

Evolutionary Computation

an introduction

These slides available at <http://db.tt/PSuRvmoD>

Who am I?

- Dr. Shahin Rostami
- Lecturer in Computing here at Bournemouth University
- Ph.D. for research project: “Preference Focussed Many-Objective Evolutionary Computation”

Presentation overview

- Why Evolutionary Computation?
- What is it?
- How does it work?
- How can you get involved?
- Questions? (5 minutes)

Why?

What?

How?

Next?

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?

What?

How?

Next?

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



Why?

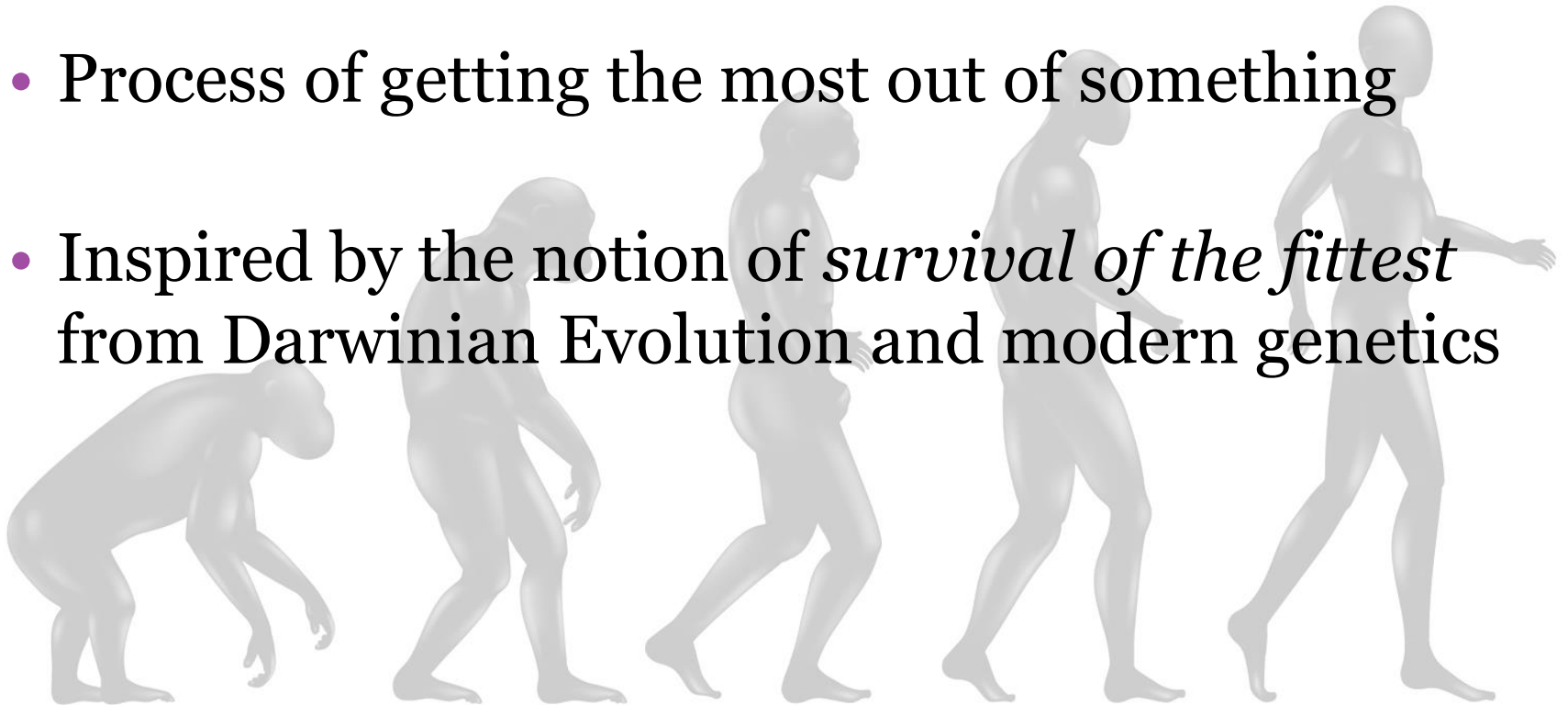
What?

How?

Next?

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



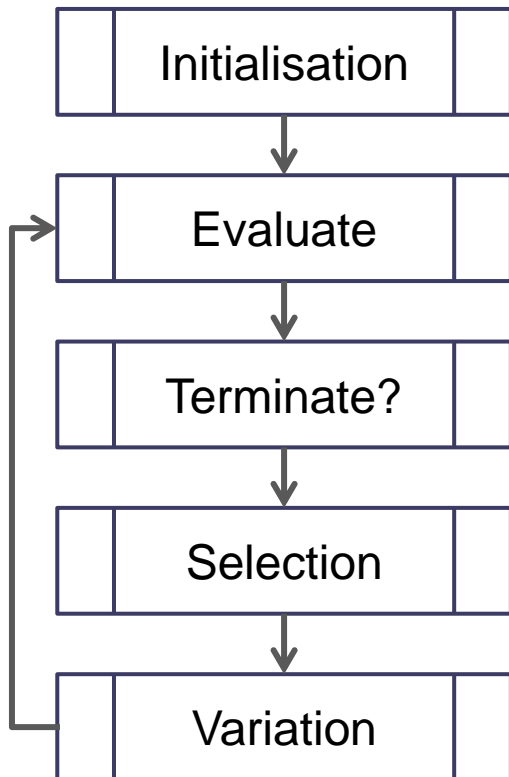
Why?

What?

How?

Next?

How does it work?



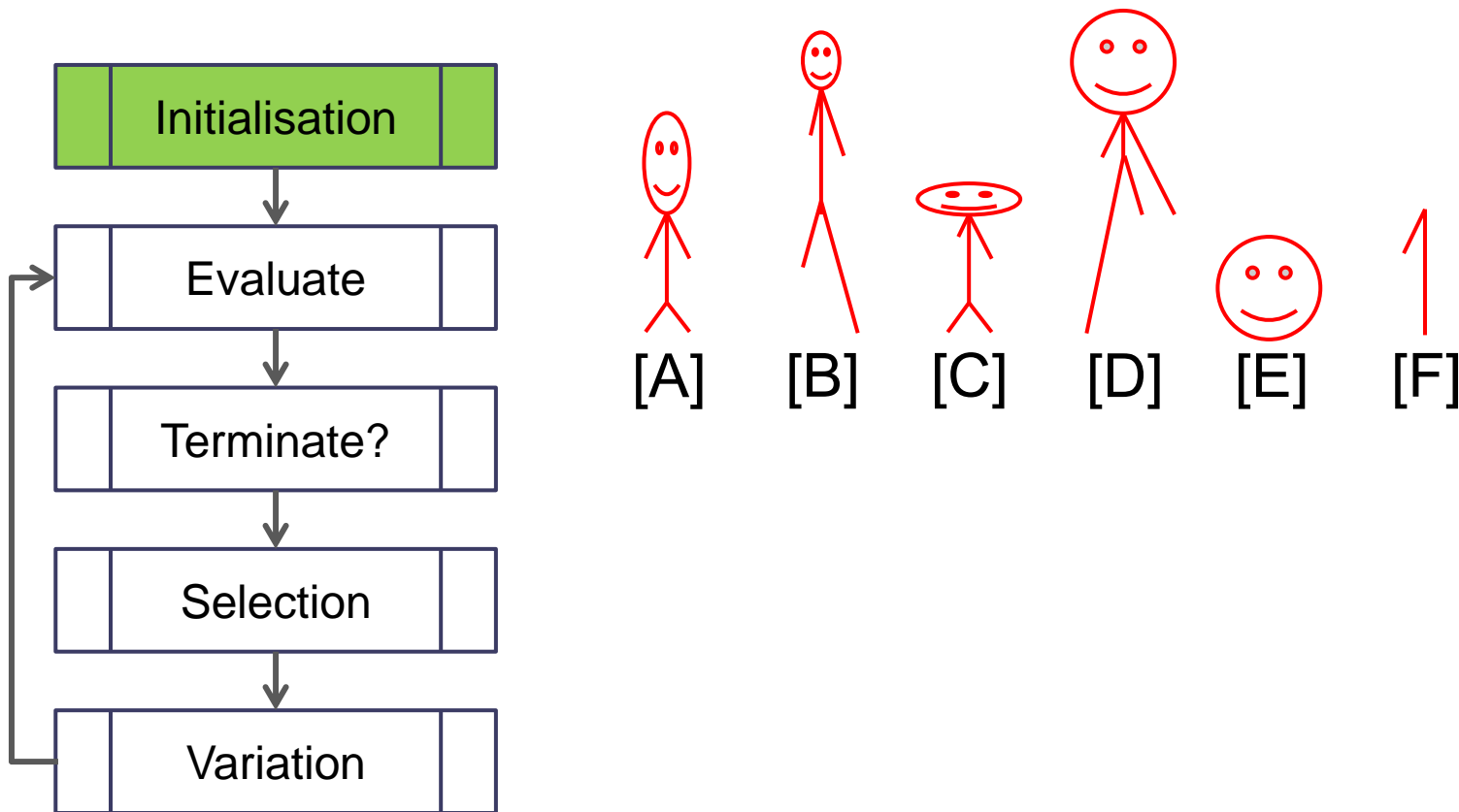
Why?

What?

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How does it work?



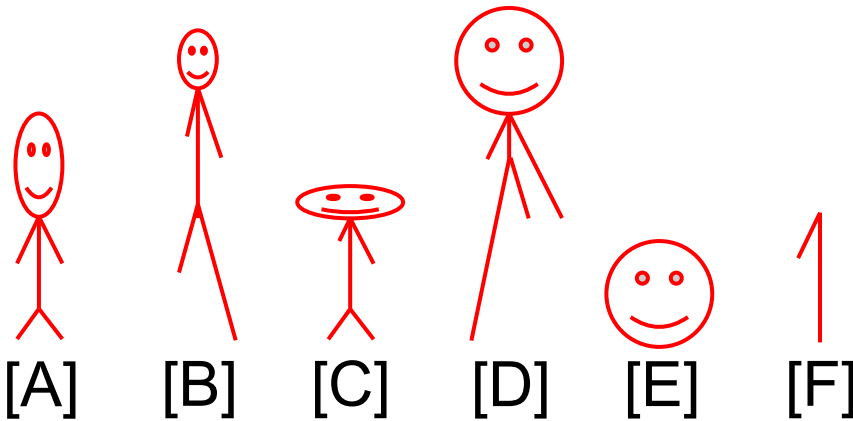
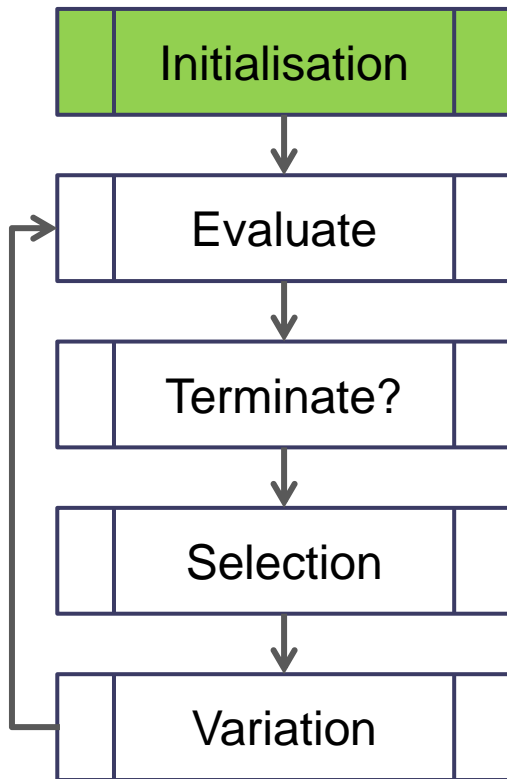
Why?

