifiers
  - Automotive active steering controllers
  - SMART home systems
  - **A.I. behaviour for video games**

Why Evolutionary Computation?

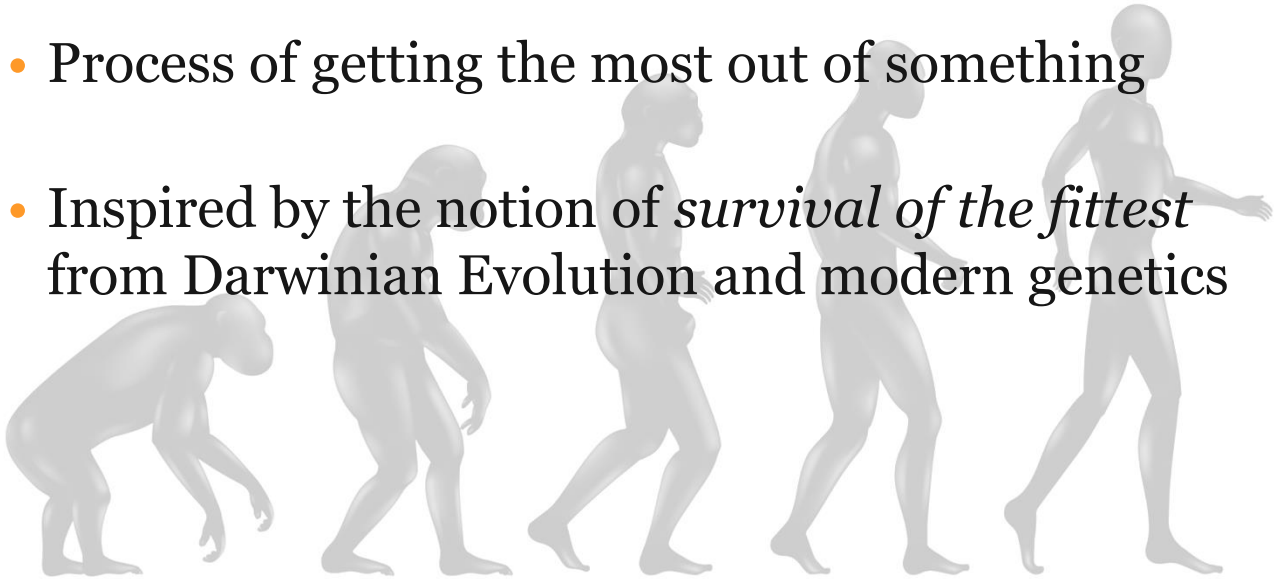
- Improve design of systems
- Make an impact on safety of others

Why Evolutionary Computation

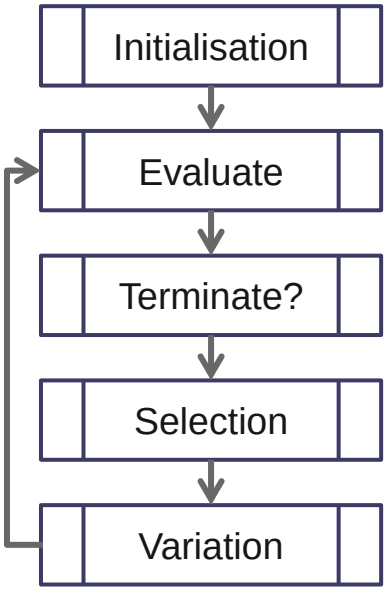
- Design A.I. behaviour with preference towards:
  - Fast level completion
  - Aggressiveness
  - Score achievement
  - Coins collected
  - Or a compromise of the above

What is Evolutionary Computation?

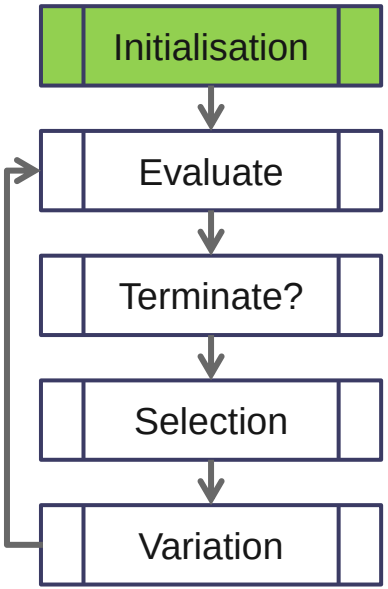
- A nature inspired approach to optimisation
- Process of getting the most out of something
- Inspired by the notion of *survival of the fittest* from Darwinian Evolution and modern genetics

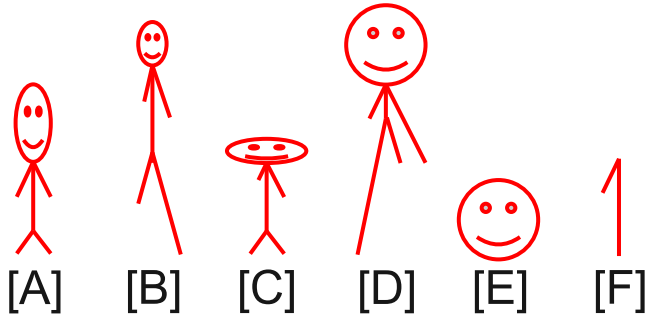


How does it work?

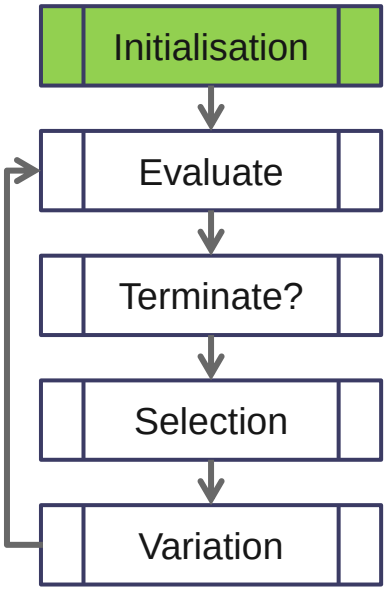


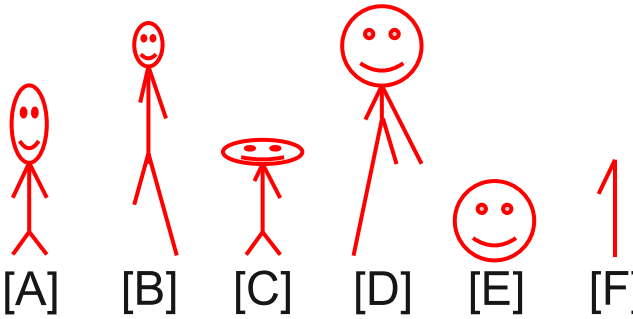
How does it work?





How does it work?





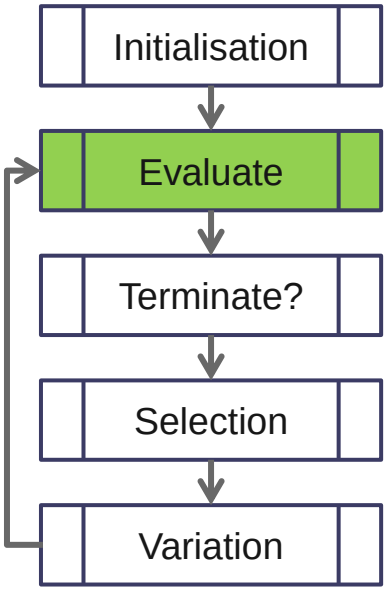
Parameters:

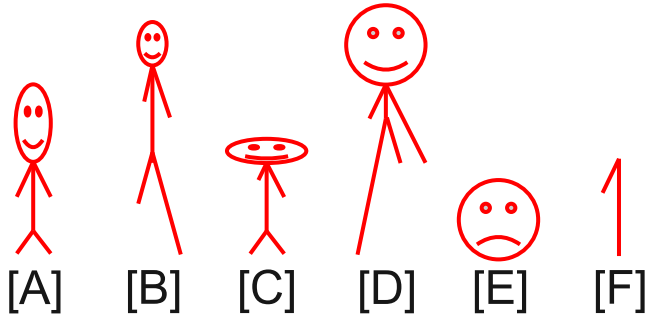
- Left leg length
- Right leg length
- Torso length
- Left arm length
- Right arm length
- Head Size

