Universität Hamburg
Department Informatik
Knowledge Technology, WTM

On the Relationship between Generative Encodings .. - in-depth analysis

Seminar Paper

Bio-inspired Artificial Intelligence

Jan Fabian Schmid

Matr.Nr. 6440383

2schmid@informatik.uni-hamburg.de

11.11.2015

Abstract

Your text here...

Contents

1   Introduction

[7]
what research question is examined in the paper?
Typical approaches
Solution by this paper

2   related work

[4] → L-Systems
[5] → neuroscience toolbox

3   Background Information

from genes to nervous systems
- direct and developmental encodings
skinner-box
regularity definition

4   Approach description

proposal - bias towards regularity is critical to evolve plastic neural networks

5   Approach analysis

results from the experiment

    psychological consistence of results
- importance of regularity
[3]
[2]

    - variability selection
[6]
- optimal fully connected brain
- synaptic plasticity
[1]
[8] → synaptic plasticity important for learning and memory

6 Conclusion

Your text here...

References

[1] Larry F Abbott and Sacha B Nelson. Synaptic plasticity: taming the beast. *Nature neuroscience*, 3:1178–1183, 2000.

[2] Jeff Clune, Kenneth O. Stanley, Robert T. Pennock, and Charles Ofria. On the performance of indirect encoding across the continuum of regularity. *IEEE Trans. Evolutionary Computation*, 15(3):346–367, 2011.

[3] Gregory S. Hornby and Jordan B. Pollack. Creating high-level components with a generative representation for body-brain evolution. *Artificial Life*, 8(3):223–246, Summer 2002.

[4] Gregory S Hornby, Jordan B Pollack, et al. Body-brain co-evolution using l-systems as a generative encoding. In *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2001)*, pages 868–875, 2001.

[5] Jean-Baptiste Mouret, Stéphane Doncieux, and Benoît Girard. Importing the computational neuroscience toolbox into neuro-evolution-application to basal ganglia. In *Proceedings of the 12th annual conference on Genetic and evolutionary computation*, pages 587–594. ACM, 2010.

[6] Richard Potts. Variability selection in hominid evolution. *Evolutionary Anthropology: Issues, News, and Reviews*, 7(3):81–96, 1998.

[7] Paul Tonelli and Jean-Baptiste Mouret. On the Relationships between Generative Encodings, Regularity, and Learning Abilities when Evolving Plastic Artificial Neural Networks. *PLoS ONE*, 8(11):e79138+, November 2013.

[8] Guang Yang, Cora Sau Wan Lai, Joseph Cichon, Lei Ma, Wei Li, and Wen-Biao Gan. Sleep promotes branch-specific formation of dendritic spines after learning. *Science*, 344(6188):1173–1178, 2014.