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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
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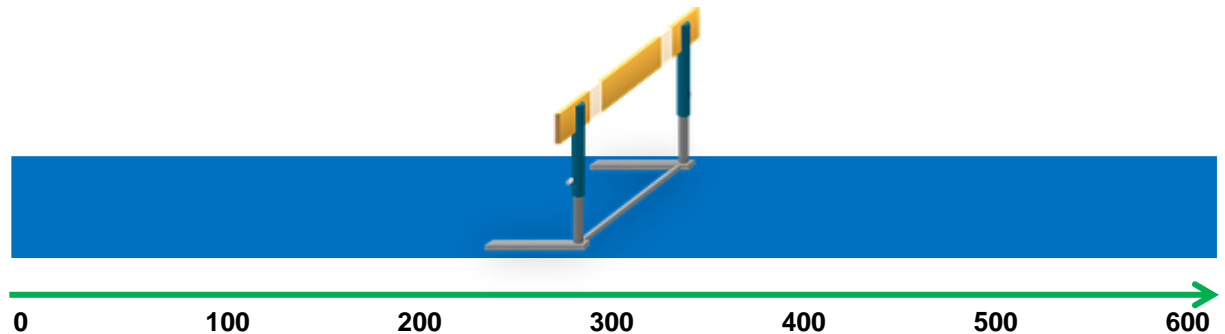
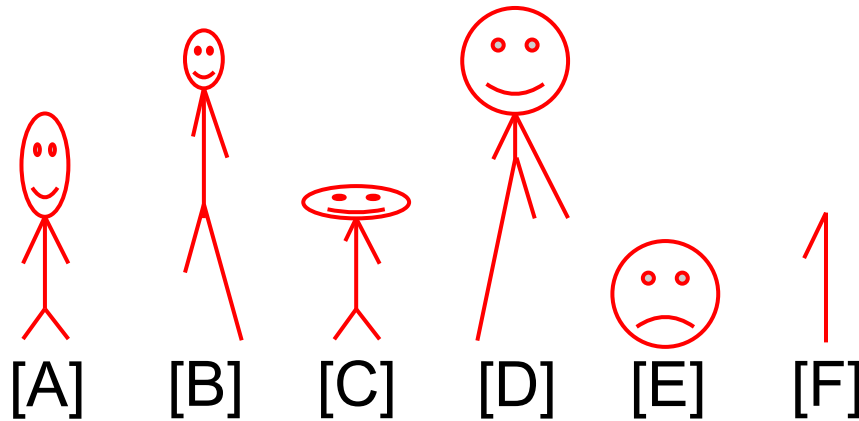
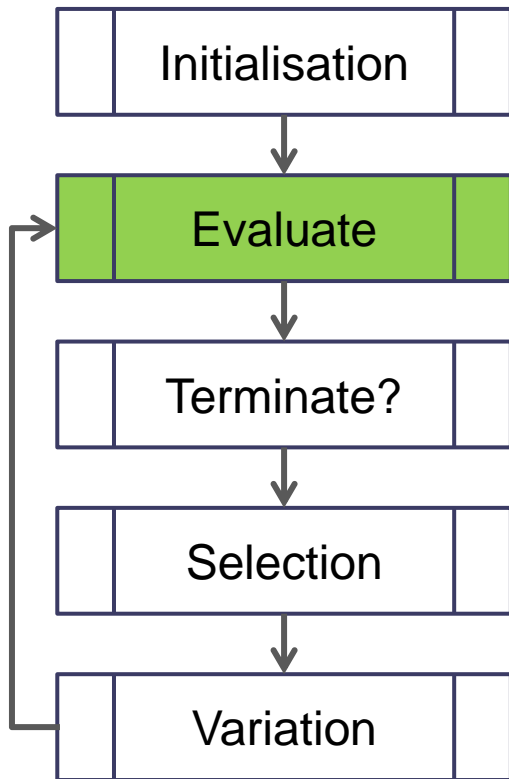
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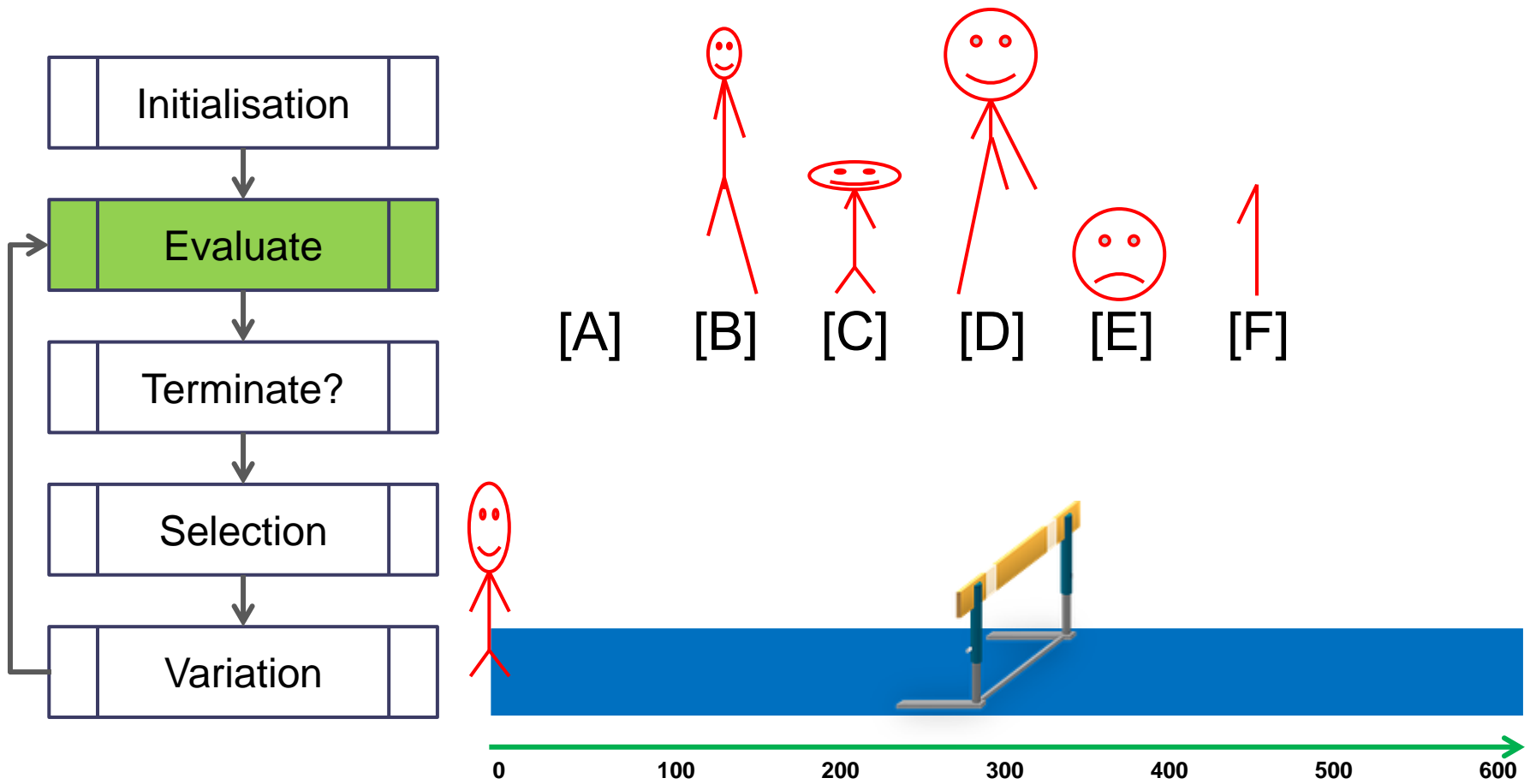
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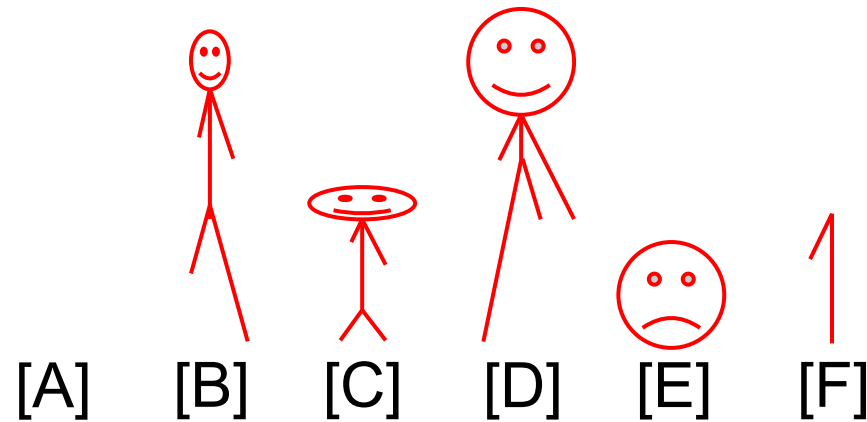
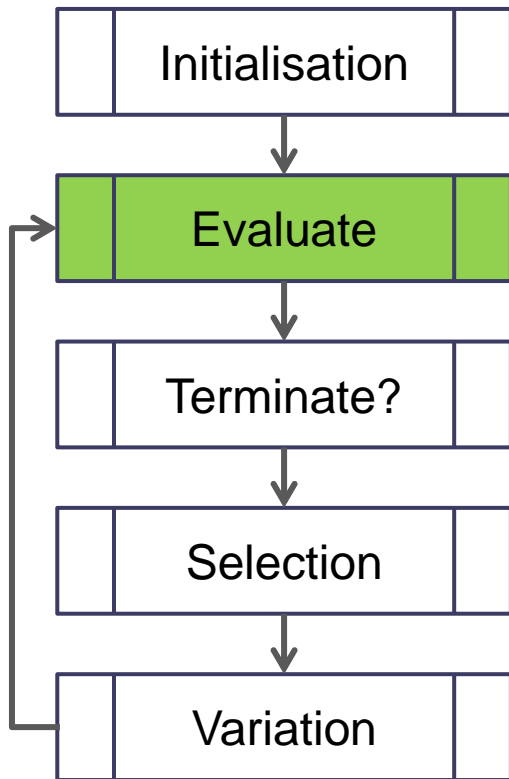
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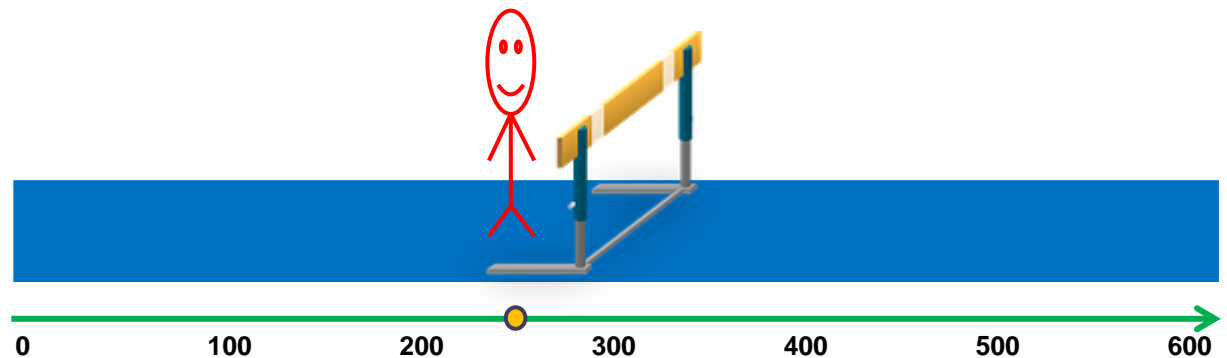