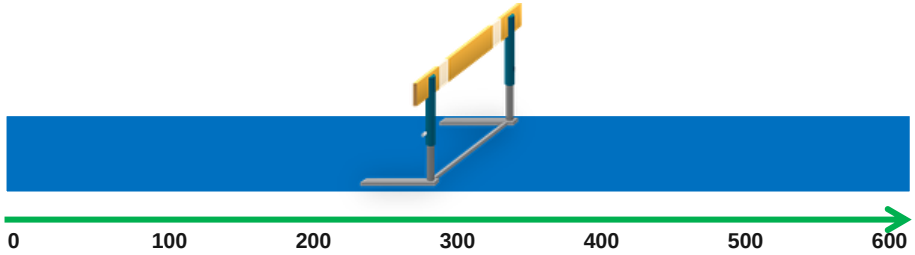
Chromosome:

Left Leg	Torso	Left Arm	Head	Right Arm	Right Leg

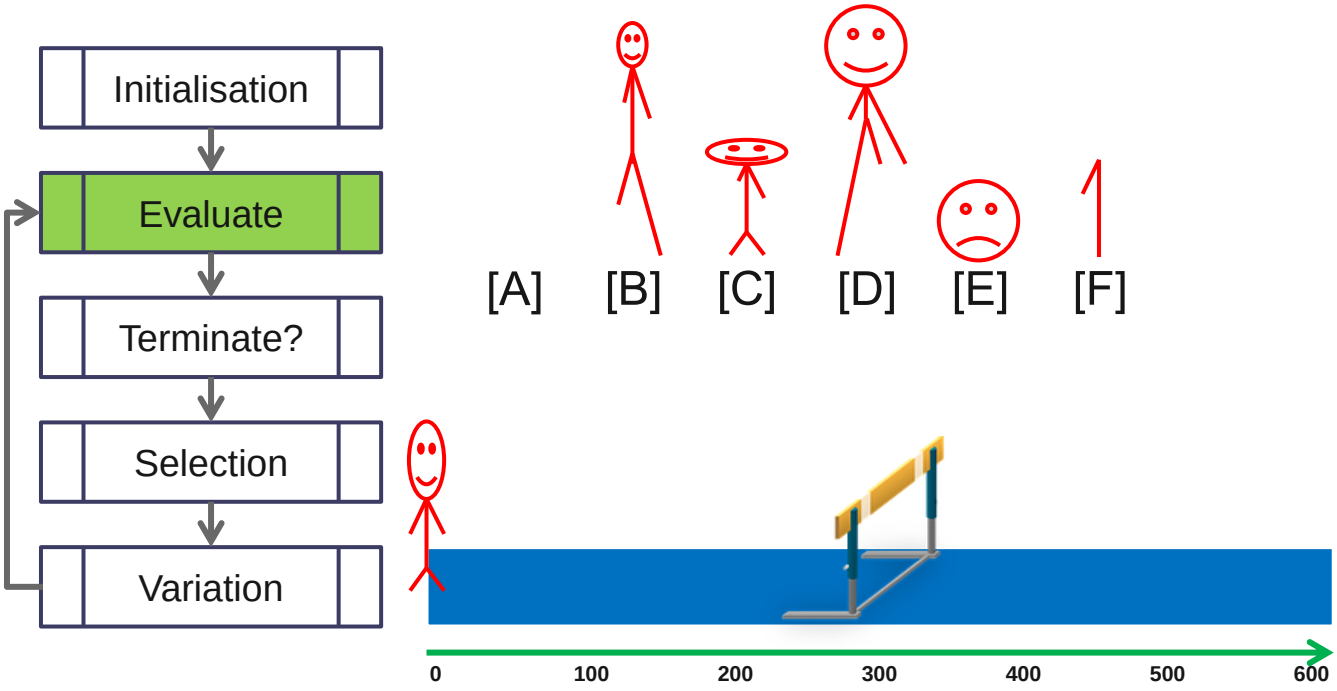
How does it work?



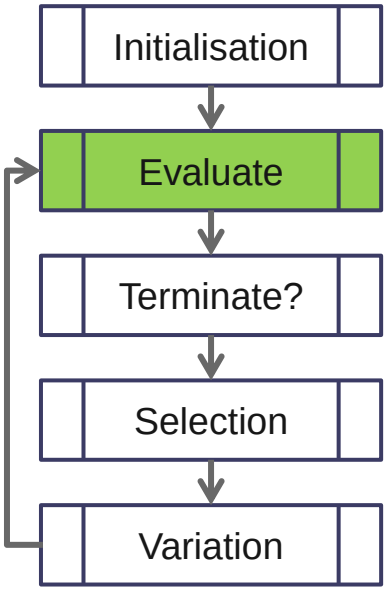


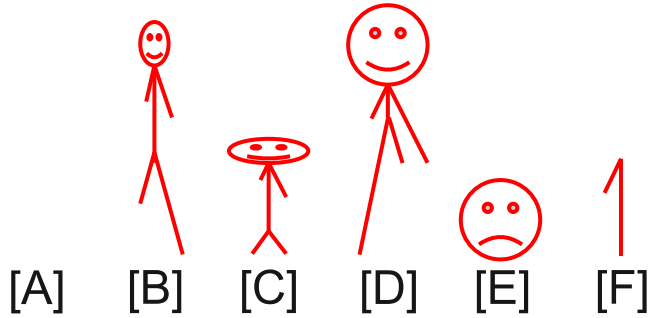


How does it work?

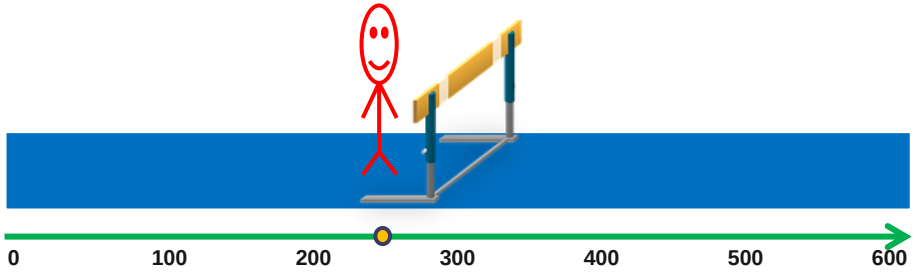


How does it work?

