LUT University

LUT Computational Engineering 2022-04-13

BM40A0202 Foundations of Computer Science

Olli-Pekka Hämäläinen

Exercise 13 (week 16): Visualization of data & artificial intelligence

Tasks (1 p/task)

1. Let's think about the product database of a supermarket. This may contain around 50 000 different items.
   a) What problems arise if we are on a mission to make an organized database of product names? Can this mission be left to a computer?
   b) What is the universally used solution for such problems? (Not all of them, but some.)
   c) How many dimensions does a product data have in this product inventory database? Name the dimensions. (Note: there is no upper limit due to unrestricted optional attributes, but give a minimum.)

2. Sometimes people ask questions which are rhetorical.
   a) Provide two examples of a rhetorical question.
   b) Why are these a hard challenge for computers to provide meaningful answers in a Turing test?
   c) How could this kind of challenge be tackled? Name two possible ways to improve AI's responses for rhetorical questions.

3. a) Are the following responses reflex, knowledge-based or goal-based responses? Justify shortly.
      i) Computer program translating text from German to English.
      ii) A thermostat turning on the furnace when the temperature in a house drops below the current setting.
      iii) A pilot landing a plane safely on a runway.
   b) i) Give some examples of declarative knowledge.
      ii) Give some examples of procedural knowledge.

4. Let's consider an eight-puzzle that has the pictured start state.

	1	3
4	2	5
7	8	6

   a) Draw the search tree that is generated by a breadth-first search without the assistance of any heuristic information.
   b) Draw the search tree that is generated by a depth-first search using a fitness function based on the number of tiles out of place as a heuristic.

5. a) Exponential growth can't continue forever. Limits of Moore's law must therefore be reached at some point. What will be the most likely cause (= limiting factor) for this?
   b) Companies all over the world are today complaining about the lack of microchips and how it's limiting their production. What are the causes for such shortage?

PO BOX 20, FI-53851 LAPPEENRANTA, FINLAND
E-mail: Olli-Pekka.Hamalainen@lut.fi