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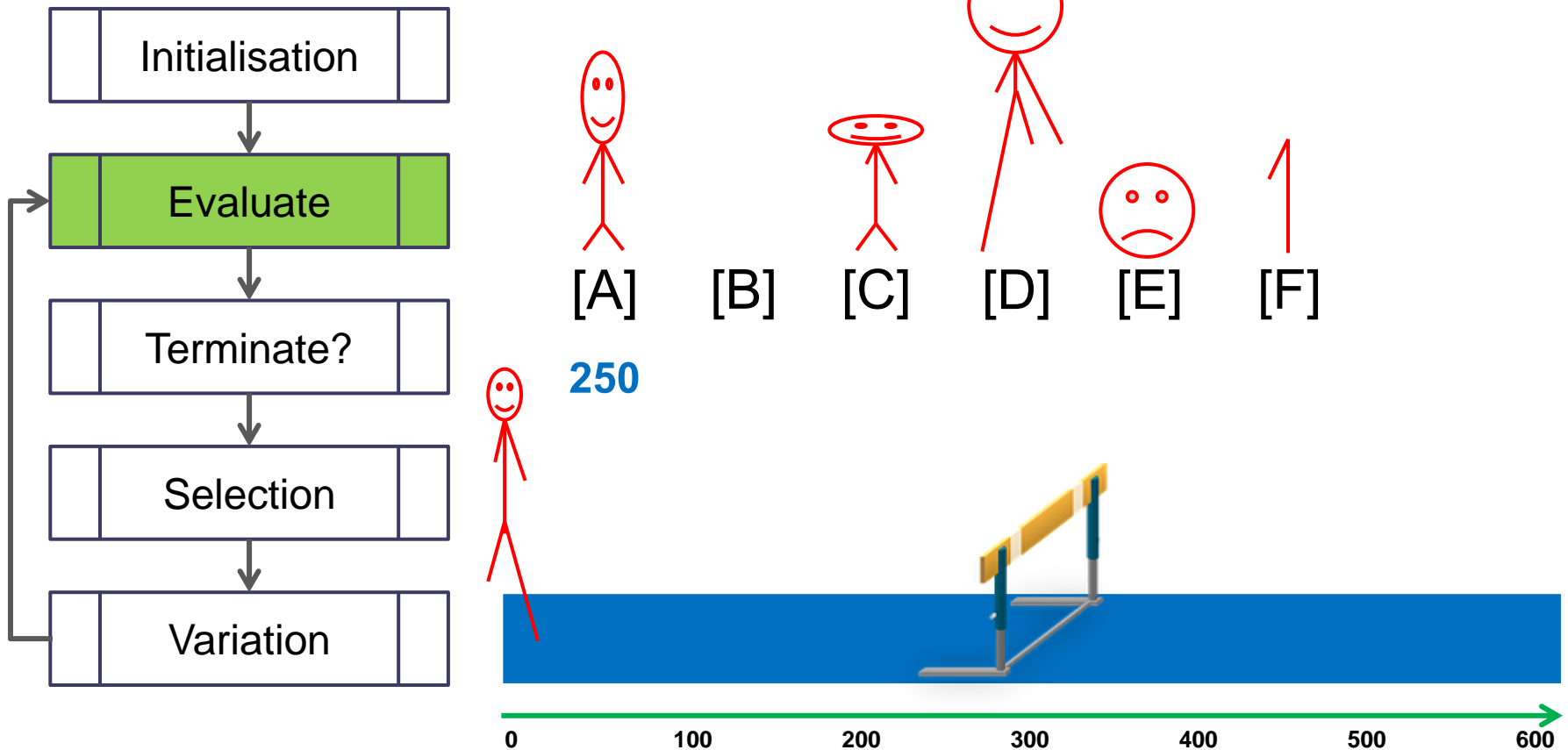
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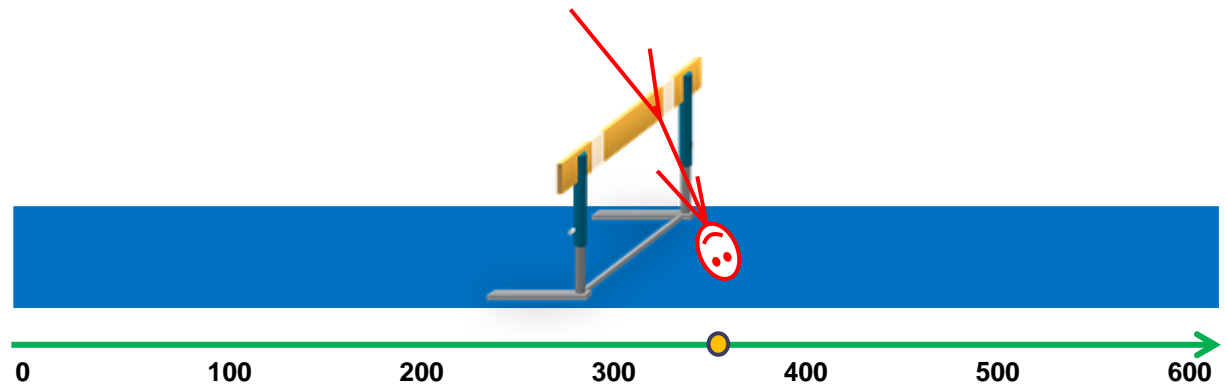
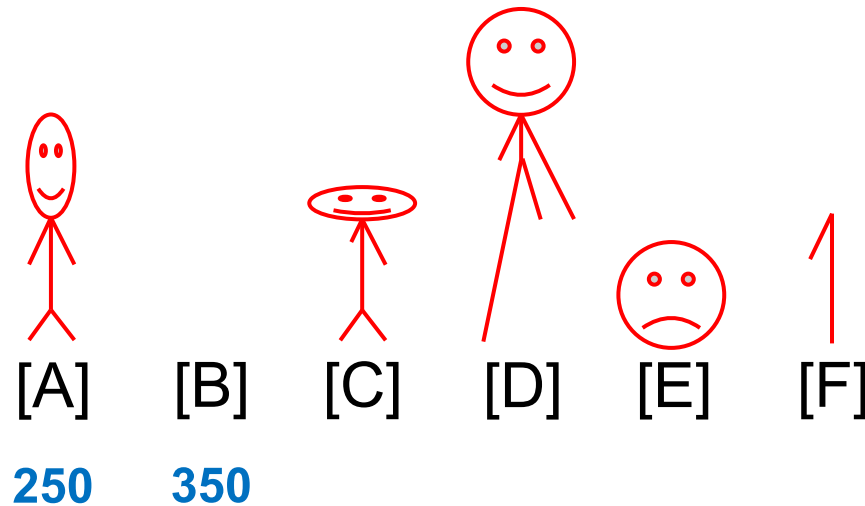
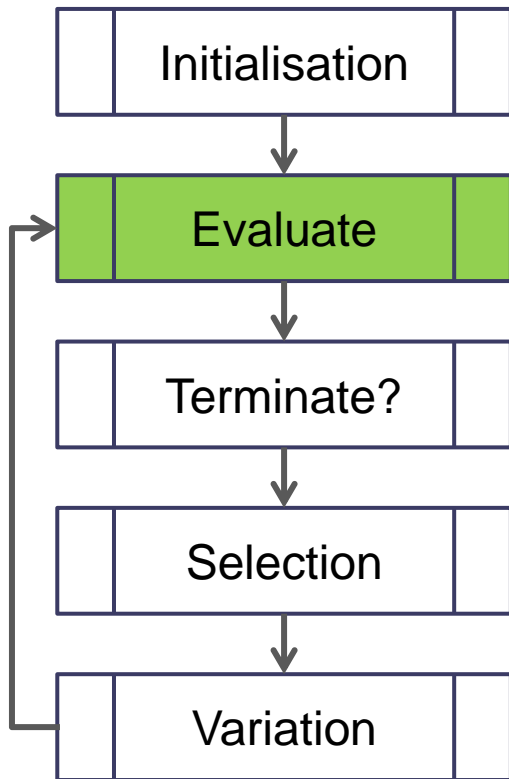
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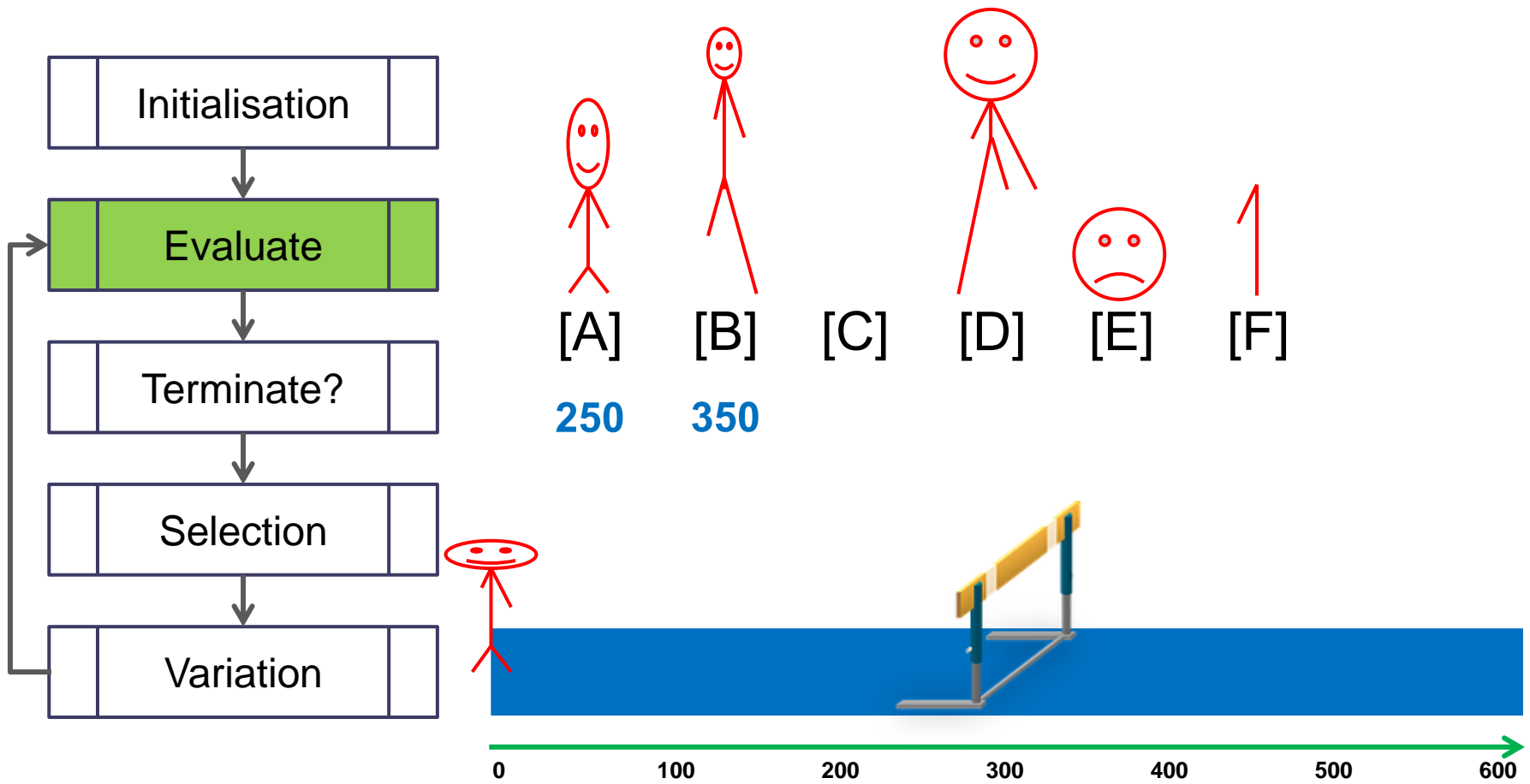
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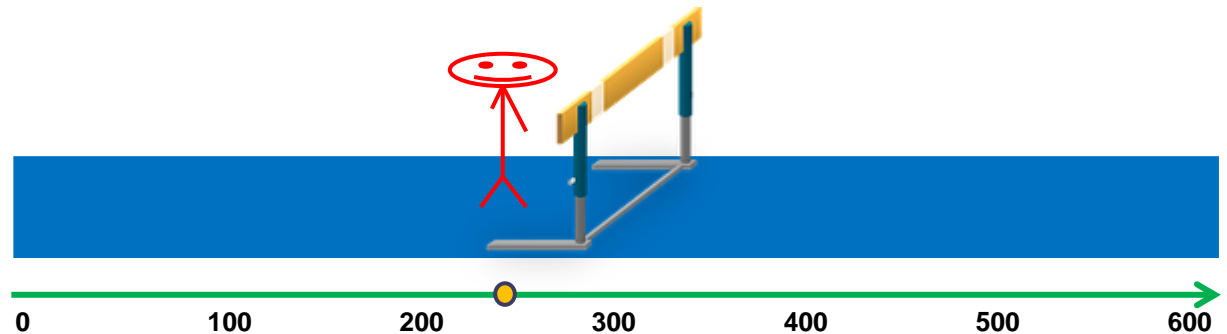
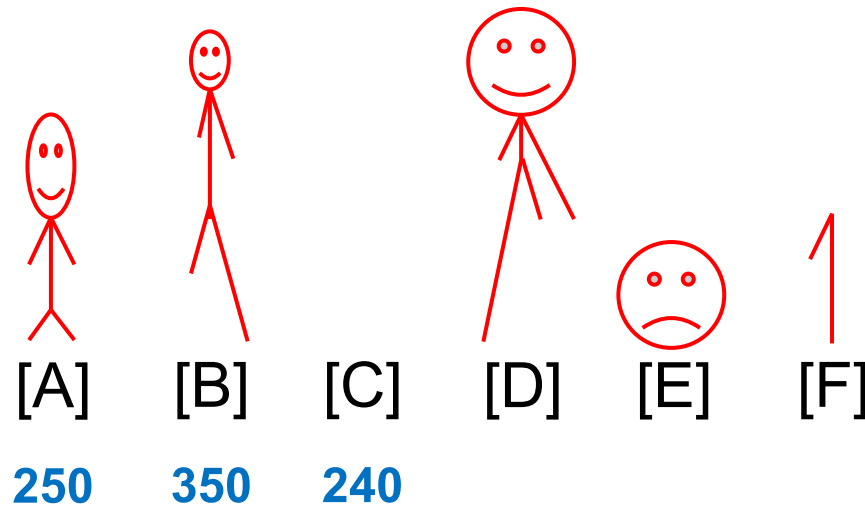
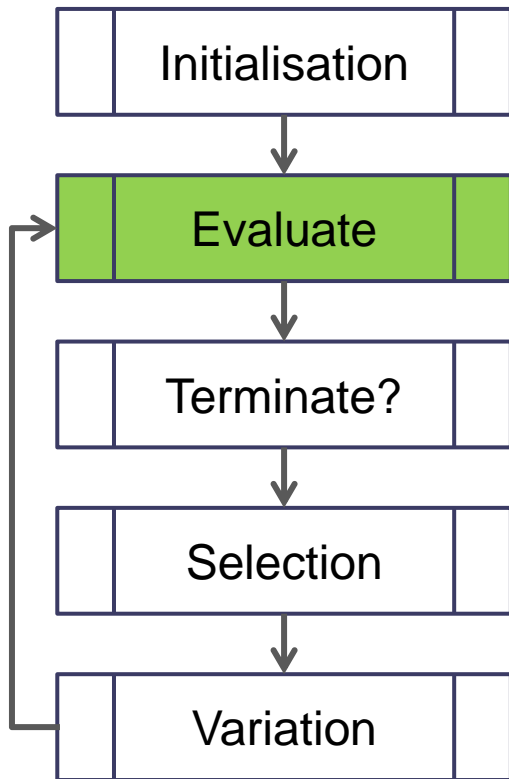
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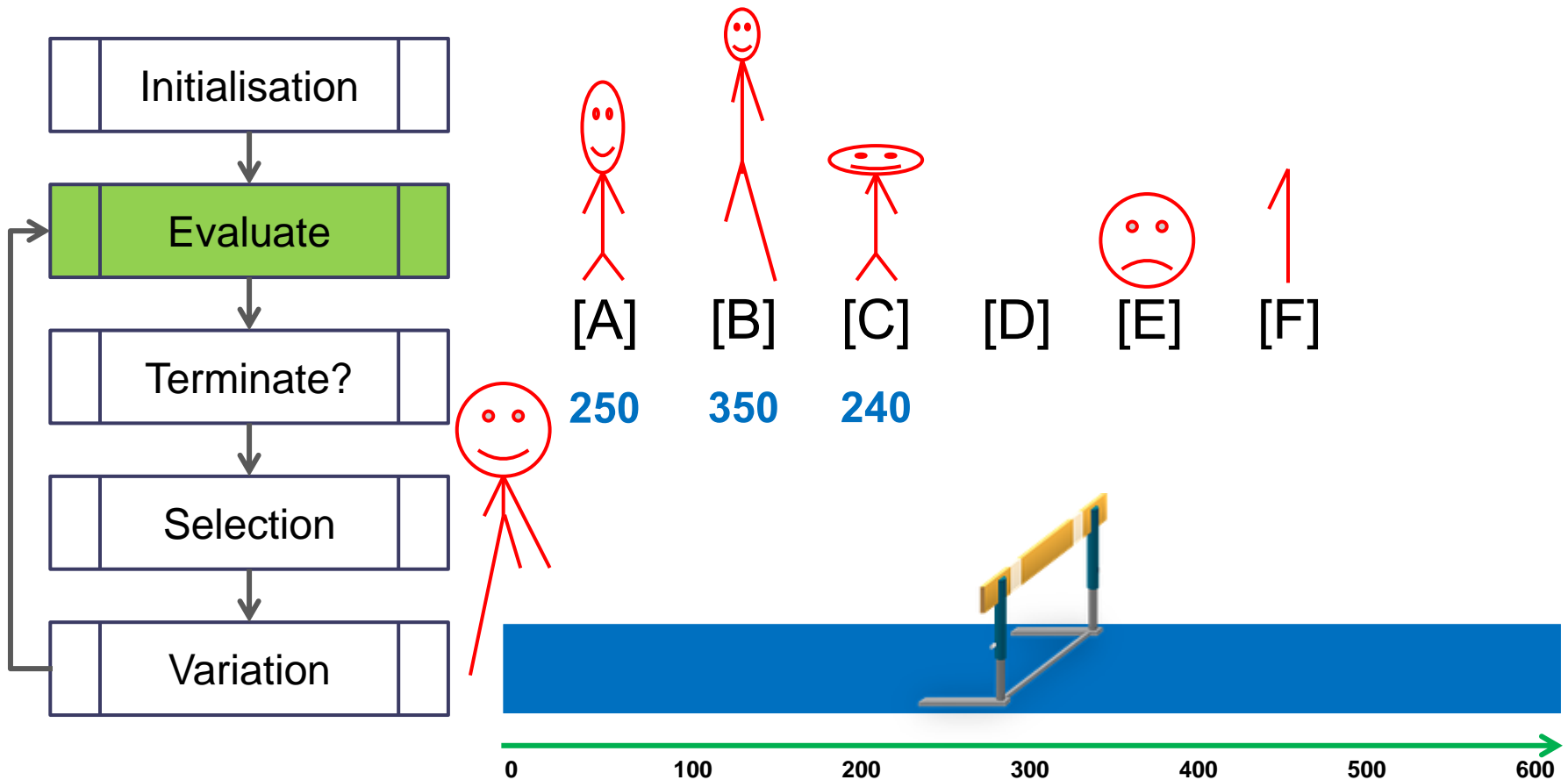