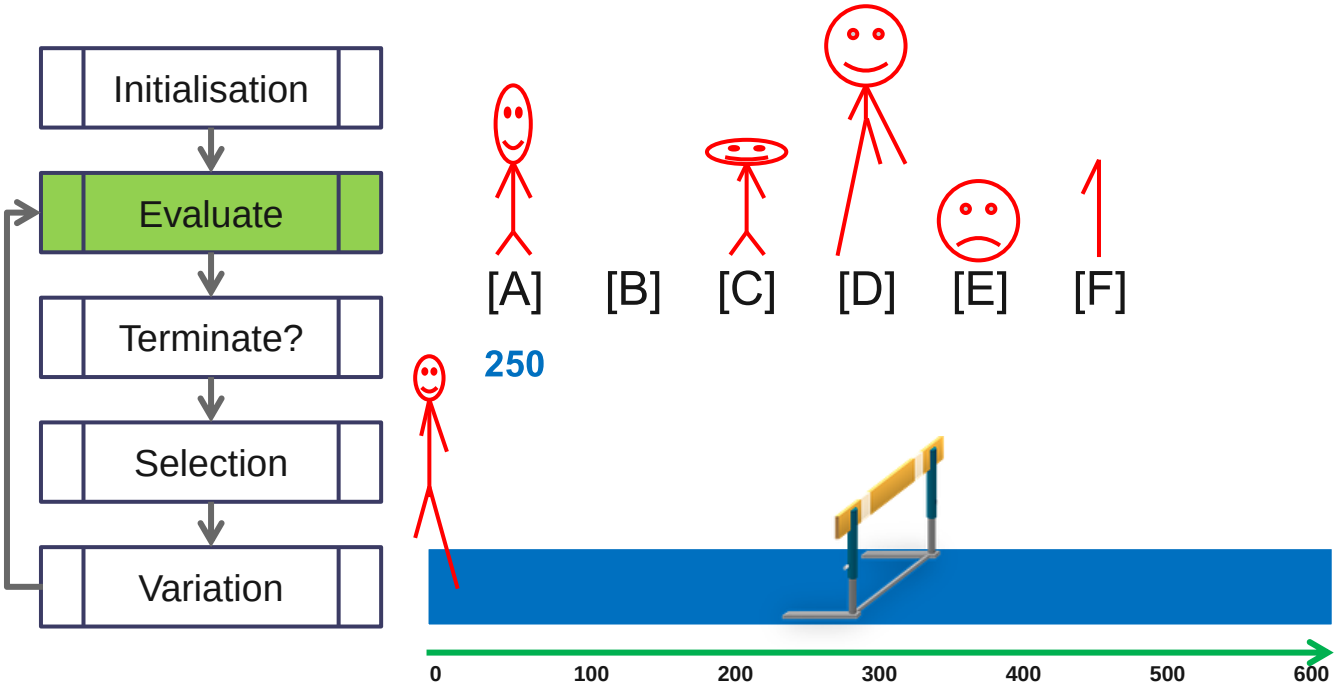




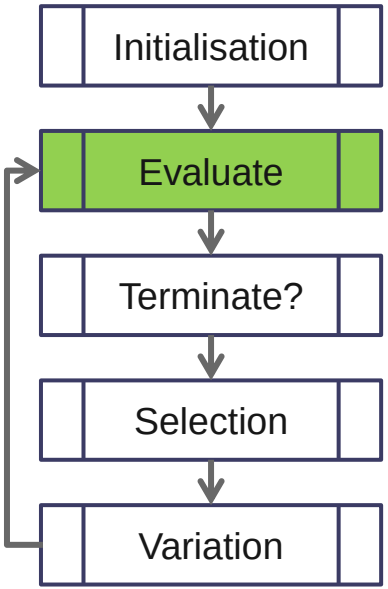
250

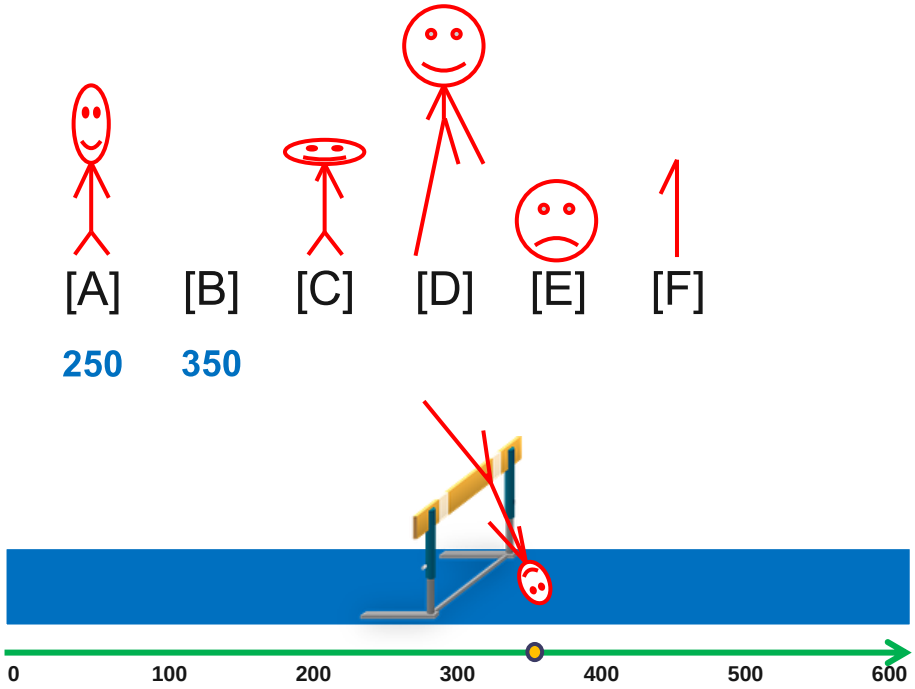


How does it work?

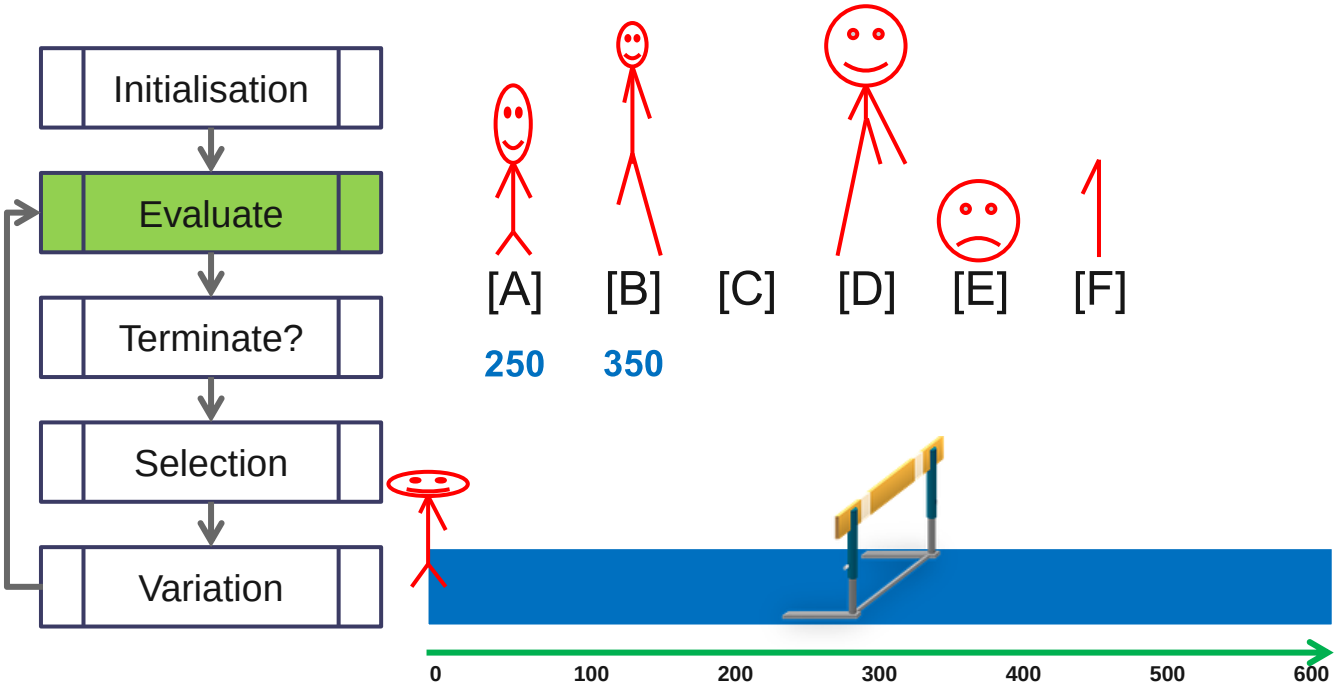


How does it work?

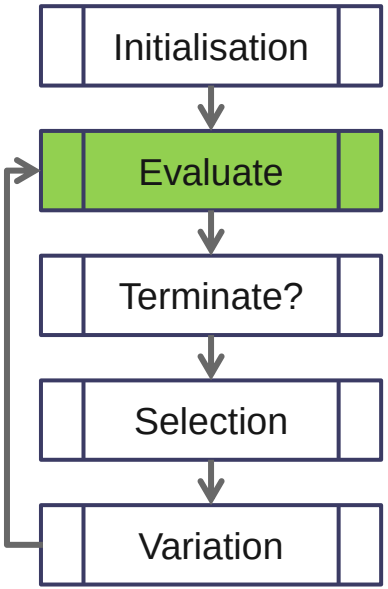


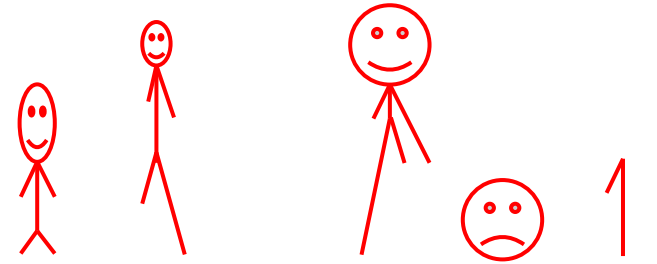


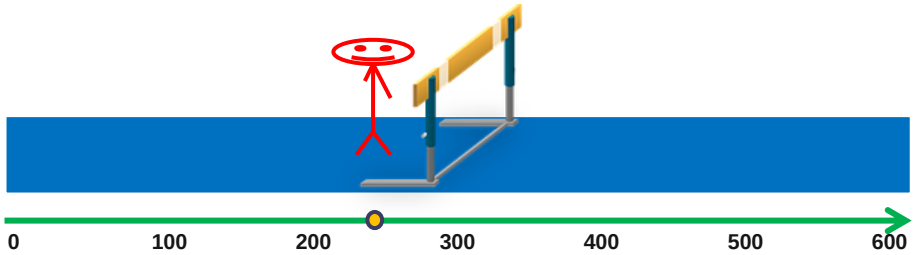
How does it work?



