TAMPERE UNIVERSITY OF TECHNOLOGY
Department of Software Systems

OHJ-2556 **Artificial Intelligence** Exercises 1
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1. Every year the Loebner prize is awarded to the program that comes closest to passing a version of the Turing test. Research and report on the latest winner of the Loebner prize. What techniques does it use? How does it advance the state of the art in AI?

2. Is the intelligent agent approach chosen in the textbook sufficient for describing all real-world phenomena? Which are the cases that support the approach? Which points, on the other hand, speak against it?

3. A *neuron* is a threshold unit that fires (is "on") if the sum of its inputs is larger than its threshold value. The inputs come from other neurons or as external input. Let a neuron have binary states (0 or 1). The value that an edge transmits is the state of the start neuron $\times$ the weight of the edge.

   Logical variables take on binary values: 1 (true) or 0 (false). Design neuron networks implementing logical connectives **and**, **or**, **exclusive-or** (a.k.a. **xor** denoted $\oplus$: $0 \oplus 0 = 0$, $0 \oplus 1 = 1$, $1 \oplus 0 = 1$ and $1 \oplus 1 = 0$), and **not** when there are two or three logical variables (one in case of **not**). You may give real values to the weights of edges and thresholds in neurons.

4. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side, without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

   (a) Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space.

   (b) Implement and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states?

5. Describe a state space in which iterative deepening search performs much worse than depth-first search (for example, $O(n^2)$ vs. $O(n)$).