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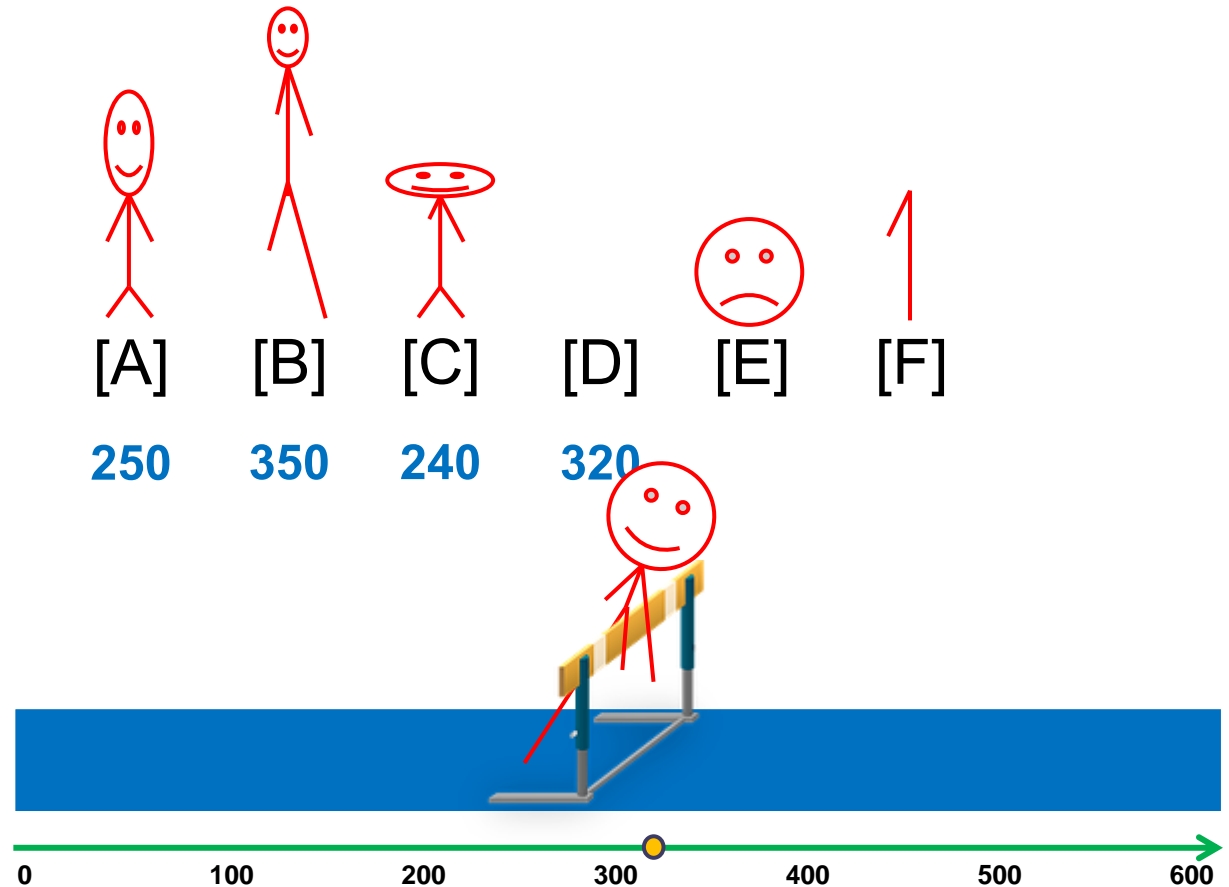
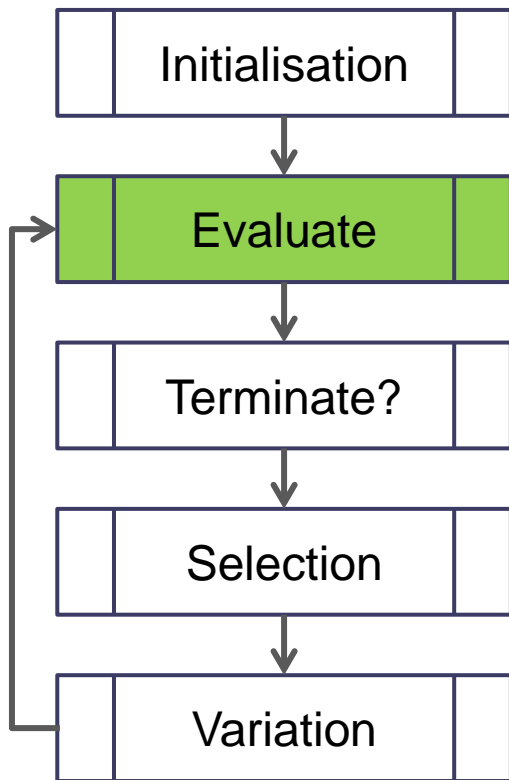
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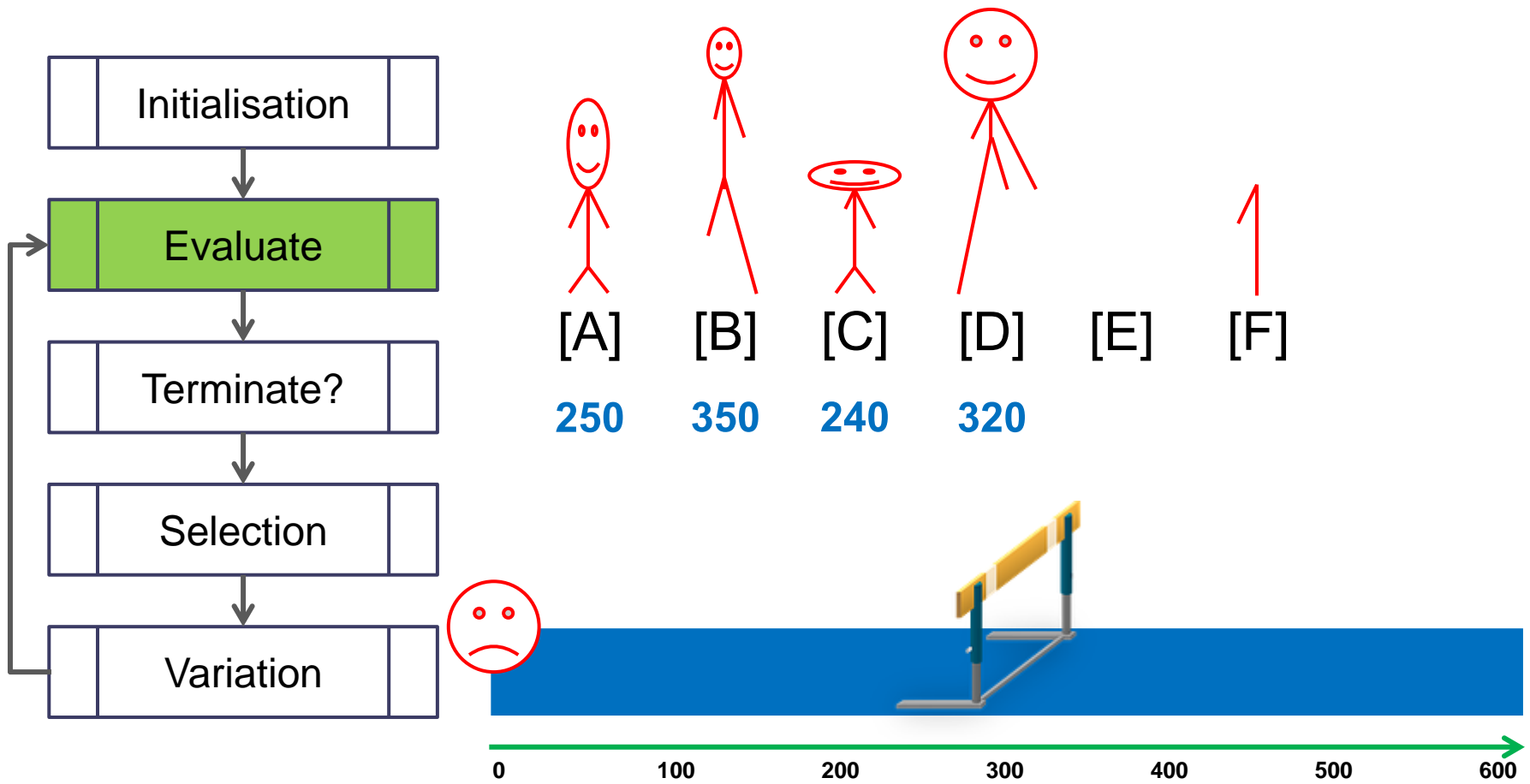
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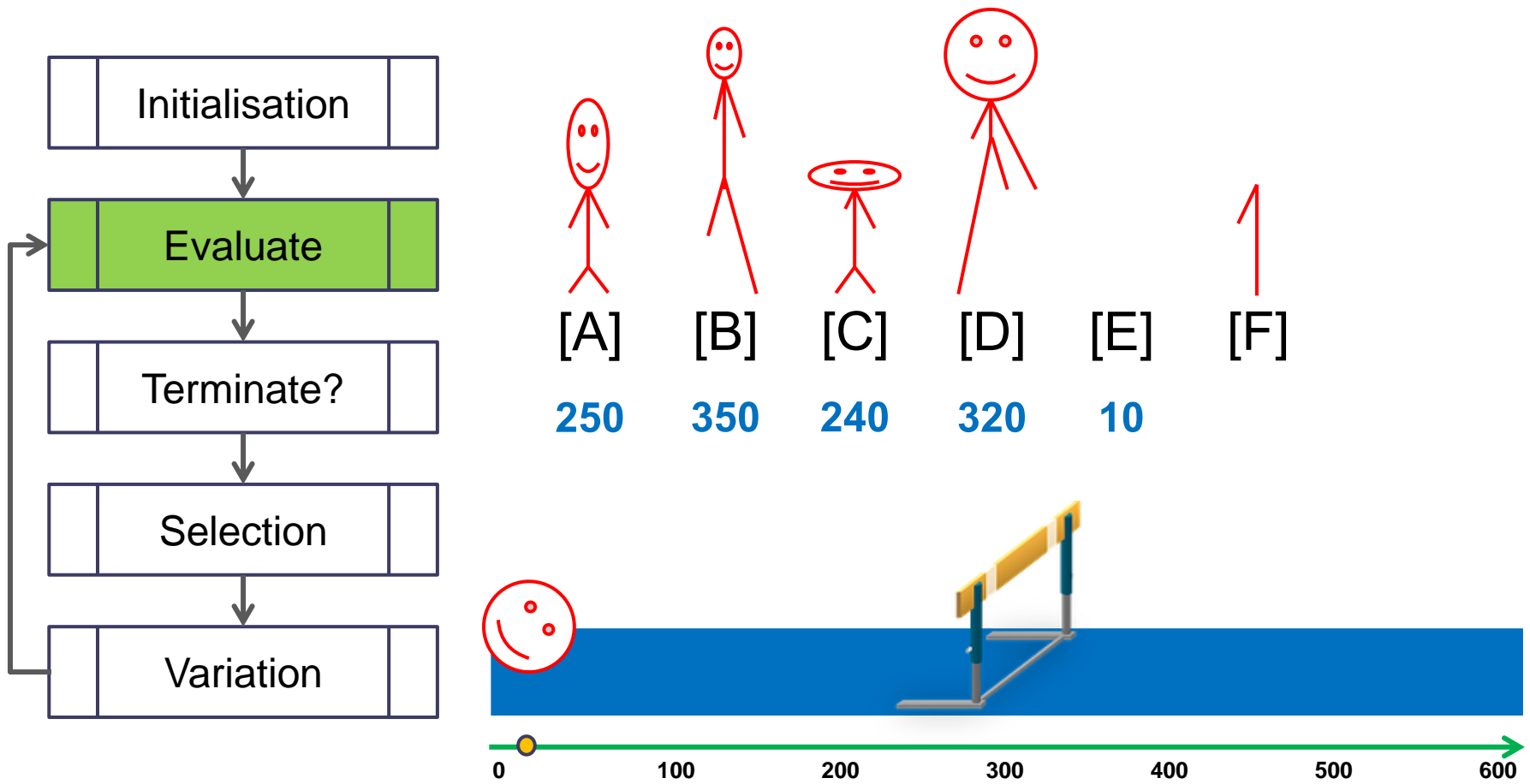
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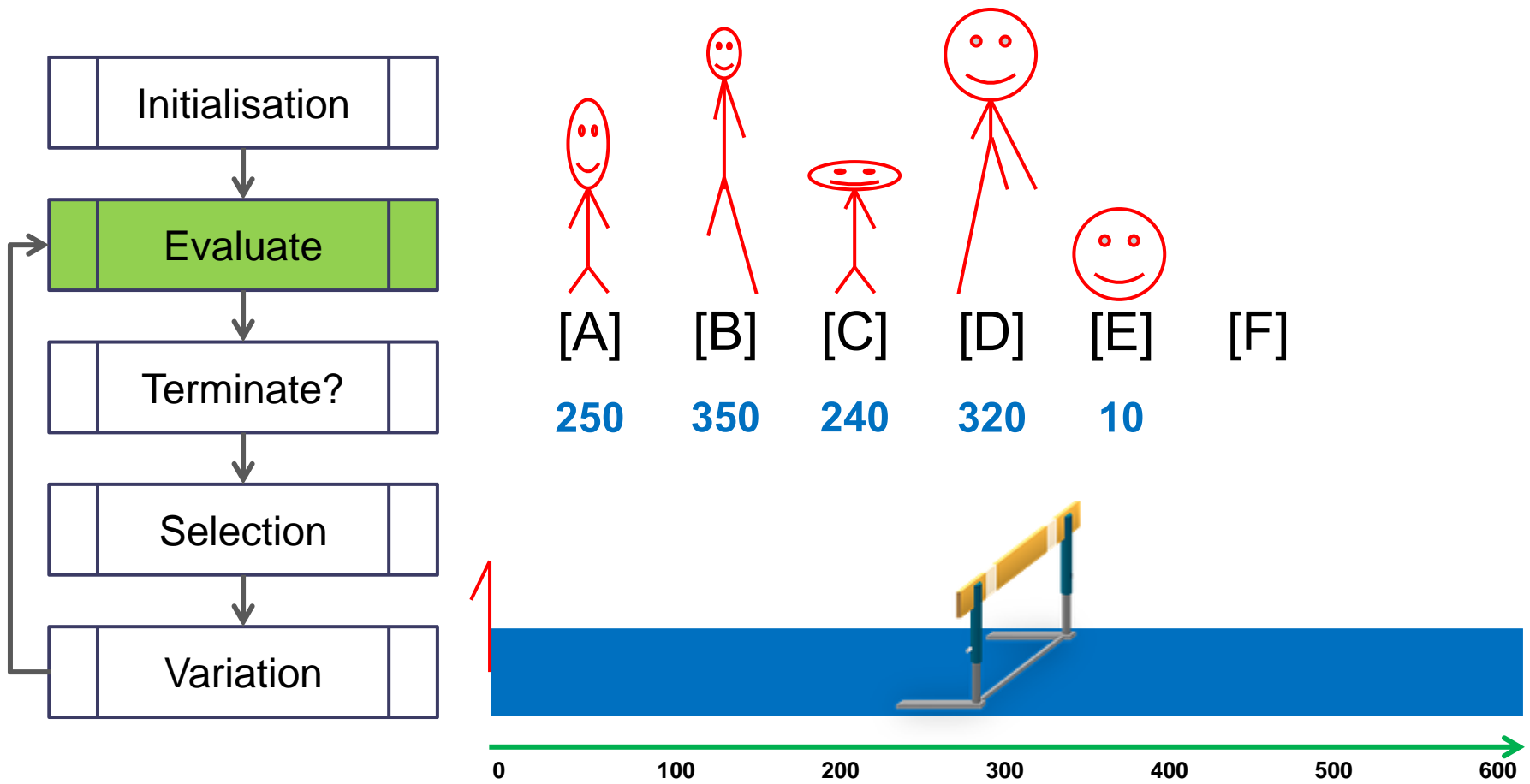
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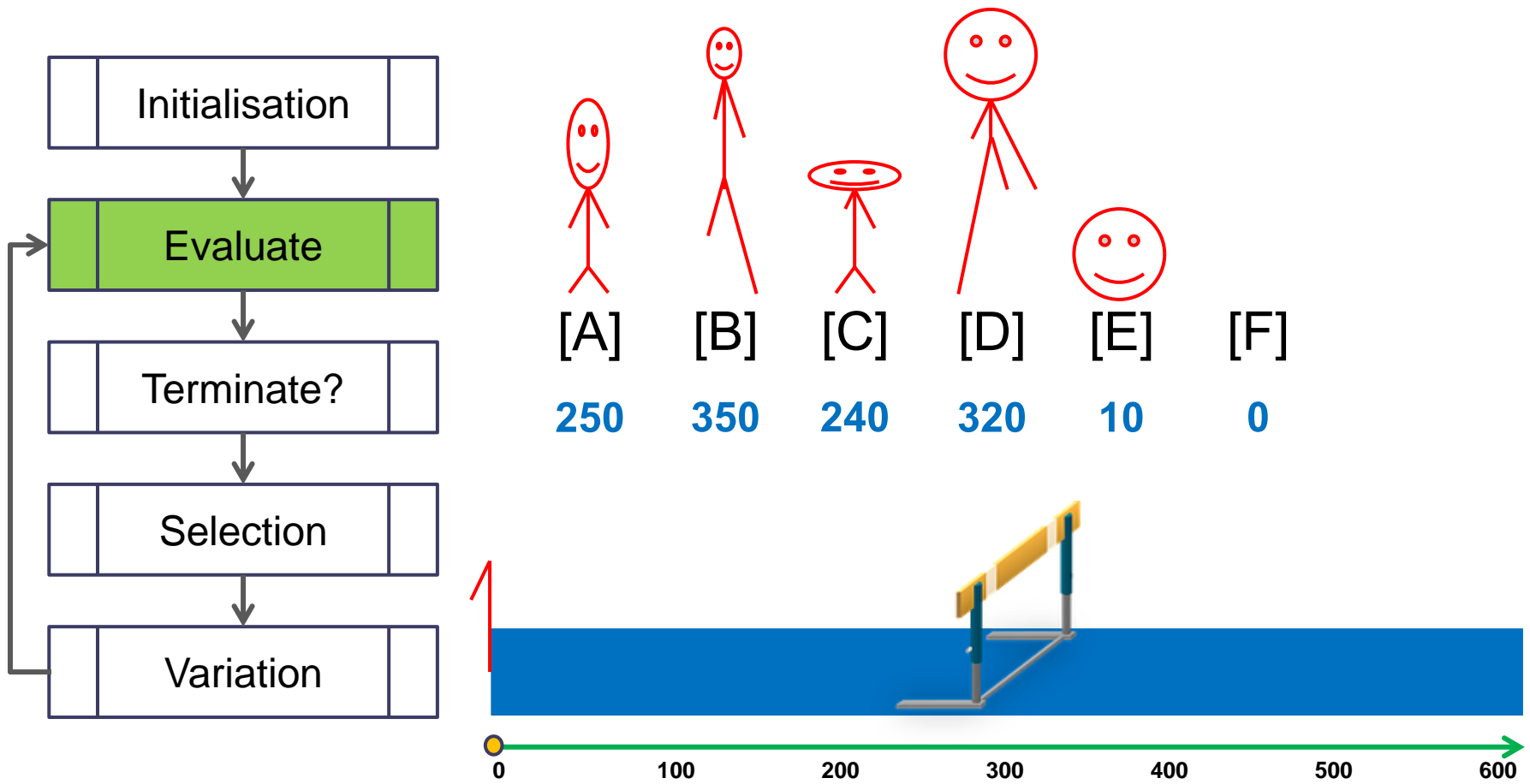
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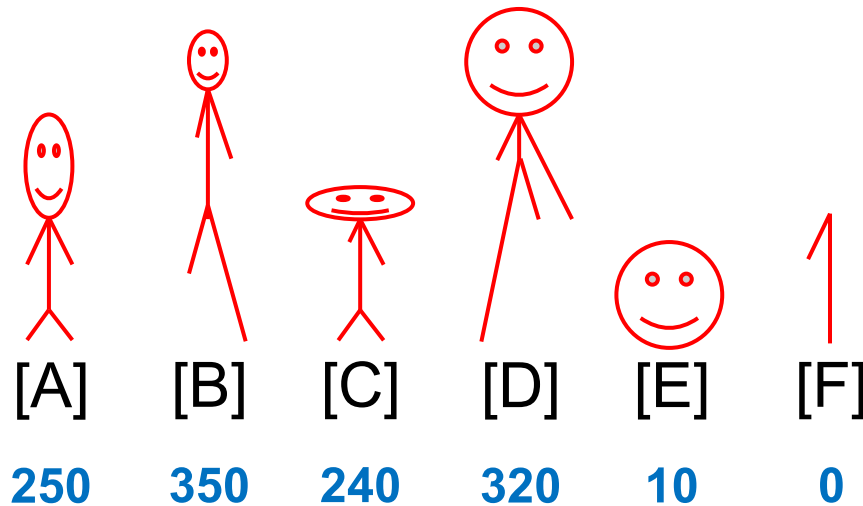
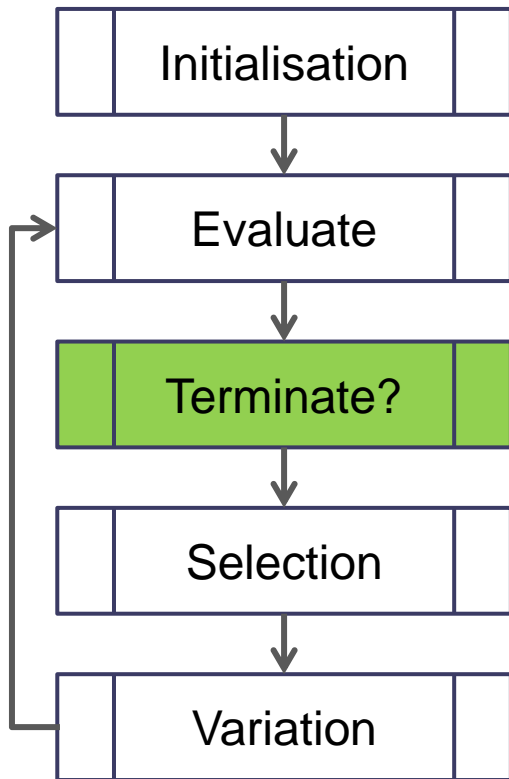
Why?

