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Experience based reasoning system coupled with real world knowledge

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Abstract

Human intelligence draws its conclusions from a base of experience-generated knowledge. Beside being able to use this knowledge, it is limited to how much can be accessed at a time and this reasoning is often shown to be illogical, with respect to mathematical logics. The human's knowledge is always growing and being modified by current experience. In addition, the humans' processing capability appears to be severally limited. This limitation is far from being a burden; it is part of the brilliance of the solution. The human mind does a every effective job of dealing with the world. For proof, we invoke the fact that human kind as survived and thrived. The current work is a first step in exploring a reasoner than can act in a human inspired performance, which is in the direction of general artificial intelligence.

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1. Introduction

When developing artificial intelligence (AI) systems for particular solutions, the systems are often built with known data, facts, information and knowledge and without the dynamic aspects of learning. Commonly, the systems are not building up their own content from scratch because there is a need of a starting point for the systems to work

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properly in a domain. In contrast a general AI-system must look at the totality of the whole situation using several senses. In this paper, general AI systems are the focus; the term AI will mean general AI in the rest of the paper. The AI-system needs simplicity, meaning that it does not have to have all the knowledge about everything in a domain but it needs to have an understanding about the different parts including experience of the parts. Hence, different AI-computerized sensory systems need to be incorporated into a totality that constitutes a combination of senses.

The research in this paper, builds on earlier research in AI-systems and abductive reasoning. Building on prior work, in this paper is a synthesis of work from both separate and joint projects. The overall goal is AGI, artificial general intelligence. While that goal seems a long way off, the attempts to build it will be found generally instructive and the author hope this will lead to better and more robust AI systems along the way.

To develop a system that is self-developed with its own knowledge base, the AIC system has been proposed in Håkansson[1]. The AIC system is built for handling a combination of senses, as perceptions, but strives to handle emotions and, finally, thoughts. It builds up the knowledge using senses about its surroundings and draws conclusions from this obtained knowledge. To understand it surrounds, it builds on Aleksander[2], consciousness of five axioms[3]: sense of place, imagination, directed attention, planning and decision/emotion. By developing its own knowledge base and incorporate the five axioms, the AIC system becomes a knowledgeable system. However, the AIC-system is not experience-based yet, since it needs a reasoning strategy that can distinguish what is really good valid knowledge which can be used as a relevant experience and what can be sorted out as useless information which can be stored, but not used in a particular setting, where it is not needed or wanted.

The approach followed in this research work in this paper is to build parts of the overall architecture piecemeal and test each one. The first piece is described below and was aimed at situation recognition. The part discussed here is a first step to building a reasoning system to augment the processing of situations.

There are a number of assumptions that drive the design: First of all, the assumption that human processing is limited. This is not taken as a limit on human intelligence, but rather a defining characteristic. This has driven a system that uses parsimonious and highly effective processing and representation approaches. The representation is necessarily not a complete high fidelity representation, but one that is effective in the human's ability to deal with the real world. For example, humans have no difficulty picking up objects. An assumption made in this paper, is that situations are the key to representation. That situations are linked representations and have an ability to use chunks to both simplify and to expand the representation as needed. Chunks are used gather a part of the representation into a single unit. This reduces the load on short-term, or working, memory in the human by reducing the number of things to be stored at one time. The chunk can also be expanded, reversing the gathering of details.

Intelligent systems must be experience driven, as are human intelligences. The blank slate (tabla rasa) is often cited with respect to experience. In our work, the assumption is that human intelligence relies on experience and the slate is "rather" blank at the beginning. However, the human is given a great gift of evolution, i.e. humans have some basic abilities and neural systems that are set to work with the surrounding world. This helps develop an effective and useful intelligence in a reasonable time frame (e.g. childhood). One consequence of this is that childhood development is very informative about the processes of the human mind. As a side note, the authors believe AI researchers should spend more time looking at research in childhood development.

Reasoning is not defined by symbolic logic. This runs counter to AI's heritage. We reject conventional symbolic logic for a number of reasons. First of all, humans display actions that are clearly illogical when viewed by those schooled in symbolic logic. The view herein is, humans do what they do, it is not wrong! Nor are humans are not limited to deductive styles of reasoning. Induction and abduction are required to achieve human like reasoning. Humans can work with contradictory beliefs and agilely shift between them; Godel's theorems are not an issue for humans. In doing these shifts, they are not acting like non-monotonic logics, they do not back out prior deductions, and they just ignore what does not fit into the current process.

Another assumption comes form the idea of flow. The best definition for what is meant by flow comes from the writing of Pred[4] . This is based on ideas from William James, John Searle and A. N. Whitehead, and it deals with the idea that thought is a continuous process flowing from situation to situation. Pred[4] is more concise and a easier read than James and Whitehead, so we reference his work and indirectly, through him, the prior works. The flow is directed; the situation recognized by the situation triggers what James referred to as habits. A habit is an action on the part of the human. In an AI sense, these as learned procedures. The triggering of a habit affects the system in two ways. First the situation generated provides expectation, i.e. what the system expects to see next. Second, a human