Universität Hamburg
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Effects of encoding on the general learning ability of neural networks

Seminar Paper

Bio-inspired Artificial Intelligence

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Abstract

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Contents

1 Introduction

The studied paper: [5]
What research question is examined in the paper?
Solution suggested by this paper?
My Research question for the in-depth analysis:
- What effect has the usage of different neural net encodings on neural plasticity?

2 related work

Typical approaches from related work
- typically the two problems (1. encoding of nervous systems for evolution of large good neural networks and 2. synaptic plasticity in neural networks) are studied separately
About generative encodings:
- [3] → L-Systems
- [4] → neuroscience toolbox
About synaptic plasticity:
- [2] → importance of synaptic plasticity for learning
- [1] → synaptic plasticity in neural networks

3 Background Information

From genes to nervous systems
- Direct and developmental encodings
Skinner-box
- Where and for what purpose can this experiment be used?
Definition of regularity used in this paper
Different encodings to describe neural networks tested in this paper
- How do they work?
- What differentiates them?

4 Approach description

Proposal of the paper
- Bias towards regularity is critical to evolve plastic neural networks
Experiment in the paper to verify the proposal
- How is it structured?
- What is it able to show?
- Expected results?

5 Approach analysis

Results from the presented experiment
- Are the results according to the proposal?
Which effects did the different encodings have?
- Map-based encoding
- HNN
- Direct encoding
Critique
- Were the choosen encodings reasonable and sufficient?

6 Conclusion

How reasonable is the approach of the paper?
General conclusions about the effect of different encodings for neural networks

References

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

[2] Donald Olding Hebb. *The organization of behavior: A neuropsychological theory*. Psychology Press, 2005.

[3] 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.

[4] 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.

[5] 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.