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Termination Criteria

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

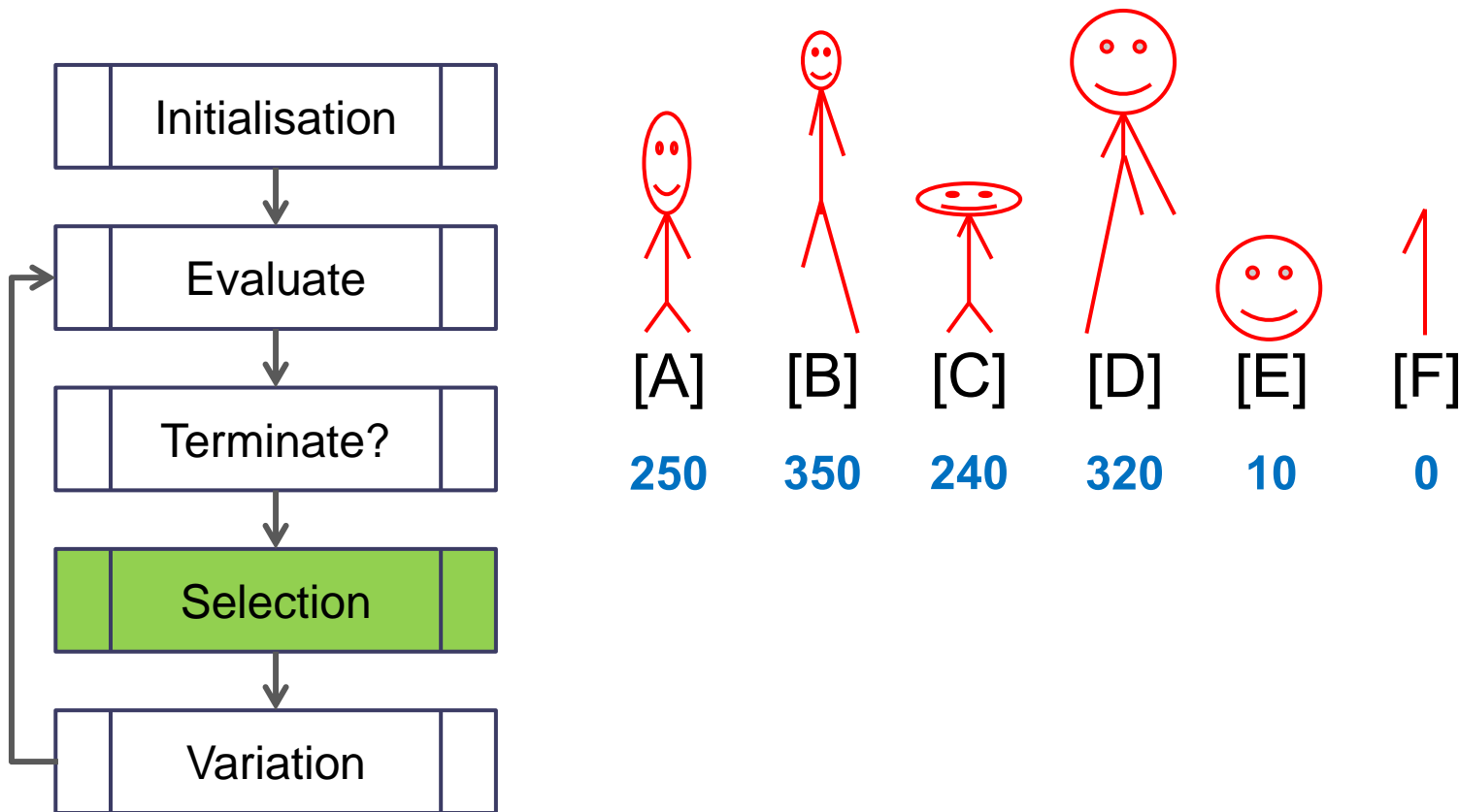
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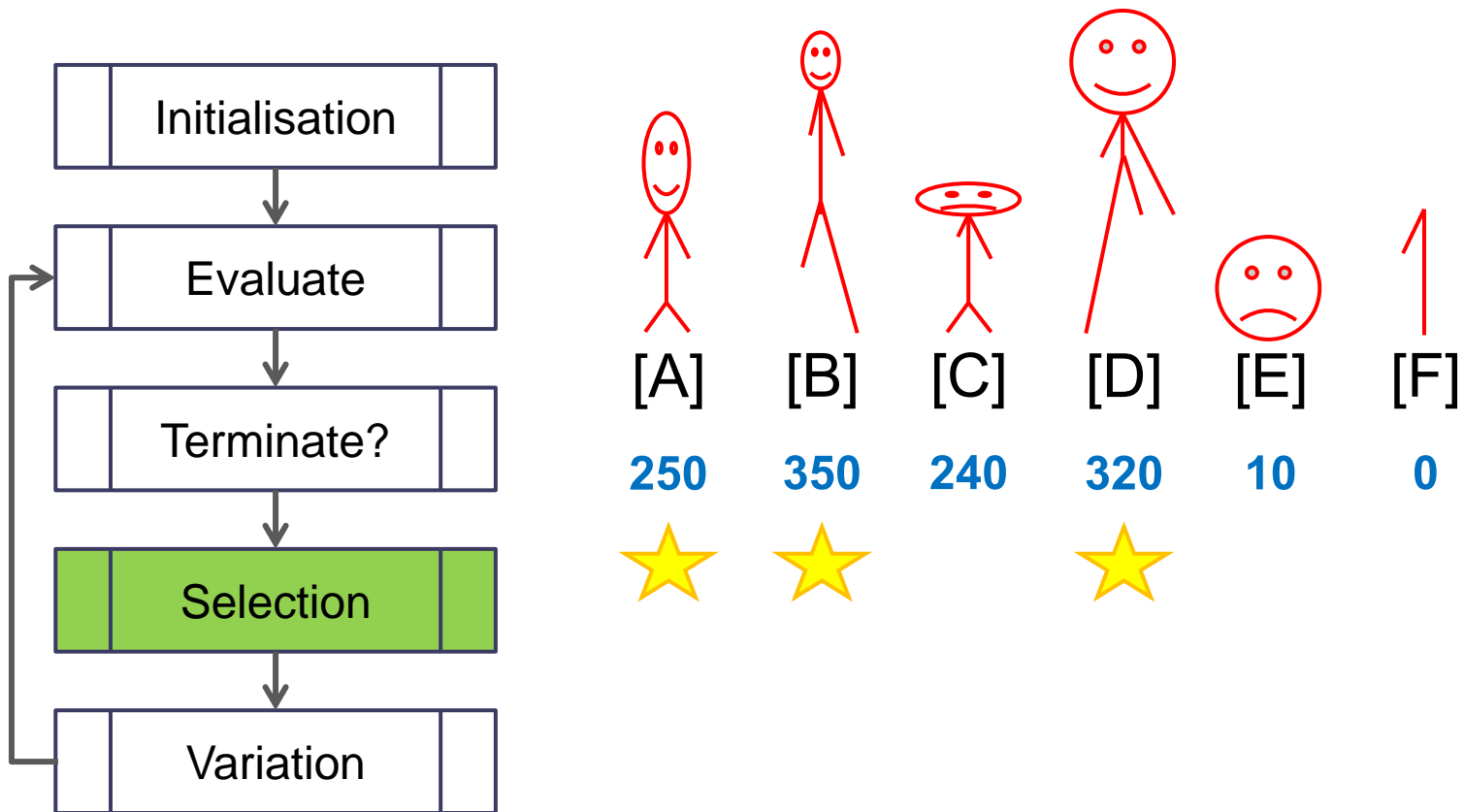
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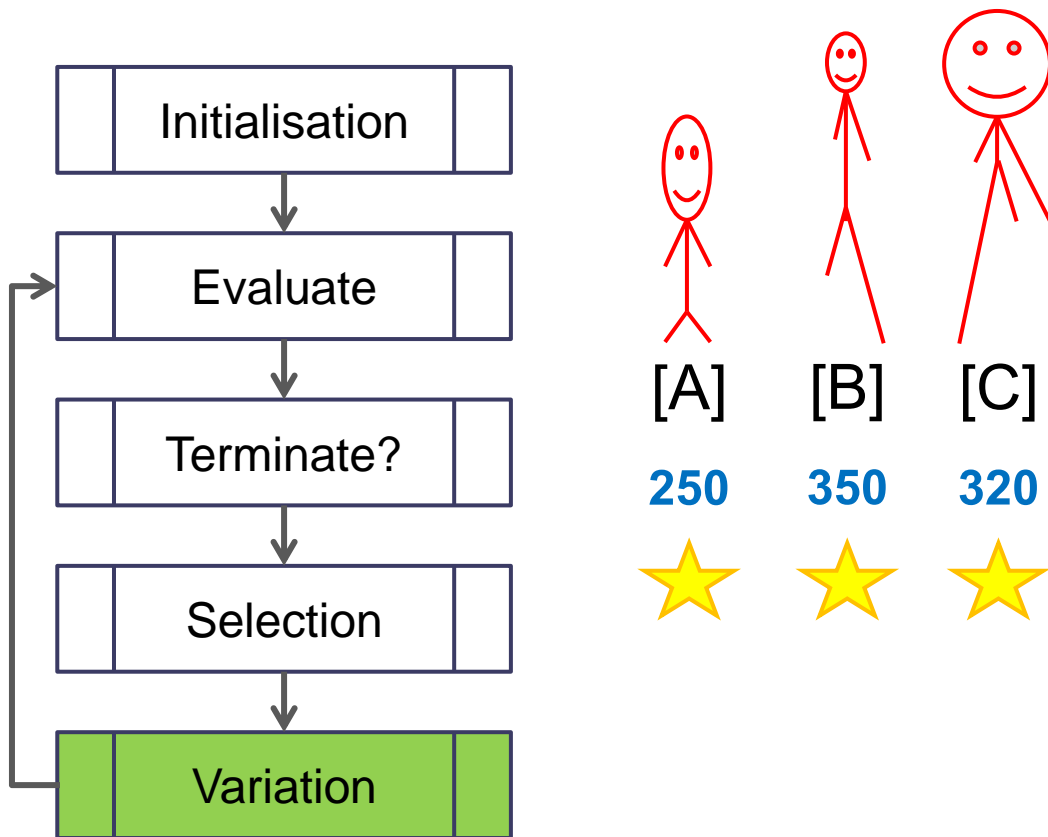
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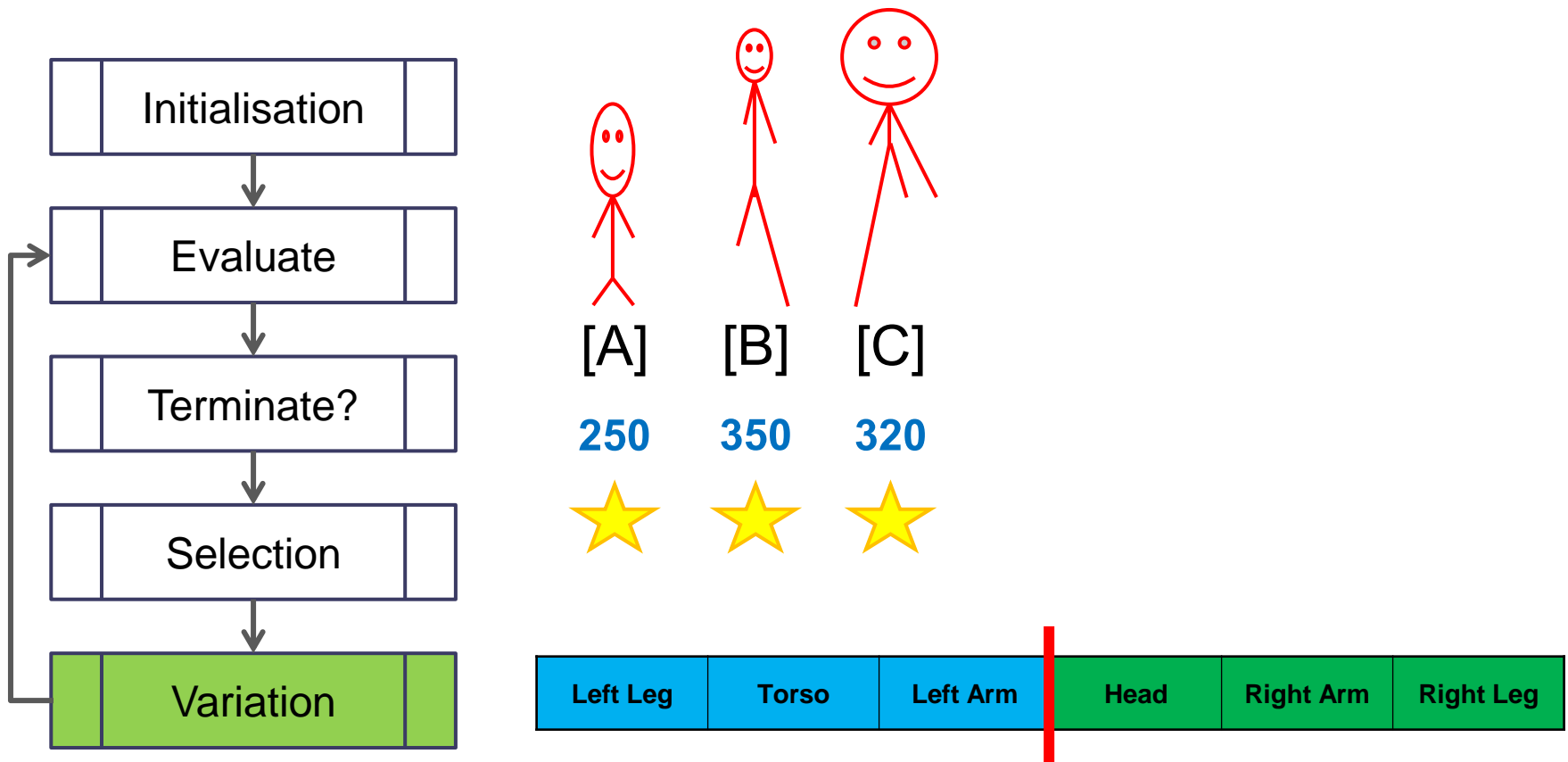
