Grading notes: SymSys 100, Fall 2015, Homework 1

Notes on the grading:

• Each question was worth 12 points, except for the long-answer question which was worth 28 points.

• The mean grade was 91%. The variance was quite large. The most common reason for large deductions was lateness. In some cases, significant deductions occurred for failure to observe the word limits.

• Many people had difficulty with question 4. We hope that the exercise was nonetheless useful conceptually in thinking about what it means to frame an algorithm for a fairly complex task in a way that truly assumes no insight on the part of the interpreter. Realizing that it was difficult, we were very lenient in grading this question. However, we did take off points for answers that assumed abilities that were not stated in the question framing (e.g., “Calculate the shortest path from X to Y and take it”).

In the broader context of the course:

• This homework is worth 15% of your final grade.

• At the end of the quarter, we will employ a curve to calculate your final grades. No one will receive a lower score than their raw grade, but some will receive a higher grade. So, the raw score you received is a lower bound on what the homework will contribute to your final grade.

• Section attendance and participation is the single largest factor in your final grade. It’s also a vital part of learning the course material, along with lecture attendance and readings. The students who do best in the course will be the ones who do not skimp on any of these components.

Here is a question-by-question grading key.

1.  **(12 points)** Why did Descartes think that animal and human bodies were machines? Why did he think that the human mind was not? What does this imply about the reach of scientific explanation in accounting for the workings of minds and bodies?
   
   – 3 points: answer addresses all three subquestions
   – 3 points: answer is accurate in light of the lecture & Flanagan reading
   – 3 points: answer is clearly written
   – 3 points: answer is concise, to the point, well organized
2. **(12 points)** Using the examples in the lecture slides as a guide, write a context-free grammar that generates the two possible structures for Tommy Cooper’s punchline “I opened the door in my pants”. Describe, as carefully as you can, the key difference between the two structures.

- 4 points: CFG correctly represents some, non-critical aspect of the sentence (e.g., $S \rightarrow NP \ VP$ or $S \rightarrow DP \ VP$, whichever notation is used)
- 4 points: CFG that produces correct trees for both interpretations of the sentence, i.e.,
  * Low attachment: PP inside noun phrase (“door”)
  * High attachment: PP attached to verb (“opened”), in VP but not in NP
- 4 points: Describe the structural differences (PP is attached at different points)

Notes:

- No points were given, or subtracted, for describing the difference in meaning, since this was not part of the question.
- Some people did not write out a CFG, but simply drew trees. We didn’t penalize including trees, but simply showing a tree does not constitute writing a CFG. However, we did decide to give partial credit to those who did this, up to a maximum of 8 points including the verbal description.

3. **(12 points)** This aim of this question and the next is for you to think about what is required to give a completely specified set of instructions. Consider the map of Romania we discussed in class (taken from the popular AI textbook by Russell & Norvig):

Imagine that you are in Eforie, and you need to give instructions to an automated car, to go from there to Zerind. The car understands English, and can find its way from city $A$ to city $B$ if there are no cities in between. But when it is in a given city, it needs to know which neighboring city to aim for next. Give the car instructions, in English, that it can use to navigate its entire journey. And make sure the path you instruct it to take is the shortest possible path to Zerind. (Note: this is not a trick question; it should be very straightforward.)

- 5 points for writing directions in English
- 5 points for correct sequence of cities: Eforie, Hirsova, Urziceni, Bucharest, Pitesti, Rimnicu Vilcea, Sibiu, Arad, Zerind
- 2 points for not going over word limit

4. **(12 points)** Just as in question 3, imagine you are trying to instruct an automated car to go from Bucharest to Arad. However, there is now a twist. Some of the roads between cities may be closed on account of ice. You are not sure which roads are closed, but you do know
there is *some* path (sequence of connected cities) that goes from Bucharest to Arad. Give the car instructions, but this time make sure that the car knows what to do if it reaches an impasse and must return to the city from where it most recently departed. Try to write your directions so that the car makes the shortest trip possible, given the circumstances.

– 3 points: Answer is written clearly and in English
– 3 points: Answer is specific or tailored to this problem – it assumes the car has no insight
– 3 points: Answer appropriately routes the car from Bucharest to Arad. Students earn 1 point for every 2 specific impasses they accommodate (with a maximum of 3 points).
– 3 points: Answer is 300 words or less

Note: If a student did not provide an answer that is specific to Q4, then they were not able to earn points for appropriately routing the car and handling impasses. But, so long as they clearly outlined any algorithm in English and in 300 words or less, they were able to receive half credit (6/12 points).

5. **(12 points)** Consider the Turing Machine below, on an initial tape that looks like:

<table>
<thead>
<tr>
<th></th>
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<th>0</th>
<th>0</th>
<th>1</th>
<th>1</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>0</td>
<td>1</td>
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<tr>
<td>1</td>
<td>1R3</td>
<td>1R1</td>
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<td>2</td>
<td>1R2</td>
<td>1L3</td>
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</tr>
</tbody>
</table>

Does this machine ever halt on this input? If it does, what function does it compute (if any)? If not, how would you describe what it does?

– 5 points for saying that it does not halt
– 5 points for any reasonable, close-enough description of what the Turing machine does (e.g. goes to the right while drawing 1’s forever)
– 2 points for not going over the word limit

6. **(12 points)** In your own words, explain what a universal Turing machine does.

– 3 points for accurately describing what a UTM does, in terms of reading the code of a TM and simulating its behavior
– 3 points for including the role of the input to the TM being simulated
– 3 points for clarity
– 3 points for not going over the word limit
7. (28 points) Your friend has just read an article that claims a computer program has finally passed the Turing test and that this means computers are now just as intelligent as humans. However, your friend hasn’t taken Symsys 100 and doesn’t know what the Turing test is. First, explain what the Turing test is to your friend in your own words. (Note: the Turing test is not the same thing as the Loebner Prize, which is fairly uninteresting for the purpose of this question.) Second, explain whether you agree or disagree with the claim that a computer program passing the Turing test shows that computers are now as intelligent as humans.

- 6 points: Correctly explain what the Turing Test is
- 5 points: State agreement or disagreement with the relevant claim
- 4 points: Offering arguments for the stated position
- 5 points: Quality of arguments offered
- 8 points: Clarity and readability