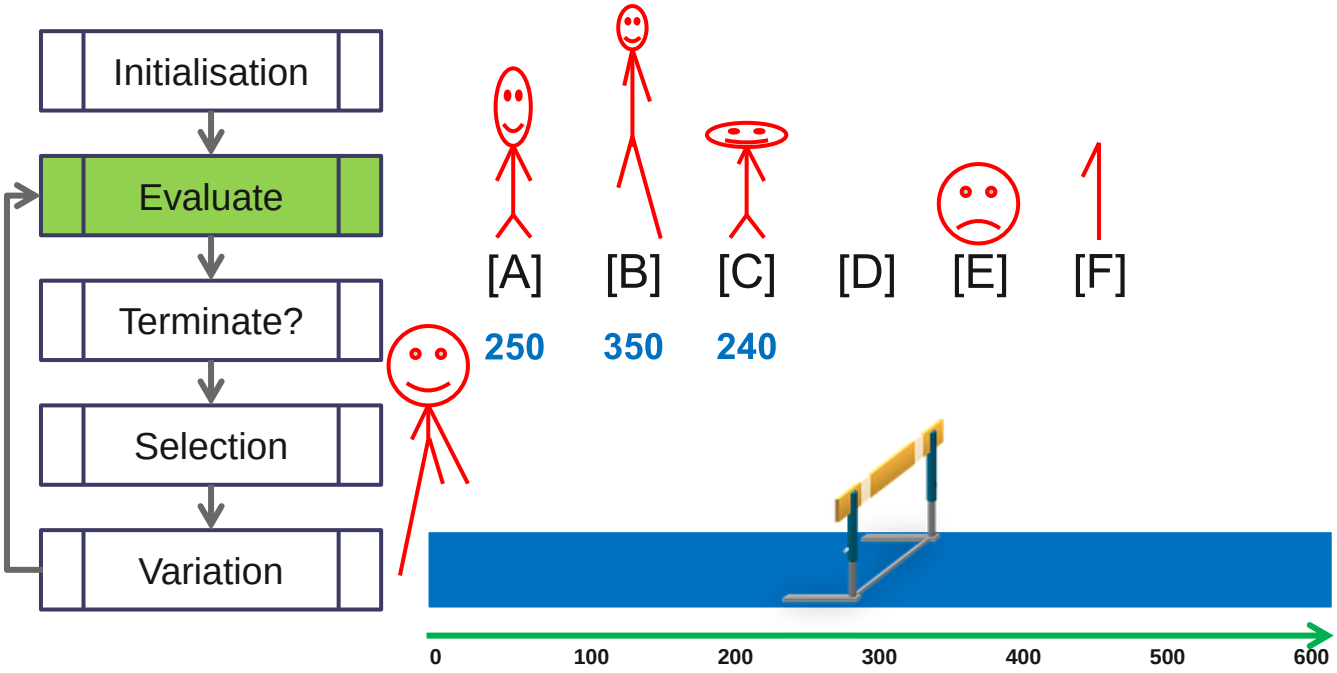
How does it work?



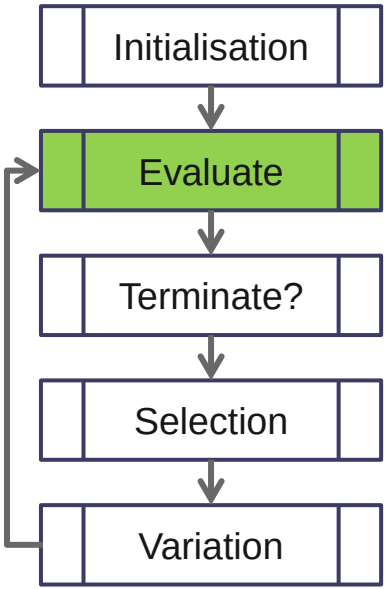


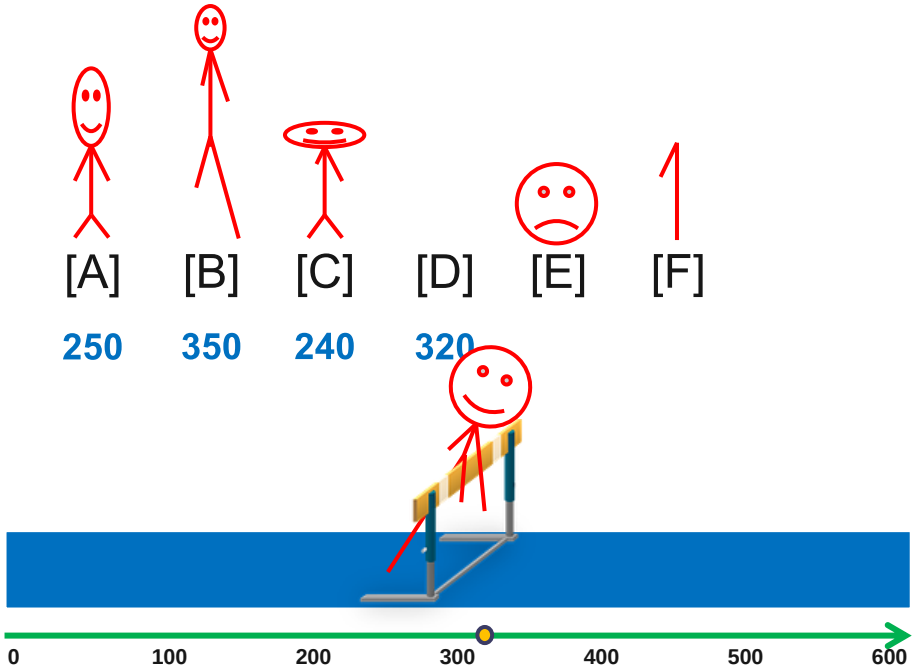


How does it work?

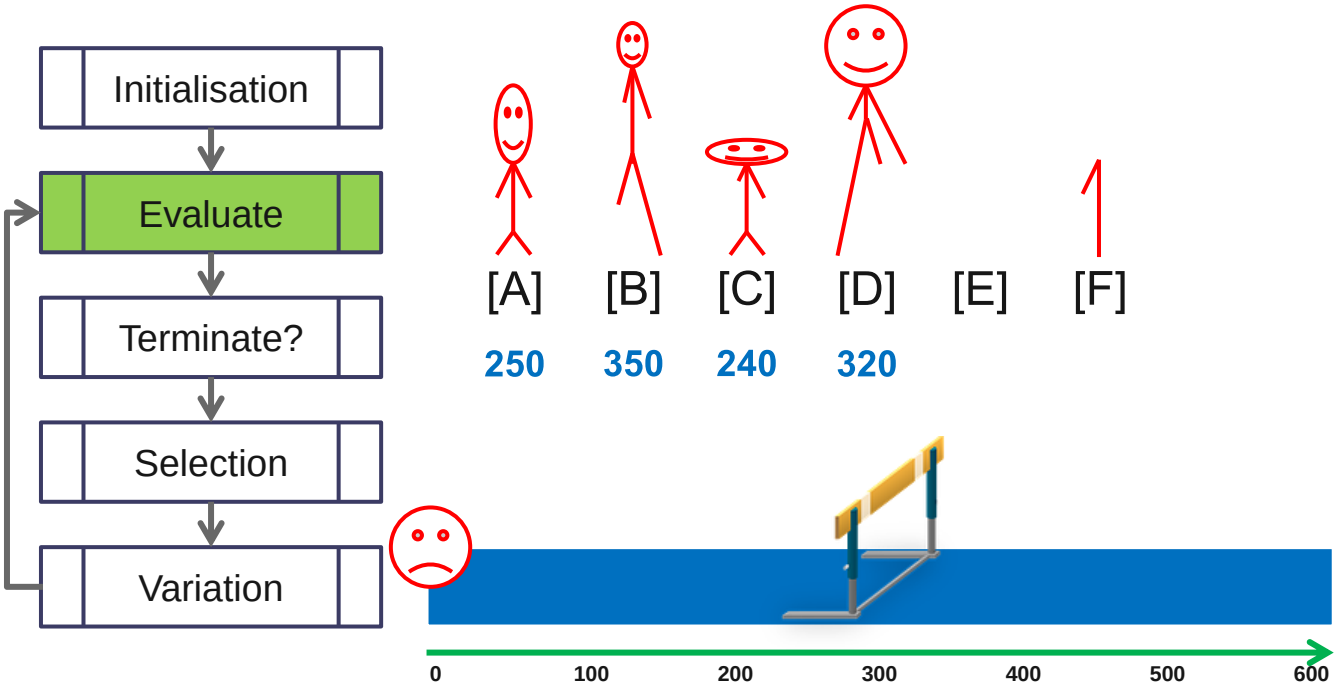


How does it work?