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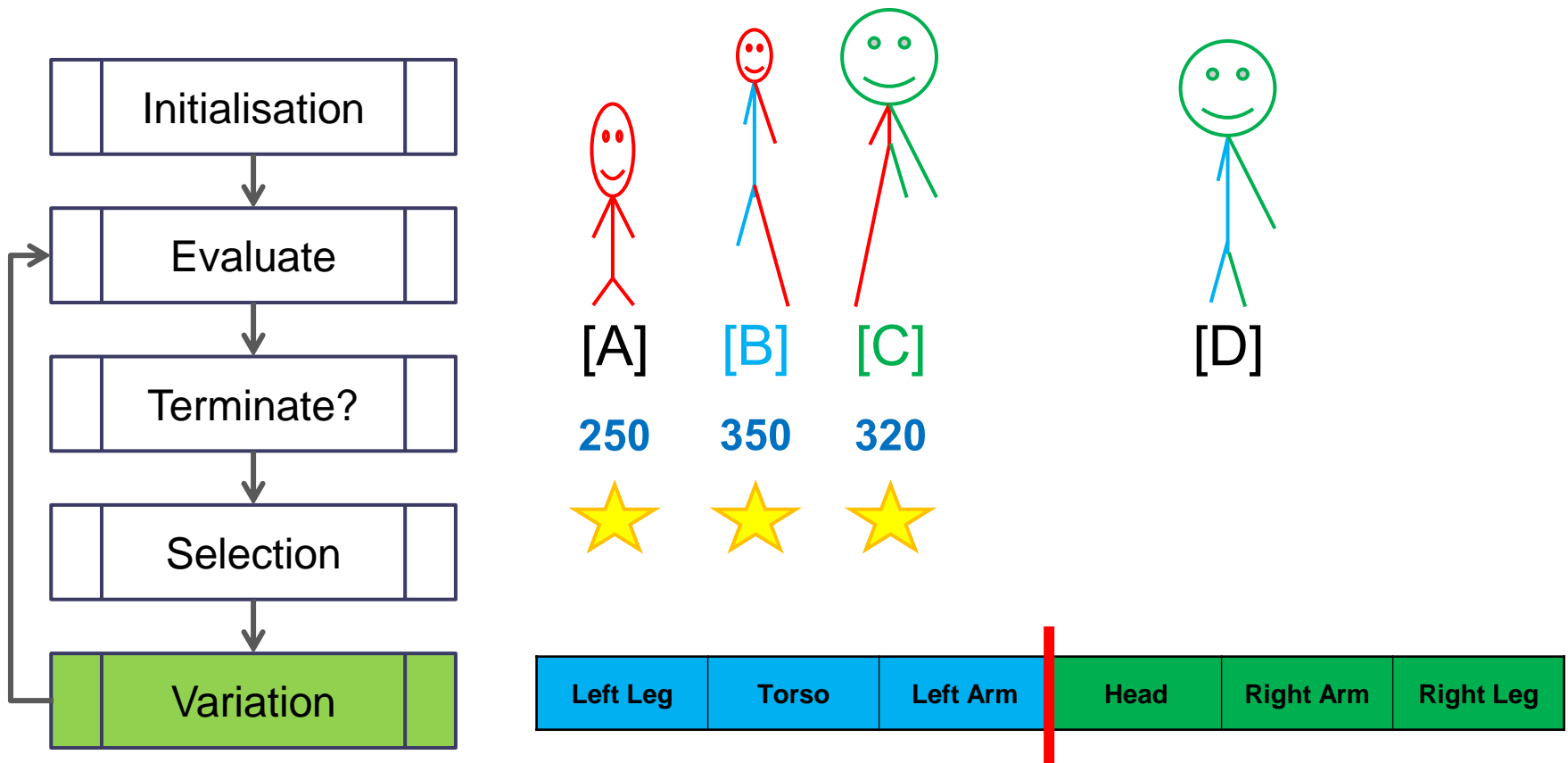
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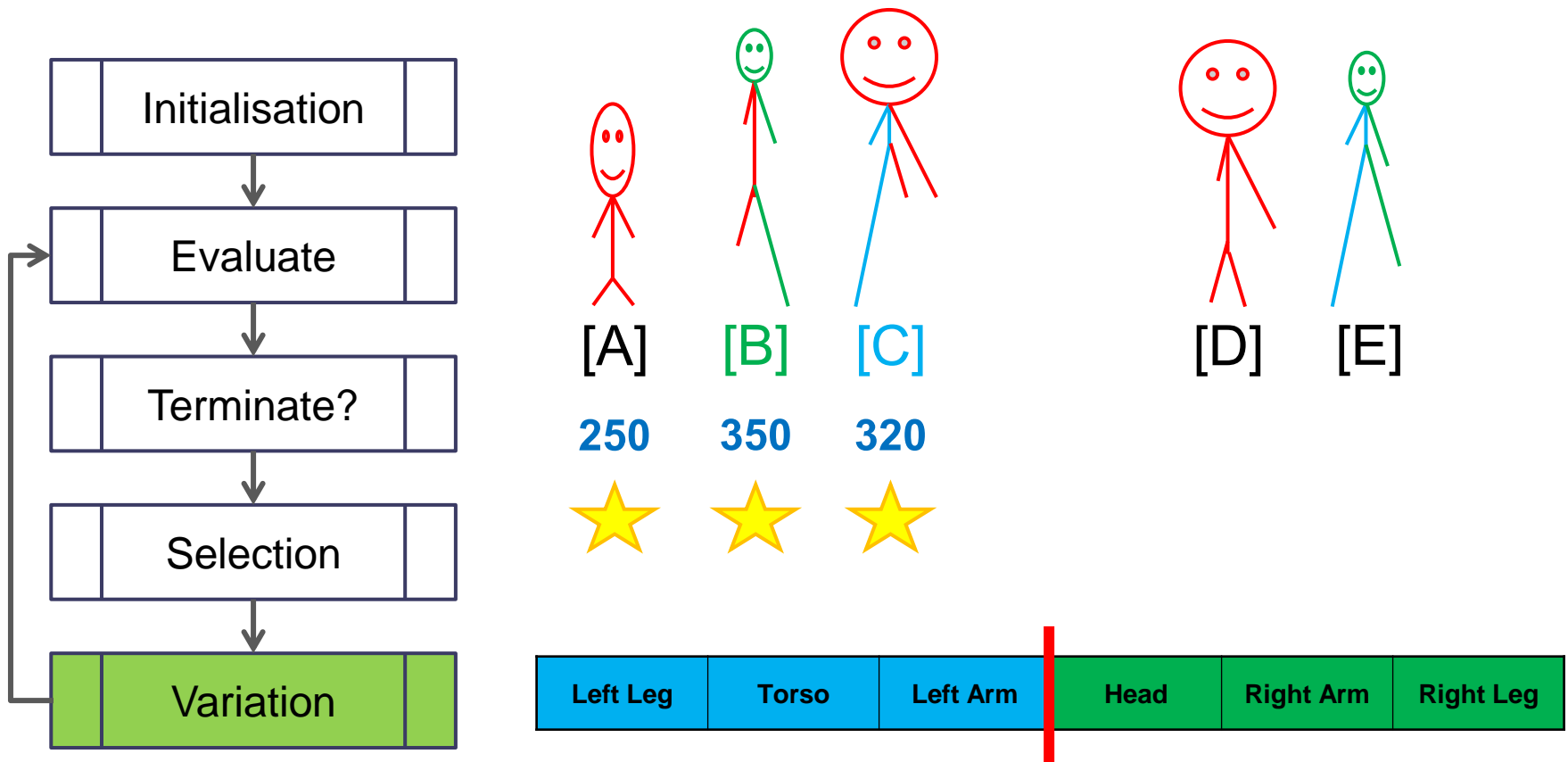
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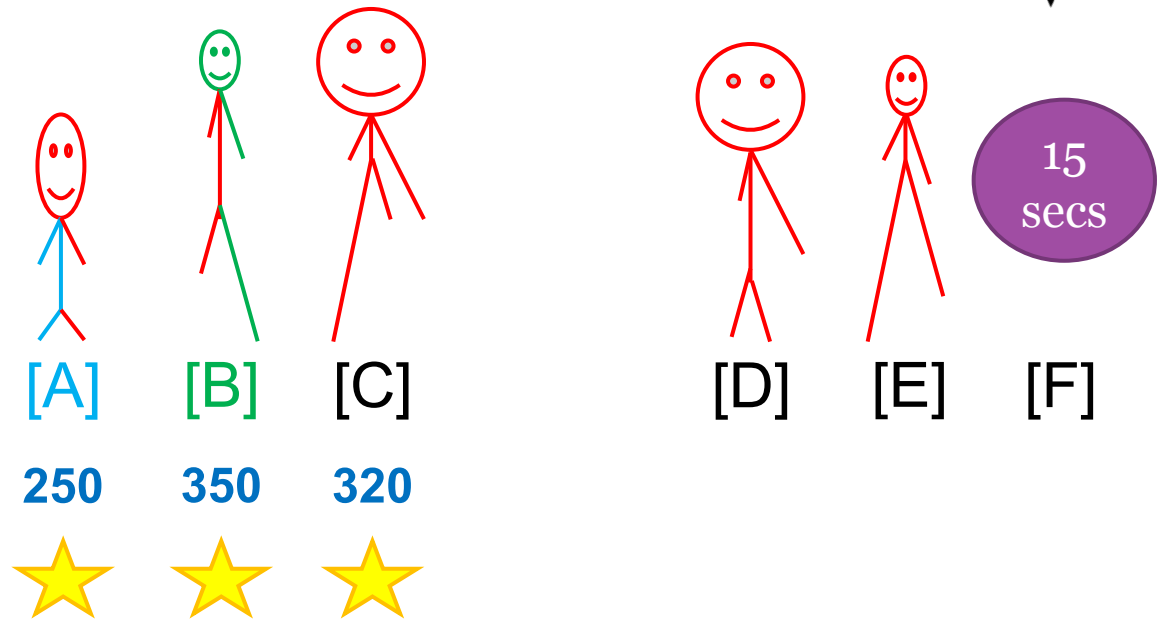
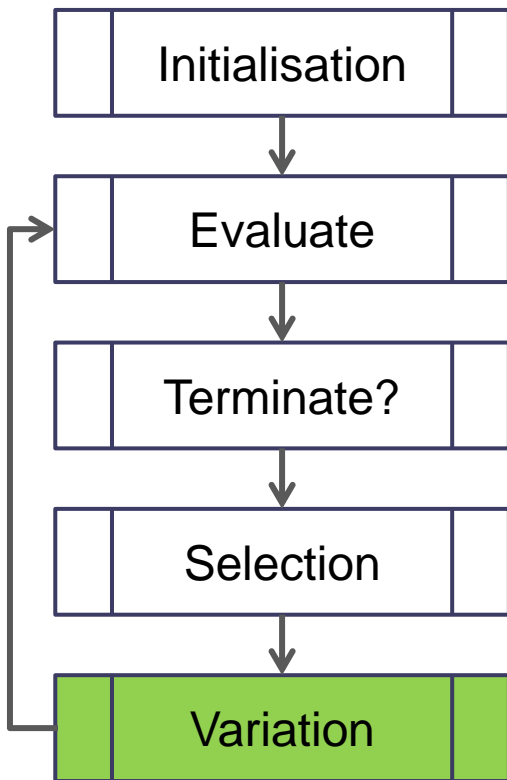
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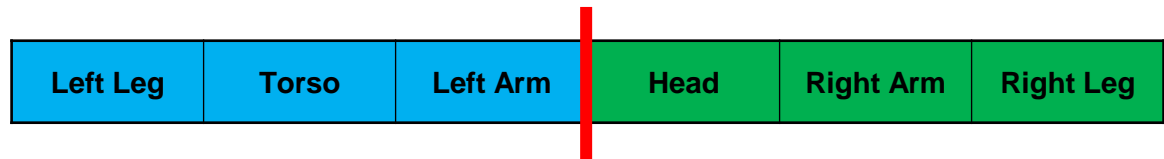
