Take-Home Exam Questions on 'AI – Biocognitive Intelligence' (Exam 2)

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Submission form: electronic copy emailed to btzhang@bi.snu.ac.kr

Answer the following 8 questions. The answers to each question should not exceed 2 pages in A4 format. Formulate the answers in your own expressions and make your best effort not to transcribe the expressions given in the textbook.

1. (20 points) What kinds of failure of visual perception have been reported? Review different types of disorder or visual agnosia. Take a specific disorder and explain what this suggests in terms of computational problems. Give an example of computational (connectionist) account of a specific deficit.
2. (20 points) Review different hypotheses regarding how the objects are represented in the brain. Compare the limitations and strong points of each method. Can we use the ideas to develop machine vision systems?
3. (20 points) Describe the whole process of understanding a spoken sentence in the brain? Discuss how much we know and what remains to be known. Can we use these findings for improving the performance of automatic speech recognition systems?
4. (20 points) What are the N400 and P600 responses in electrophysiological experiments? Why are these interesting in understanding human language processing? To what purposes can we use these findings?
5. (20 points) Review the models of short-term memory in humans. What aspects of human memory can best be explained by each model? What are their weaknesses?
6. (20 points) Compare the structures and properties of memory in the human brain and that in the current computer. What can we learn from the brain to advance the computing technology, especially for artificial intelligence?
7. (20 points) Explain the cellular mechanisms of learning and memory. How is the long-term potentiation (LTP) produced? How is LPT related with Hebbian learning rule? What kinds of molecules (receptors and neurotransmitters) are involved in this process?
8. (20 points) Explain the following terms or concepts related with learning and memory.
   (a) Short-term memory vs. working memory
   (b) Implicit memory vs. explicit memory
   (c) Habituation vs. sensitization
   (d) Distributed representation vs. localist representation

The end (160 points in total)