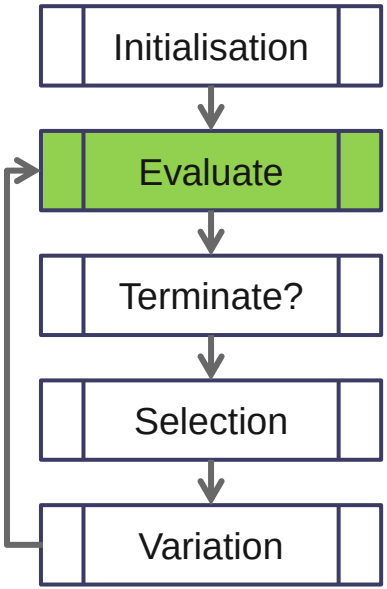


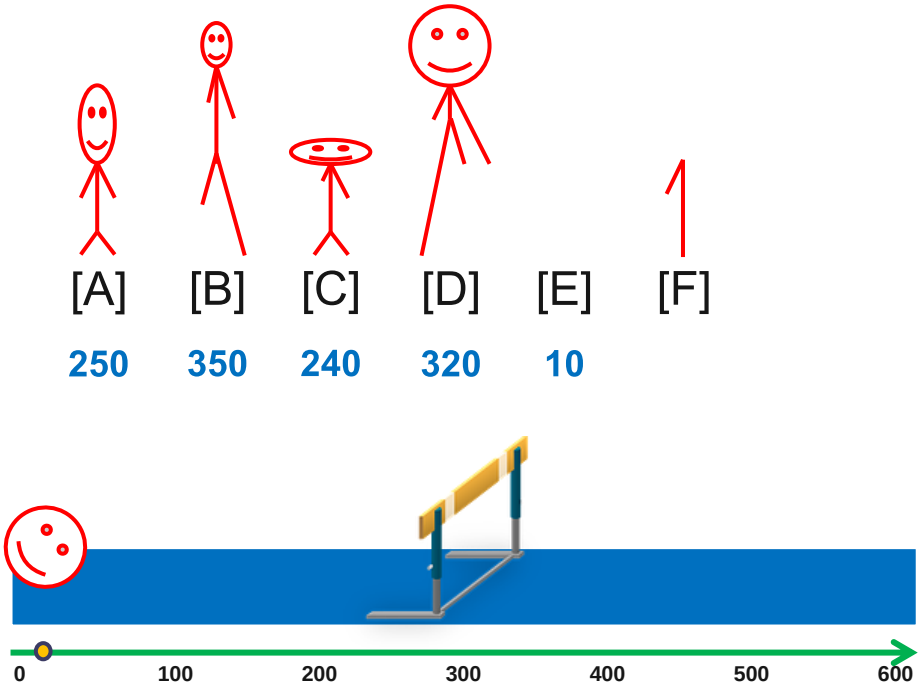


How does it work?

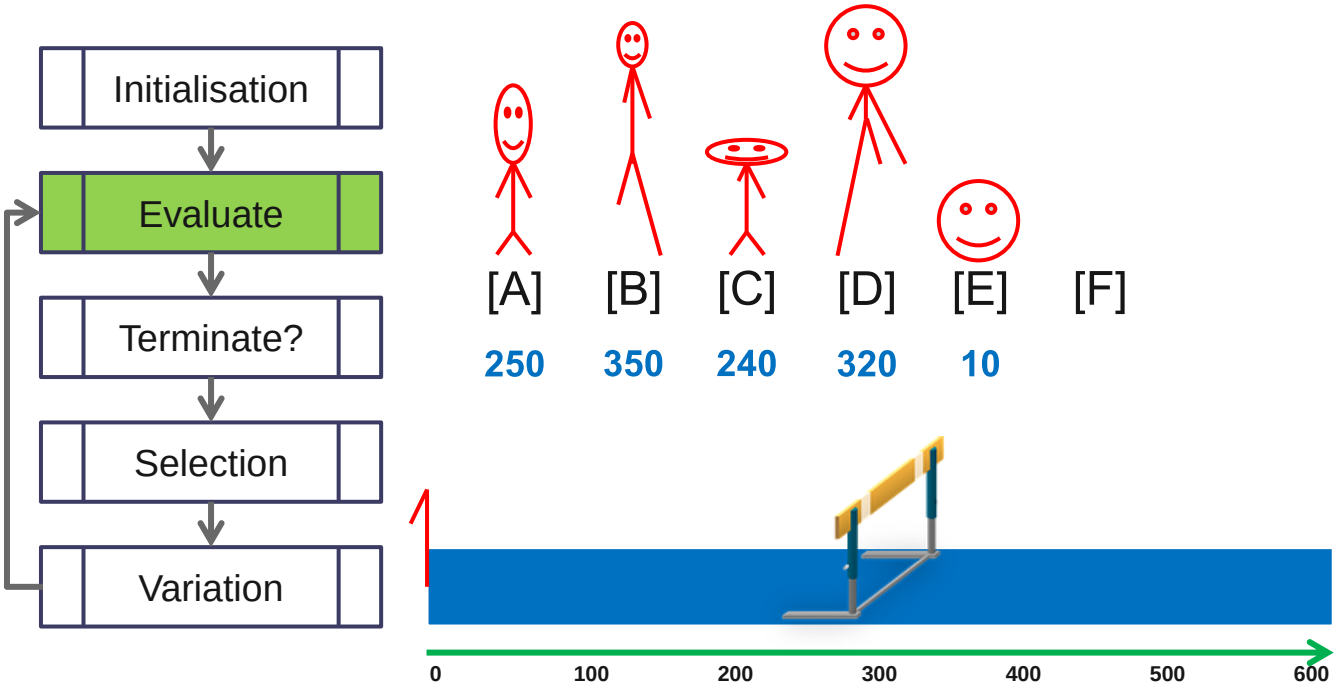


How does it work?

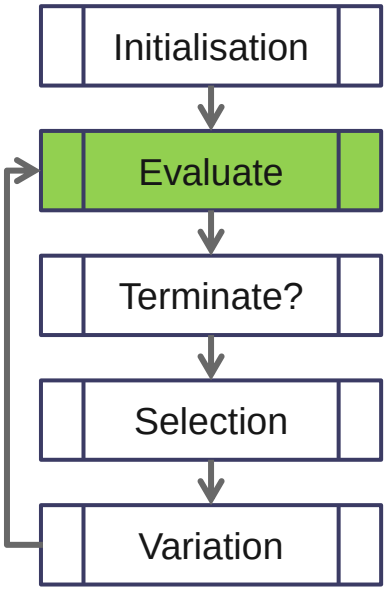


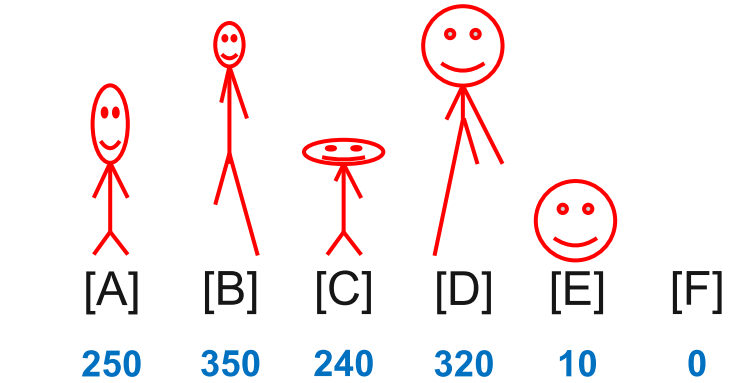


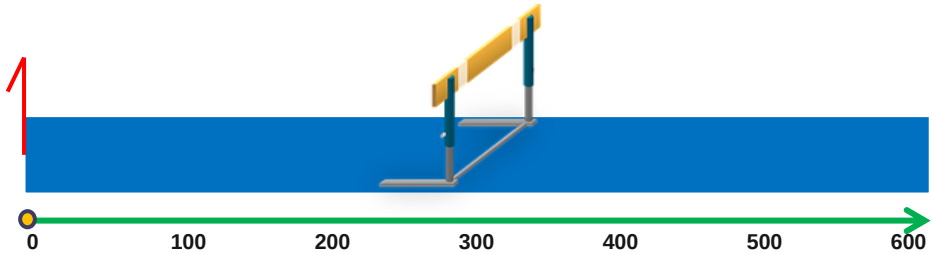
How does it work?