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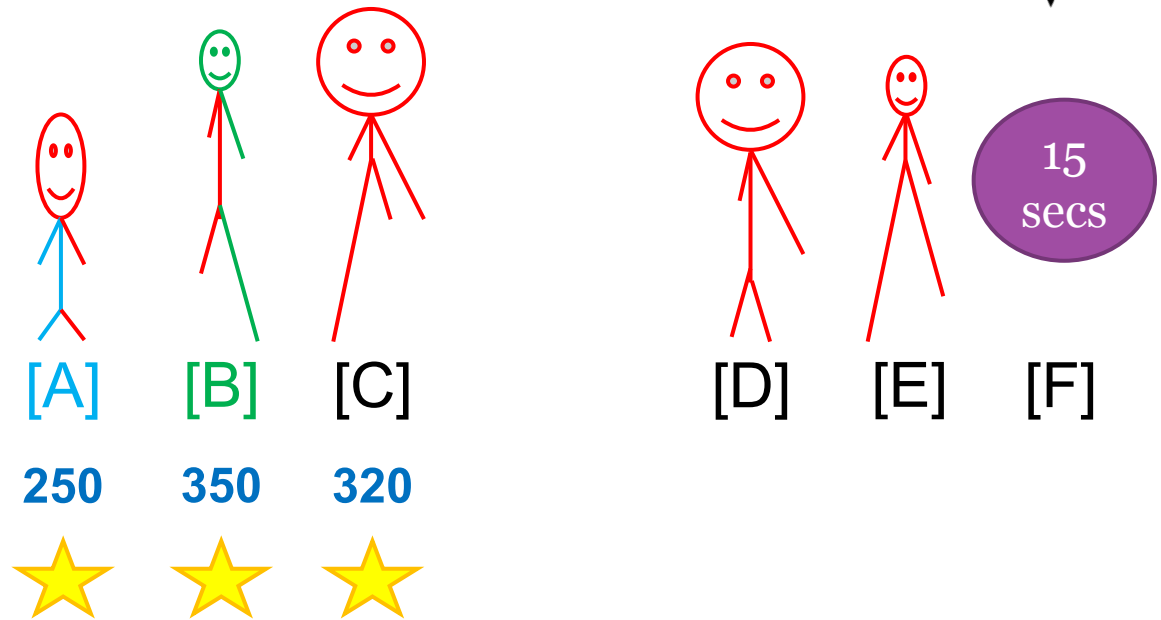
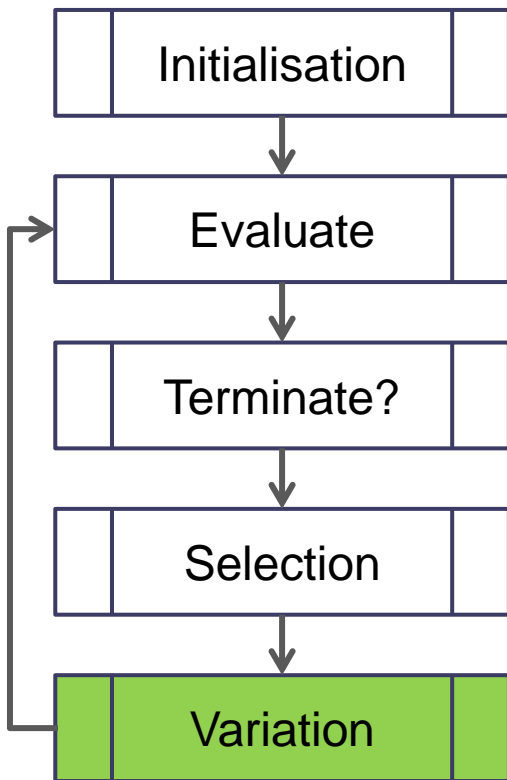
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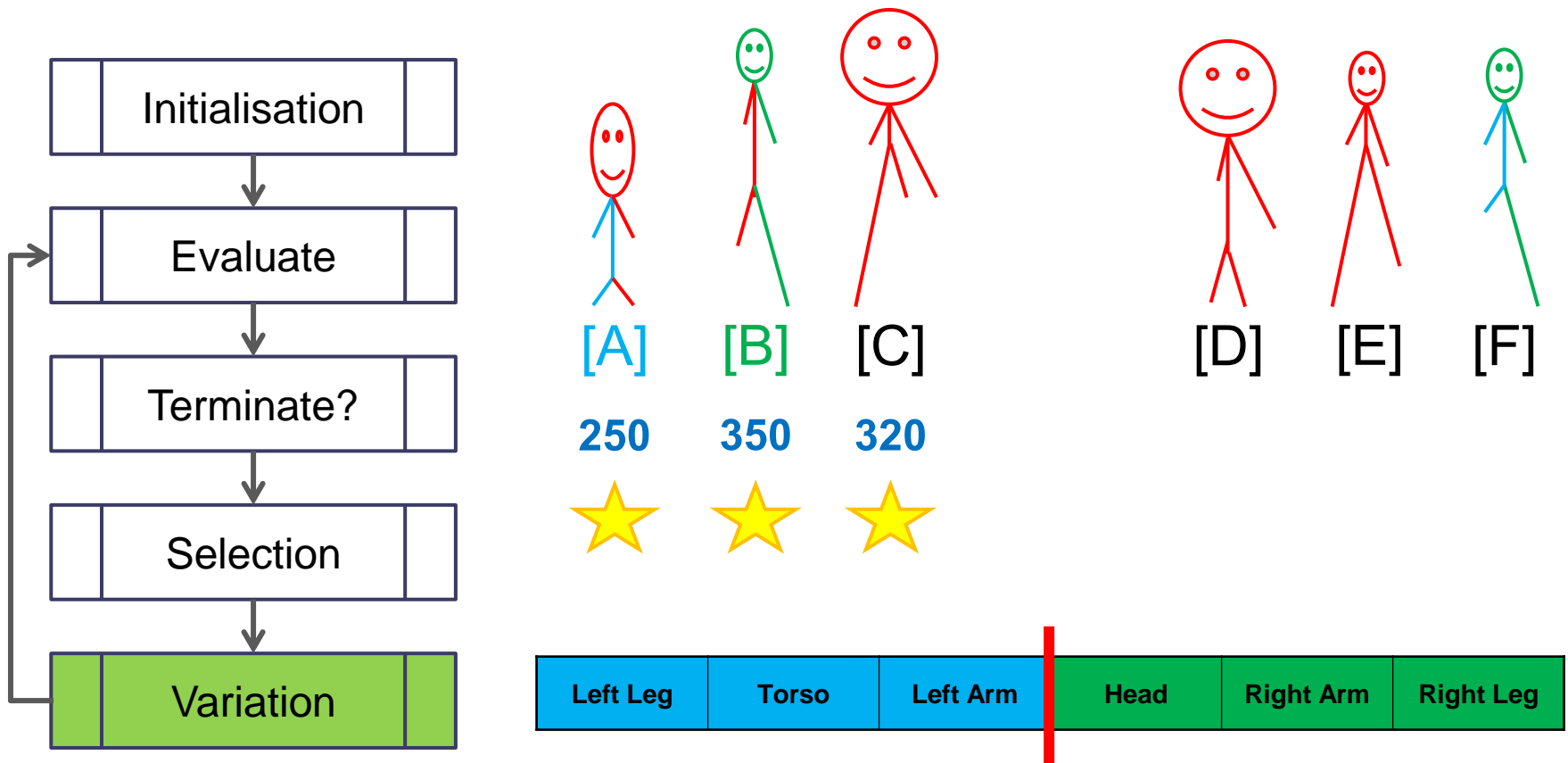
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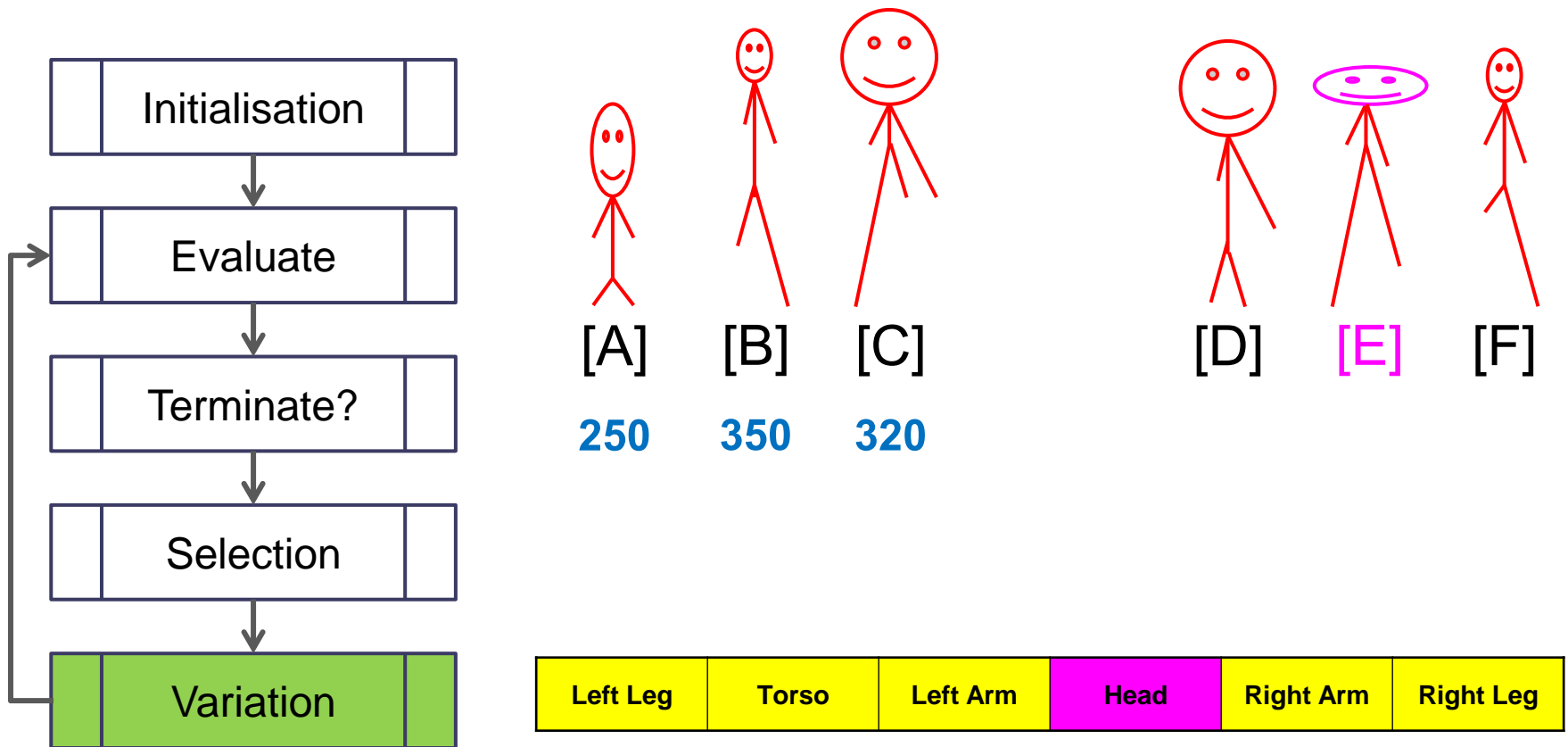
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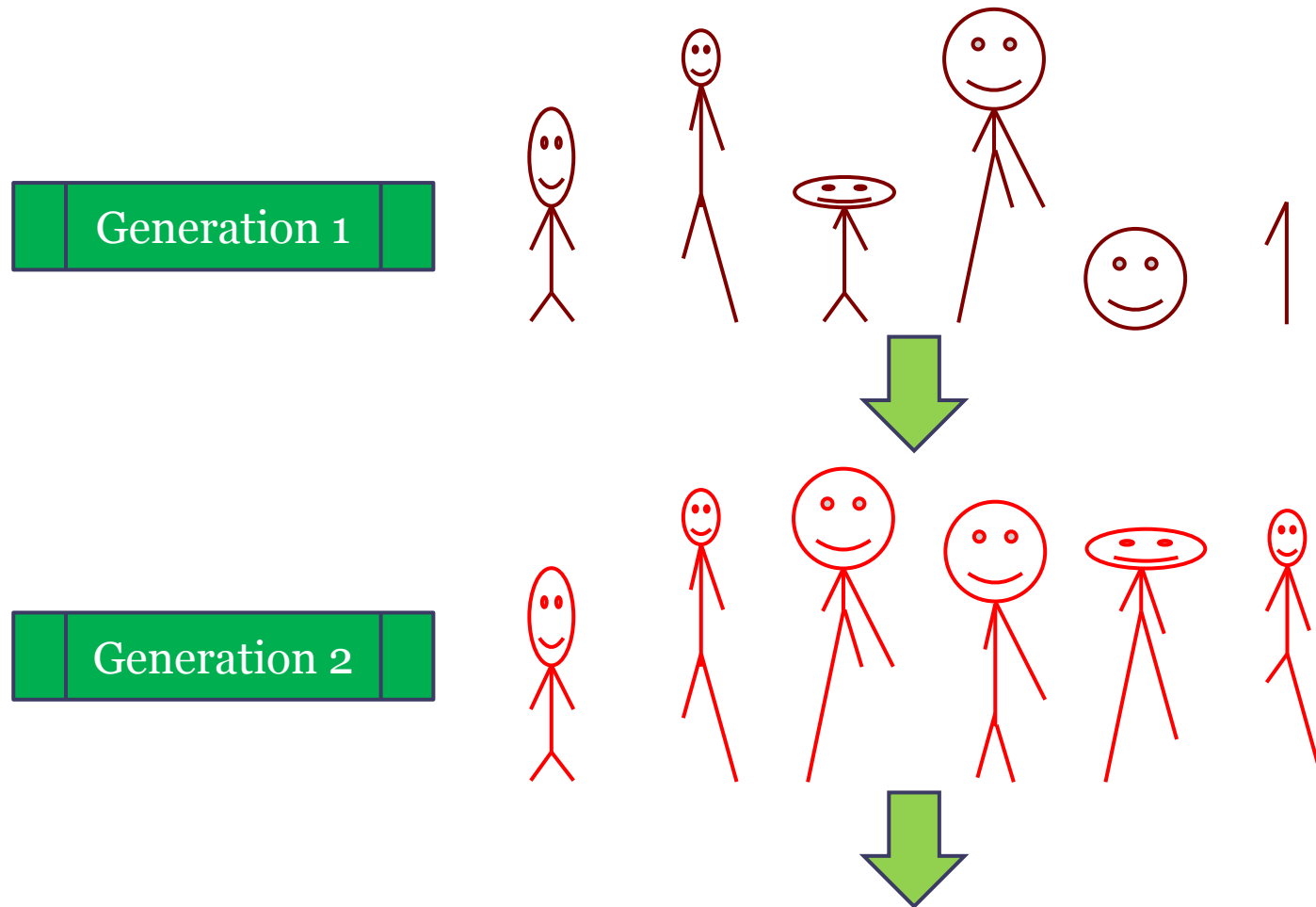
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Why?

