

TDT4137 (Cognitice Architectures) Assignment Sheet 1

1 Newell and Simon: Symbols and search

Task 1.1: What is a *symbol*, from the perspective of Newell and Simon?

According to Newell and Simon, a *symbol* is a mean used to express state. The symbols represents a certain value/meaning that can be put together to form components that can build a system.

For example, in a programming language, symbols can be the set **{1-9, A-z, , ", =, +, -}**.

Task 1.2: What is a *symbol structure*?

A symbol structure defines the arrangement that gives the symbol a meaning by a given context. This structure can be determined by how symbols should be aligned physically.

A symbol structure is the arragnment of symbols in a given context. For example if we have the symbols {A-z, (,), {, }}, a symbolic structure could be `if(true){doSomething() }`

Task 1.3: What does the word '*physical*' mean in this context?

In the article physical is not tethered to actual physical objects (physical symbols that exist in the real world), and says that the system follow the laws of physics.

Task 1.4: Besides symbols, what is the second, equally important component of a symbol system?

Besides symbols, a symbol system contains a collection of processes. These processes are operaing on the symbols, editing, deleting, reproducing, destroying or creating them.

Task 1.5: Explain what this second component does

Processes are editing, deleting, reproducing, destroying or creating symbols. A process can for example be a "move process" in chess - the process that actually moves the pieces.

Task 1.6: What is, according to Newell and Simon, the relation between a physical symbol system (PSS) and intelligent behaviour?

This can be explained using *The physical Symbol System Hypothesis*: "A physical symbol system has the necessary and sufficient means for general intelligent action."

This means that every system that show general intelligence can be proven to be a physical symbol system and that it can be organized to show intelligence.

Task 1.9: If an intelligent system interacts with the world, can all the necessary processing be symbolic? Where would non-symbolic processing be useful (or necessary) in that situation?

I think that depends on what the system were to do. If we have a system that learns your most visited web pages and gives you similar sites, then symbolic processing is enough. A self moving car on the other hand, would need non-symbolic processing, to compensate for having no vision.

2 The Knowledge level

Task 1.10: What does it mean if we say that the regarded system behaves in a rational manner?

First, it may be useful to describe what rationality is and what it means to be thinking rationally. To *think* rationally is to think by a logical set of rules. For example: "*Metal is glowing red when hot, this metal is glowing red, this metal is hot*". To *behave* rationally is to do the right thing based on what you know. For example, if we have an AI-system that works as a car mechanic, it can reason like above: "*This metal is glowing red, so the metal is hot*" and *then* decide not to touch it. This is behaving in a rational manner.