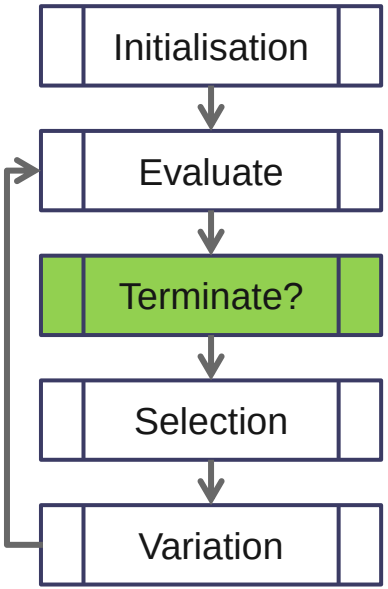
How does it work?

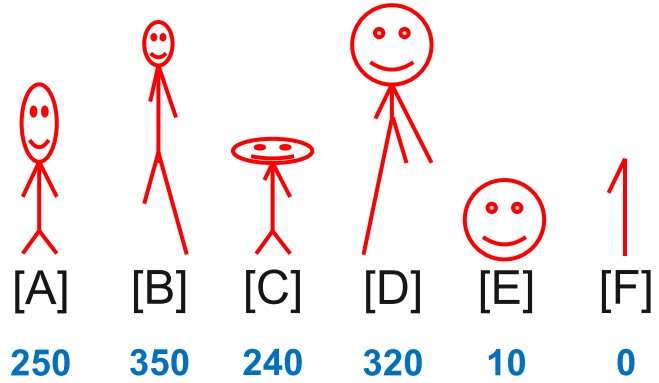






How does it work?

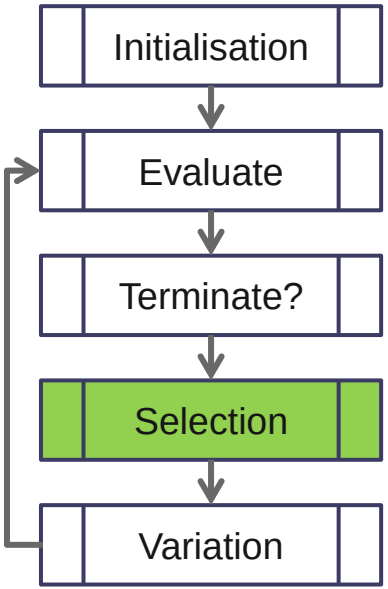


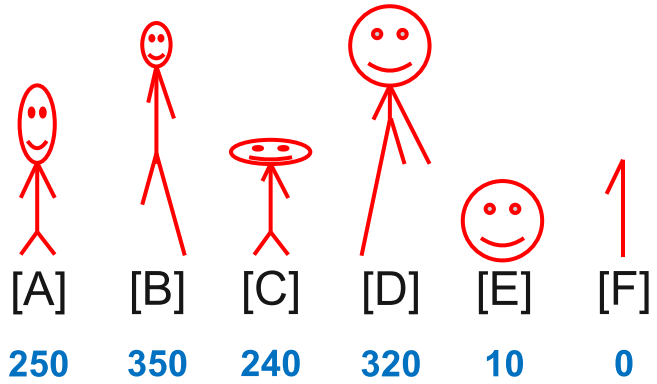


Termination Criteria

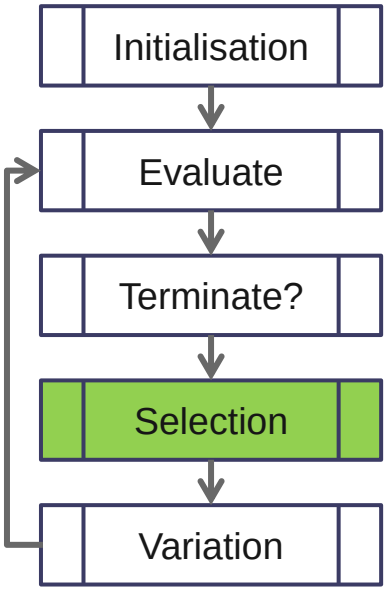
- Goal achieved?
- Number of generations reached max?
- Performance stagnating?

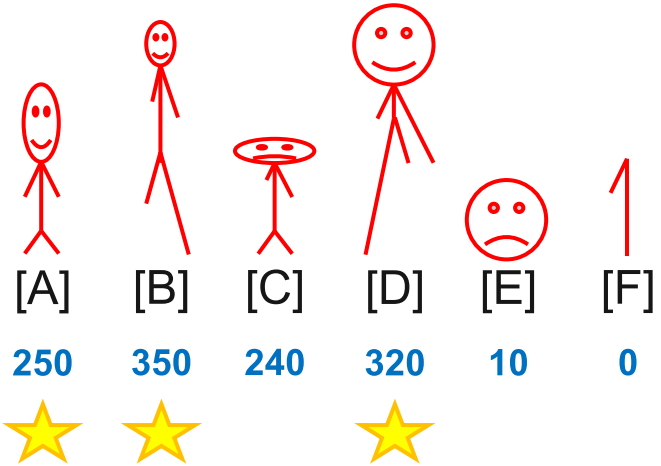
How does it work?



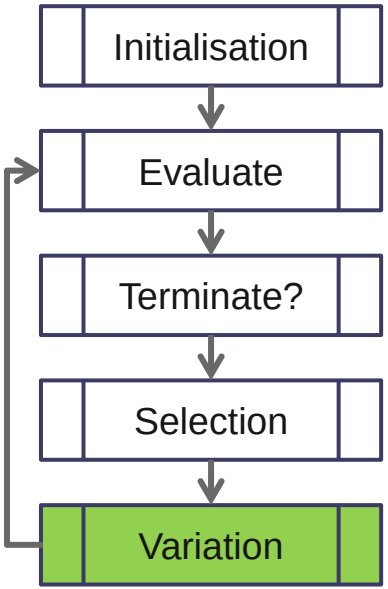


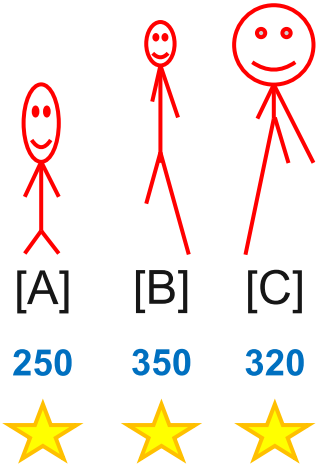
How does it work?



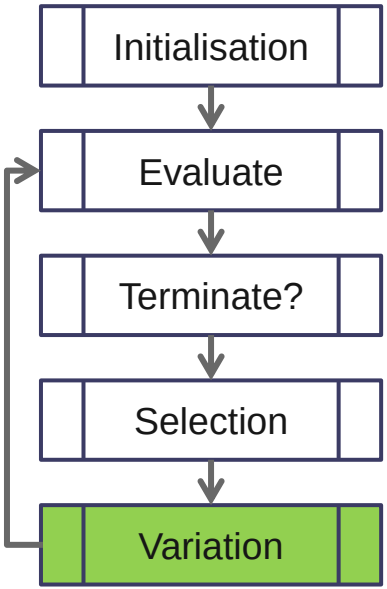


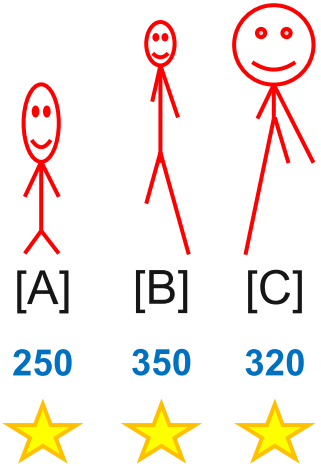
How does it work?

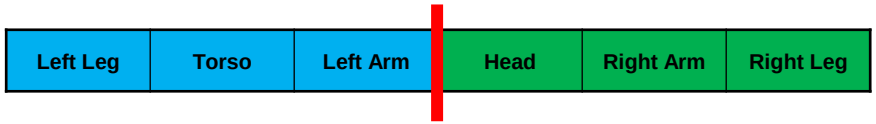




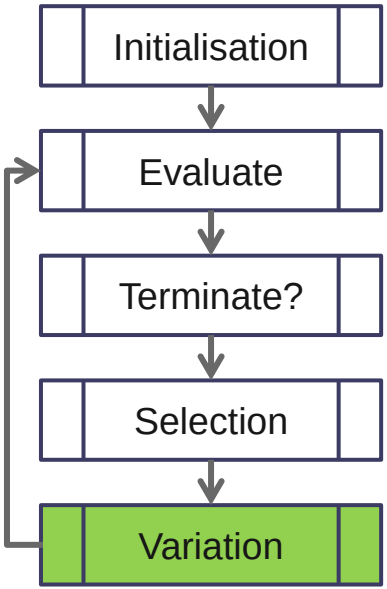
How does it work?