What?

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Next?

Condition				
Mario within 90 to 110 px of enemy	X	✓	X	X
Mario within 0 to 50 px of enemy	✓	X	X	X
Mario within 100 px of an obstruction	✓	✓	✓	X
Mario is on the ground	✓	✓	X	✓
Action				
MARIO.KEY_JUMP	✓	✓		
MARIO.KEY_SPEED	✓			✓
MARIO.KEY_RIGHT	✓	✓	✓	✓
	Jump on enemy head	Jump on enemy head	Prepare for jumping over	Keep running

GENE 1

GENE 2

GENE 3

GENE 4

GENE 5

GENE 6

Why?

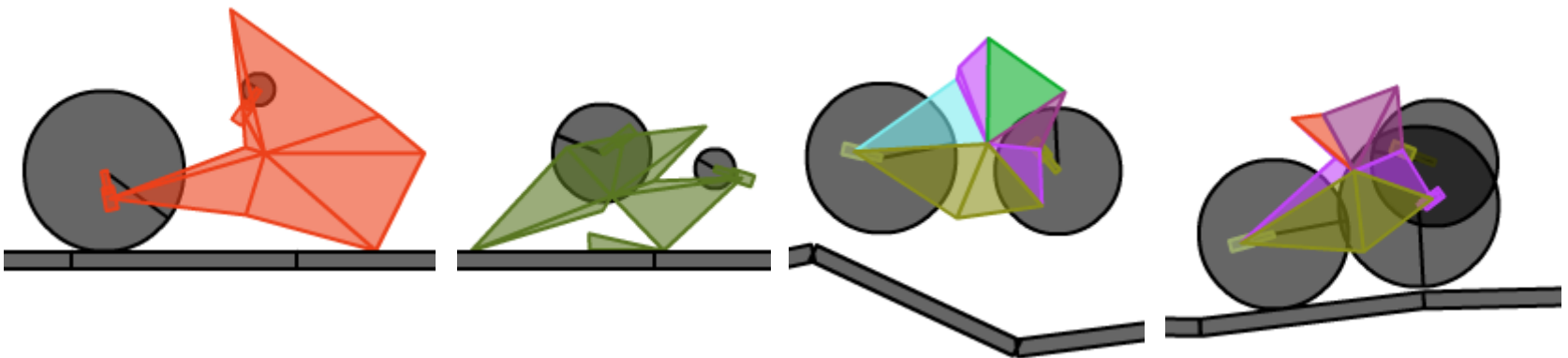
What?

How?

Next?

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
- Evolutionary Computation [Journal], MIT
 - <http://www.mitpressjournals.org/loi/evco>
- Information Sciences [Journal], Elsevier
 - <http://www.journals.elsevier.com/information-sciences/>
- My publications at www.shahinrostami.com



Why?

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Next?

Presentation overview

- Why Evolutionary Computation?
- What is it?
- How does it work?
- How can you get involved?

Why?

What?

How?

Next?

Our web page!



- Visit: www.shahinrostami.com/MARP

BU
MARP
Mario A.I. Research Project at
Bournemouth University

PAGES

- About us
- Research aim
- Members
- Topics

Search ...

About us

MARP (Mario A.I. Research Project) is a research project intended for undergraduate Computing Framework students at Bournemouth University. The group meets once weekly for lectures and discussions on the topic of Computational Intelligence, and to make progress on our research aim.

Below is a photograph of members who attended the first ever session:

Thank you, any questions?

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www.shahinrostami.com

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