

Introduction to Complexity (Fall 2016)

5.7 Take Unit 5 Test » Unit 5 Test

Instructions 1

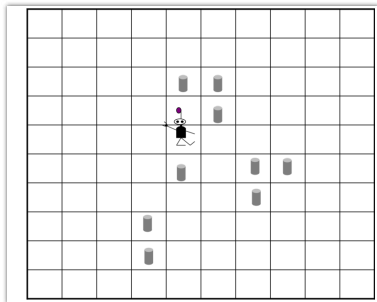
You may use any course materials, websites, Netlogo models, calculators, etc. for this test. Just don't ask another person for the answer and don't share your answers with other people.

Question 2

Suppose the GA has evolved the following strategy for Robby the Robot (shown in part):

<i>Situation</i>	<i>North</i>	<i>South</i>	<i>East</i>	<i>West</i>	<i>Current Site</i>	<i>Action</i>
1	Empty	Can	Empty	Empty	Empty	Move East
2	Can	Empty	Empty	Empty	Empty	Move North
3	Can	Empty	Empty	Empty	Can	Move West
4	Can	Empty	Can	Empty	Empty	Pick Up Can

Now suppose Robby has a score of 0 and is in the following situation (Situation 1 above):



What is Robby's score after performing **four** actions (according to the above strategy and the scoring system described in the lectures)

- A. -2
- B. -5
- C. 10
- D. -1
- E. 0

Question 3

Recall from Video 5.2 (#3) that the length of a string encoding a strategy is 243.

Suppose that Robby is improved, and can now see the contents of the four positions diagonal to his current position. That is, a situation is now the contents of **North, South, East, West, Current-Site, NorthEast, NorthWest, SouthEast, and SouthWest**. As before, each of them has three possible "contents": *Empty, Can, and Wall*.

If his strategy using these new situations is encoded in the same way as described in Video 5.2 (#3), what would be the length of the string encoding a strategy for this improved Robby?

- A. 3^5 (= 243)
 - B. 5^3 (= 125)
 - C. 3^7 (= 2187)
 - D. 7^3 (= 343)
 - E. 3^9 (= 19,683)
 - F. 9^3 (= 729)
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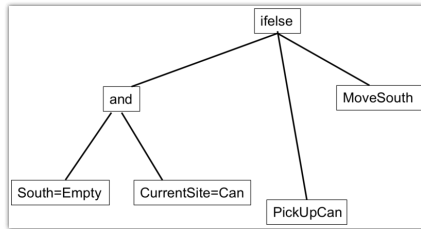
Question 4

Recall (again) from Video 5.2 (#3) that the length of a string encoding a strategy is 243, where each symbol in the string corresponds to Robby's 7 possible actions. One (impractical) way to find a good strategy would be to test every possible strategy there is. How many strategies are there?

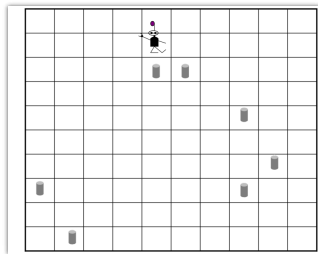
- A. 243^7
- B. 7^{243}
- C. 3^{243}
- D. 3^7
- E. 1,701

Question 5

Consider the following genetic programming ("tree") representation of a strategy for Robby the Robot:



Suppose Robby has a score of 0 in the following environment:

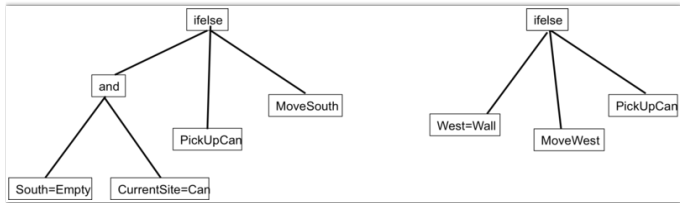


What will his score be after following the strategy above for **three** steps (i.e., to perform 3 actions)?

- A. 0
- B. 10
- C. 20
- D. -1
- E. -2

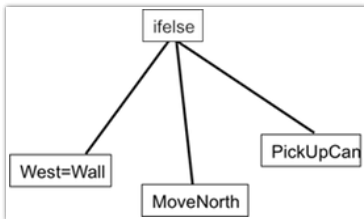
Question 6

Consider the following two genetic programming trees below.

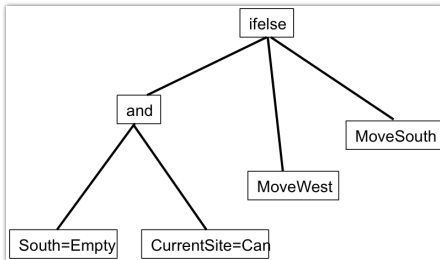


Which of the following trees could result from a single crossover between the two trees above? [See Video 5.3 for description of crossover between trees].

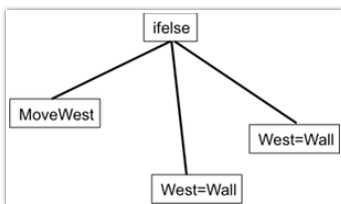
o A.



o B.



o C.



Question 7

In Video 5.2 (#4), it was stated that the GA exhibits "Exaptation". Which of the following best describes what is meant by this?

- A. The GA evolves strategies without assistance from humans.
 - B. Under the GA, evolution proceeds via long periods in which the best fitness changes very little, punctuated by short periods in which the best fitness increases rapidly.
 - C. In some cases, the best fitness in the population of a strategy can decrease for several generations before it increases again.
 - D. At later generations, the fitness of the best strategies are significantly better than at early generations.
 - E. In some cases, the GA evolves a highly fit strategy in which one or more "non-adaptive" traits of earlier strategies have a new, adaptive function.
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Question 8

Stephanie Forrest described her current main area of research as which of the following?

- A. Using GAs to evolve computer networks
- B. Using GAs as models of social and cultural evolution
- C. Using GAs to repair bugs in software
- D. Using GAs to model the "major transitions" in biological evolution