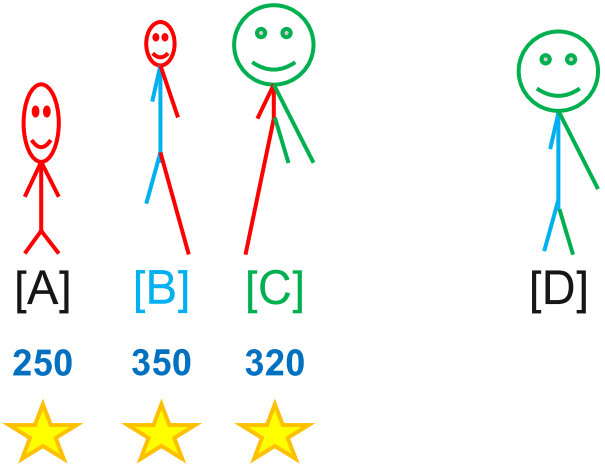


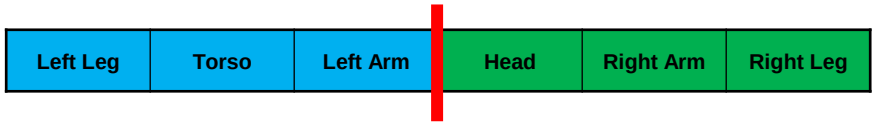




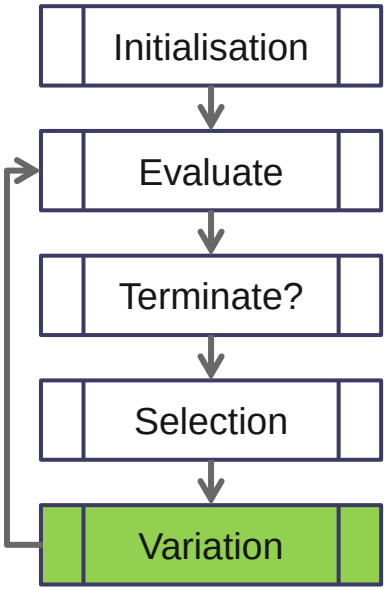
How does it work?

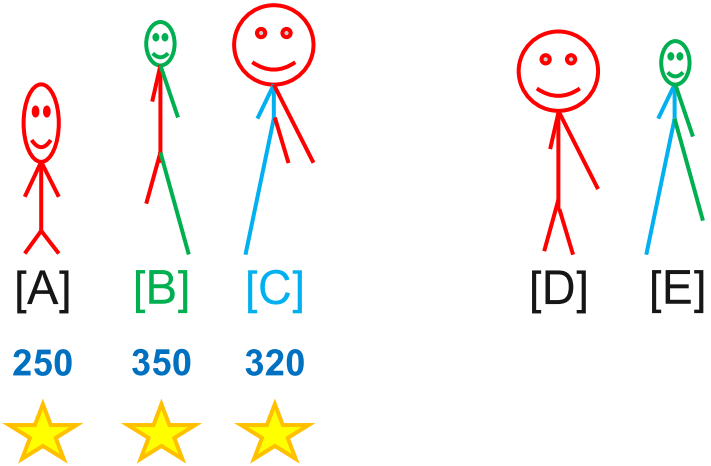


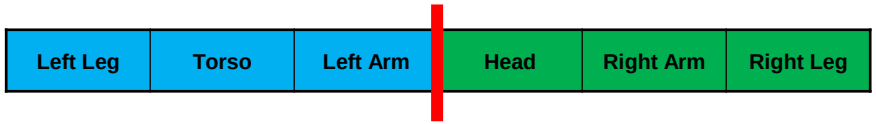




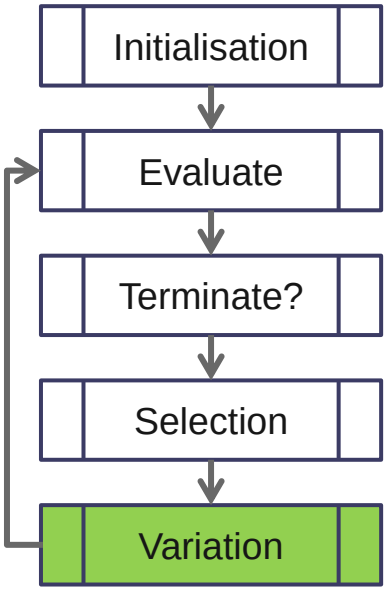
How does it work?

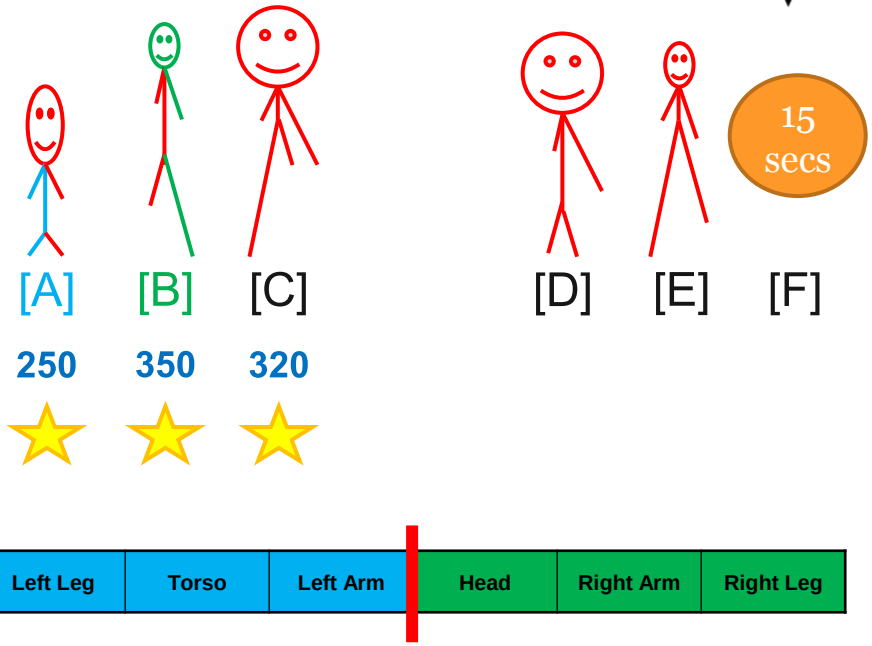




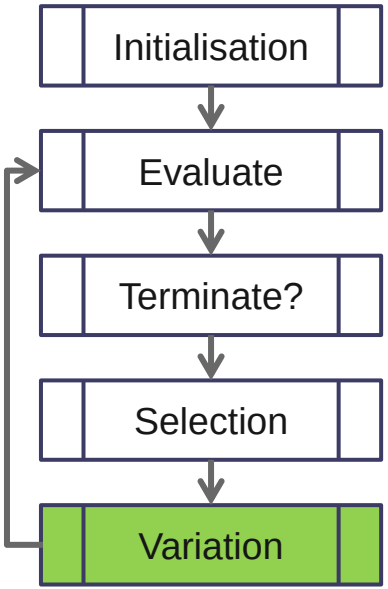


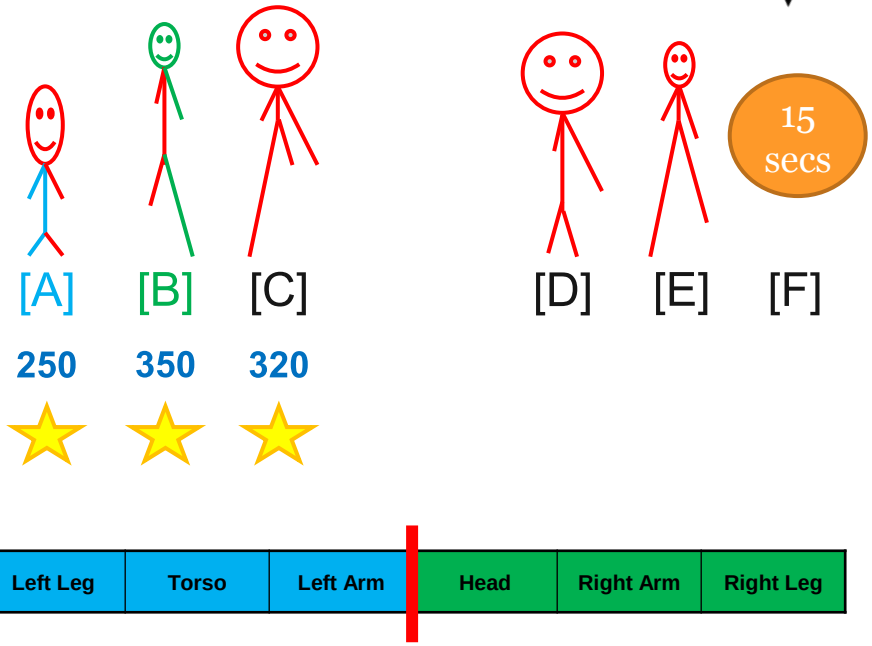
How does it work?



