Artificial Intelligence Reading Club

Chapter09: A New Constructivist AI:From Manual Methodsto Self-Constructive Systems

Hao ZHAN

haozhan1993@gmail.com

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1.Introduction

Point

Artificial intelligence (AI) systems has to date been largely one of manual labor.

Going beyond current AI systems will require significantly morecomplex system architecture than attempted to dat

One way to address the challenge of artificial general intelligence (AGI) is replacing atop-down architectural design approach with methods that allow the system to manage it sown growth.

This calls for a fundamental shift from hand-crafting to self-organizing architectures and self-generated code

1.Introduction

What is the AGI?

Point

Artificial intelligence researchers have traditionally been rather optimistic about the rate ofprogress in the field

AI is not AGI

Modern software techniques are too inflexible for helping us realize the kinds of complex dynamicsystems necessary to support general intelligence.

2.The Nature of (General) Intelligence

To some extent one could say that the ability to "learn to learn" may be an important characteristic of such a system.

For example, a system working on the docks and helping to tie boats to the pier must be able to ignore rain and glaring sun, the shouts of others doing their own tasks, detect the edge of the pier, catch a glimpse of the rope in the air, prepare its manipulators to catch it, catch it, and tie it to the pier –all within the span of a few seconds.

2.The Nature of (General) Intelligence

Attention Is All You Need

It is hard to see how a general-purpose intelligence can be implemented without an attention mechanism that can –in real time –learn to shift focus of attention effectively from internal events (e.g.remembering the name of a colleague) to external events (e.g. apologizing to those present for not remembering her name), and at run time –while operating – improve this skill based on the goals presented by social norms. Natural intelligence s probably include many such attention mechanisms, at different levels of detail.

2.The Nature of (General) Intelligence

Necessary features of AGI systems

Tight integration

Transversal functions

Time

Large architecture

predictable, robustness and graceful degradation...

3.Constructionist AI: A Critical Look

Point

Architecture

Programming languages

3.Constructionist AI: A Critical Look

Drawbacks

Limited

Brittle

LIDA [8], AKIRA [25], NARS [45], SOAR [16], CLARION [32], ACT-R [1], OSCAR [27], and Ikon Flux [23].

3.Constructionist AI: A Critical Look

No matter how dynamic and granular the components of an architecture are made, orwhich expanded version of a constructionist methodology is being applied, a heavy relianceon manual construction has the following effects:

- System components that are fairly static. Manual construction limits the complexitythat can be built into each component.

- The sheer number of components that can form a single architecture is limited by whata designer or team can handle.

- The components and their interconnections in the architecture are managed by algo-rithms that are hand-crafted themselves, and thus also of limited flexibility.

4.The Call for a New Methodology

Available evidence strongly indicates that the power of general intelligence, arising from a high degree of architectural plasticity,is of a complexity well beyond the maximum reach of traditional software methodologies.

At least three shortcomings of constructionist AI need to be addressed in a new methodology: Scale, integration, and flexibility.

5.Towards a New Constructivist AI

Temporal Grounding

Context

Connection to both space and time

Environment

5.Towards a New Constructivist AI

Feedback Loops

Attention and the perception-action loop

loop in intelligent systems

Self-organization

5.Towards a New Constructivist AI

Pan-Architectural Pattern Matching

For a large, heterogeneous architecture such architecture-scale pattern matching can get quite complicated. But it is unlikely that we will ever build highly intelligent artificial systems without it.

5.Towards a New Constructivist AI

Transparent Operational Semantics

Syntax and semantics

To make architectures that construct themselves, we must move away from large black-box components

White-box

Thank you for your time!