

# Readings in Neuroinformatics

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Matthew Cook. The reusable symbol problem a position paper for nesy'08. 2008.

## Abstract

Neural networks implement rules according to which they can process input and generate output. This can be achieved through training with logical data and has been enhanced with probabilistic capabilities. Because however these rules have to be followed throughout the neural network, they have to be learned at every part. Repeating this learning process over and over again leads to a large redundancy, growing together with the size of the neural network itself. In this paper I introduce the *reusable symbol problem* and I propose that its solution would remove much of that redundancy. I present a concrete canonical instance integrating the Wang tiling problem. The Wang tiling problem structures the neural network graphically into a workspace and a clearly scaled set of allowed tiles which can be arranged according to the color of their edges. I argue that reaching this milestone by applying reusable symbols to solve the Wang tiling problem can be regarded as a first milestone to solve the reusable symbol problem in general. Setting this milestone is intended to encourage work aimed at a better understanding of the symbolic processing performed by neural systems.

188 words.