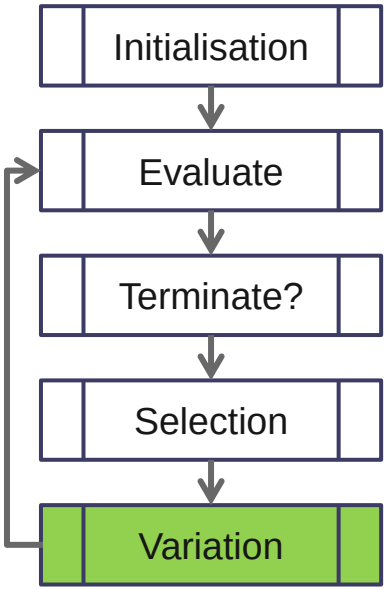


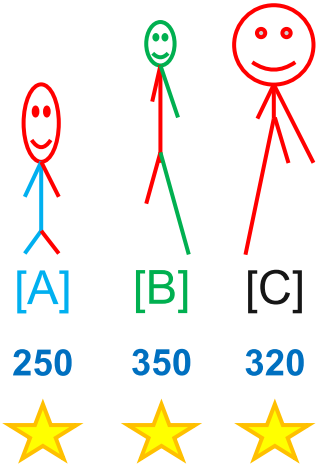
How does it work?

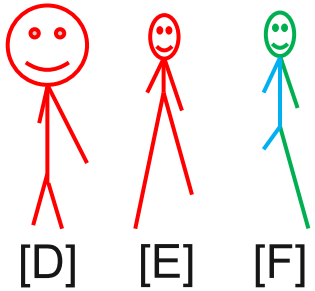


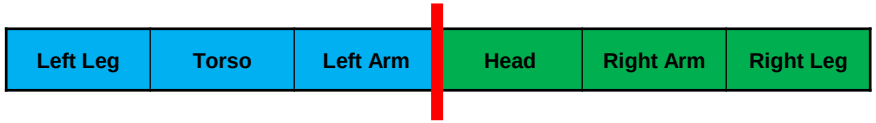


How does it work?

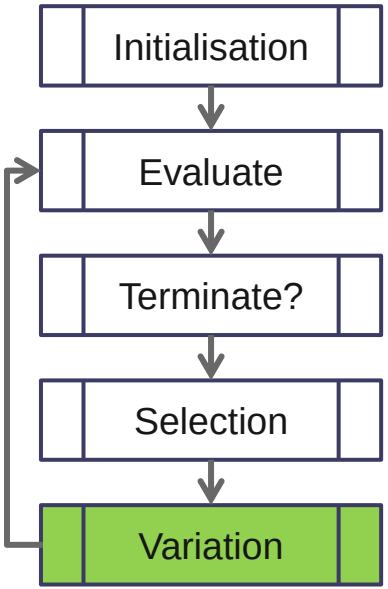


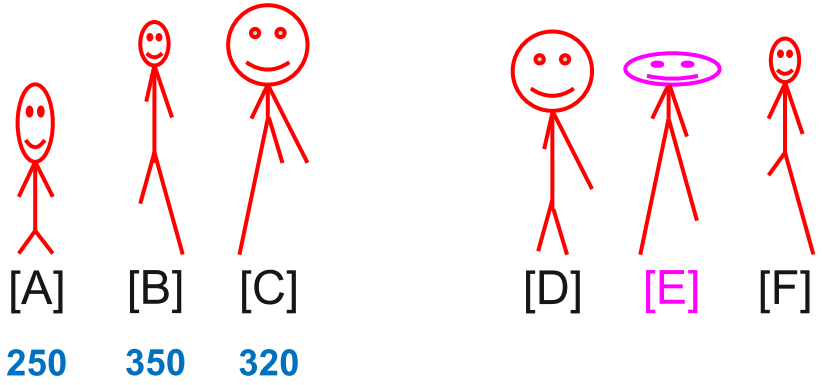






How does it work?

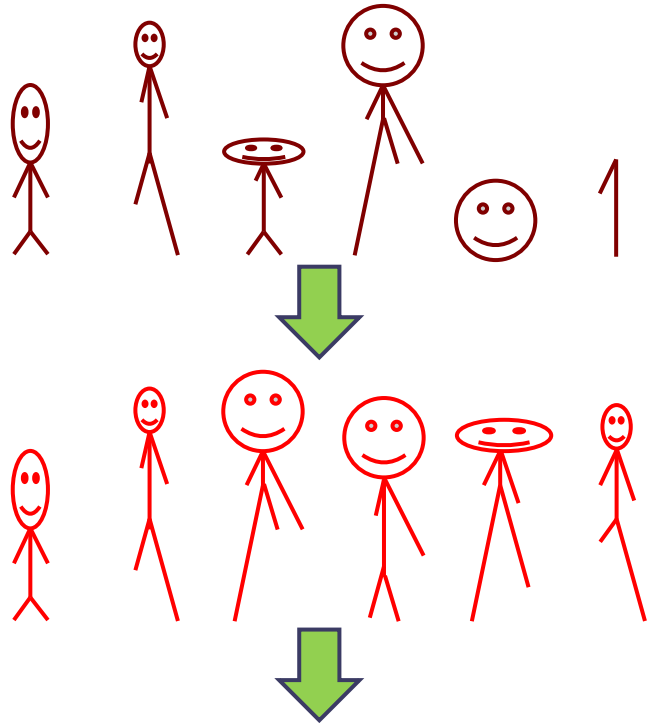




How does it work?

Generation 1

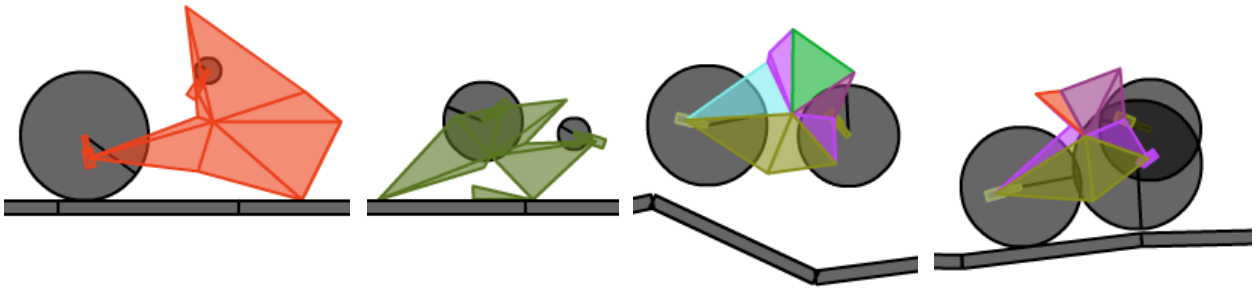
Generation 2



Further playing

- Visit: http://boxcar2d.com/

- Evolutionary Computation used to design a vehicle within the Box2D Physics engine.



Further reading

- Genetic Algorithms in Search, Optimization and Machine Learning [Book]
  ISBN: 0201157675

- Transactions on Evolutionary Computation, [Journal], IEEE
  - http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4235
- Evolutionary Computation [Journal], MIT
  - http://www.mitpressjournals.org/loi/evco
- Swarm and Evolutionary Computation [Journal], Elsevier
  - http://www.journals.elsevier.com/swarm-and-evolutionary-computation

- My publications at www.shahinrostami.com

Presentation overview

- Why Evolutionary Computation?
- What is it?
- How does it work?
- Further reading

Thank you, any questions?

Dr. Shahin Rostami
Bournemouth University
srostami@bournemouth.ac.uk
@shahinrostami
github.com/shahinrostami
www.shahinrostami.com