Instructions 1

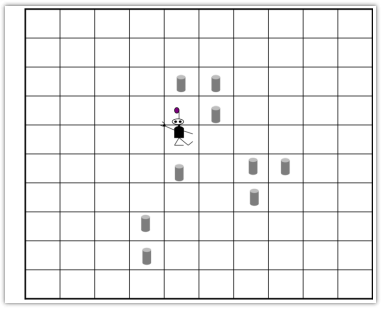
You may use any course materials, websites, Netlogo models, calculators, etc. for this test. Just don't ask another person for the an share your answers with other people.

Question 2

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

Situation	*North*	*South*	*East*	*West*	*Current Site*	*Action*
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 situat is now the contents of **North, South, East, West, Current-Site, NorthEast, NorthWest, SouthEast, and SouthWest.** As before, each of t 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 s 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)

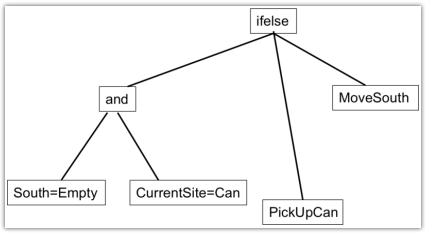
Question 4

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

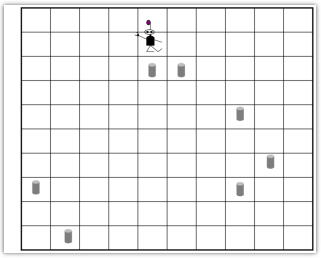
- A. 243^7
- B. 7^{243}
- C. 3^{243}
- D. 3^7
- E. 1,701

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:

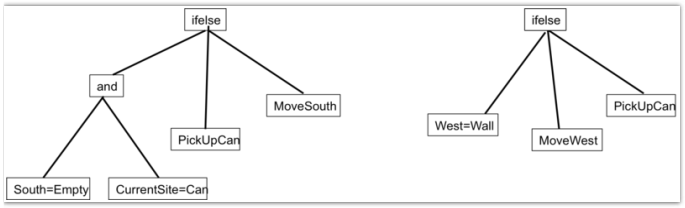


What will his score be after following the strategy above for **three** steps (i.e., to perform 3 actions)?

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

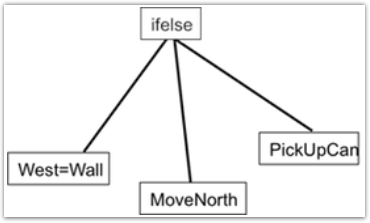
Question 6

Consider the following two genetic programming trees below.

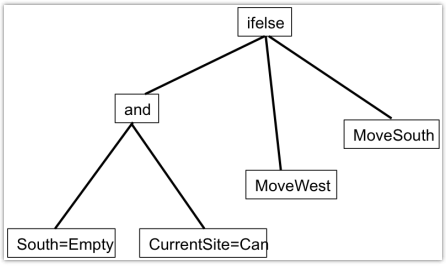


Which of the following trees could result from a single crossover between the two trees above? (See Video 5.3 for description of cros between trees).

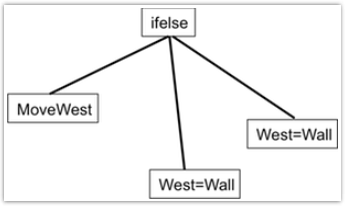
- A.



- B.



- 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 incre 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.

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