UNCONVENTIONAL APPROACHES TO AI

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INSIGHTS FROM THE PAST

- UNCONVENTIONAL APPROACHES IN AI: COMPLEX SYSTEMS PERSPECTIVES, COGNITIVE PSYCHOLOGY, SOCIAL SCIENCES, COMPUTATIONAL MODELS OF CREATIVITY AND OTHER UNCONVENTIONAL MODELS
- THIS IS AI OR CLASSICAL AI BEFORE BIG DATA. THE TIME IS NOW RIPE TO REVISIT THESE WONDERFUL IDEAS AND THINK ABOUT HOW TO INCORPORATE THEM IN MODERN AI/DEEP LEARNING. INSIGHTS FROM THE PAST CAN INFORM FUTURE APPROACHES TO AI, ESPECIALLY IN THE AGE OF BIG DATA.
- LOOKING AT THE HERITAGE OF COMPUTING AND ITS INTERDISICIPLINARY PAST CAN INSPIRE NEW APPROACHES FOR THE FUTURE. WE NEED TO LEARN LESSONS FROM THE HISTORY OF AI, WHAT APPROACHES WORKED AND DID NOT WORK IN THE PAST AND HOW AI WENT THROUGH MULTIPLE WINTERS.
- THESE APPROACHES CAN BE USED TO DEVELOP TECHNIQUES THAT CAN INSPIRE EXPLAINABLE AI.

INSIGHTS FROM THE PAST

- We are told of eureka moments (Archimedes, newton, …)
- In reality we always build on the work of others
- There is a preparation stage
- Incubation stage
- Retrieval/indexing (kekule dreaming of a snake and then linking it to benzene rings)

INSIGHTS FROM THE PAST

- Unconventional approaches in AI: complex systems perspectives, cognitive psychology, social sciences, computational models of creativity and other unconventional models
- Perceptrons
- Cognitive psychology
- Neuroscience
- linguistics

APPROACHES

- Narratives and stories
- Computational models of creativity and insight
- Analogies
- Dreams
- Commonsense reasoning

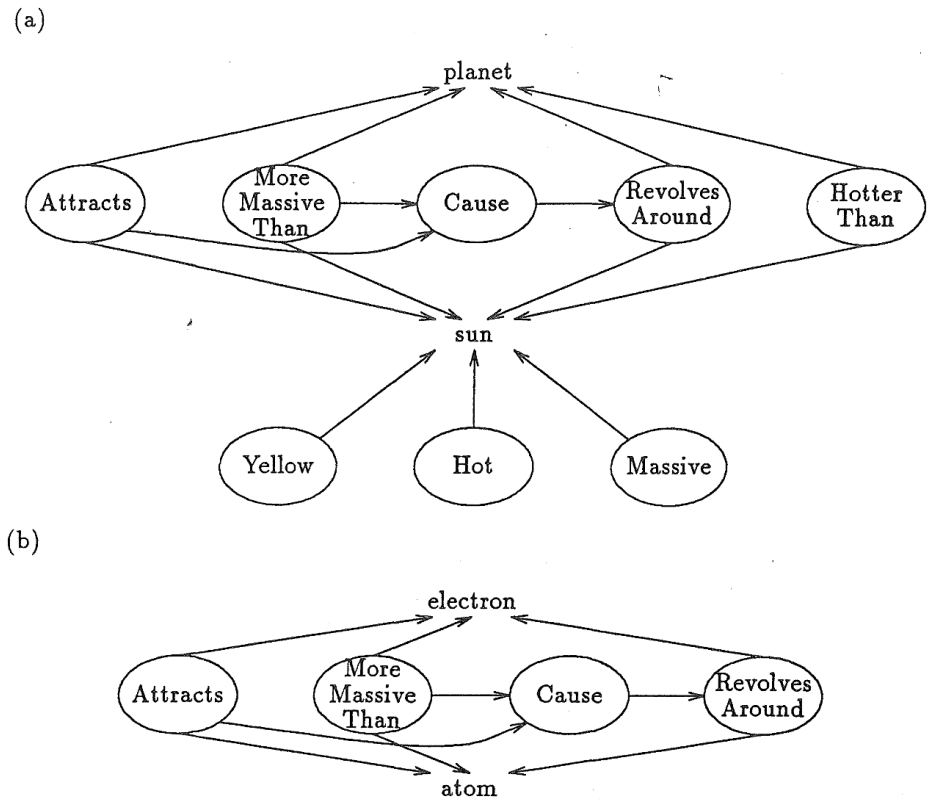


Figure 2. Creating a representation for the atom from the statement, "The atom is like the solar system." Higher order relations are carried over and simple attributes are ignored.

APPROACHES

A COMPUTATIONAL MODEL OF SCIENTIFIC INSIGHT, 1986, LANGLEY ET AL.

3. Perceiving the Bull

I hear the song of the nightingale.
The sun is warm, the wind is mild,
willows are green along the shore
-
Here no Ox can hide!
What artist can draw that massive head,
those majestic horns?[web 8]

APPROACHES

ZEN KOAN, TEN BULLS, WIKIPEDIA

APPROACHES

- Explainability (insights from social sciences)
  - Miller, 2019
- How do you generate explainable models by working with domain experts
  - Rudin, 2019
  - Important for high stakes decisions in domains like healthcare, recidivism prediction
- Case based reasoning
  - How humans reason
- We can take inspiration from other disciplines and develop new xAI approaches

APPROACHES

- Abstraction and reasoning
- Psychology of invention
  - Kekule
  - poincare

APPROACHES

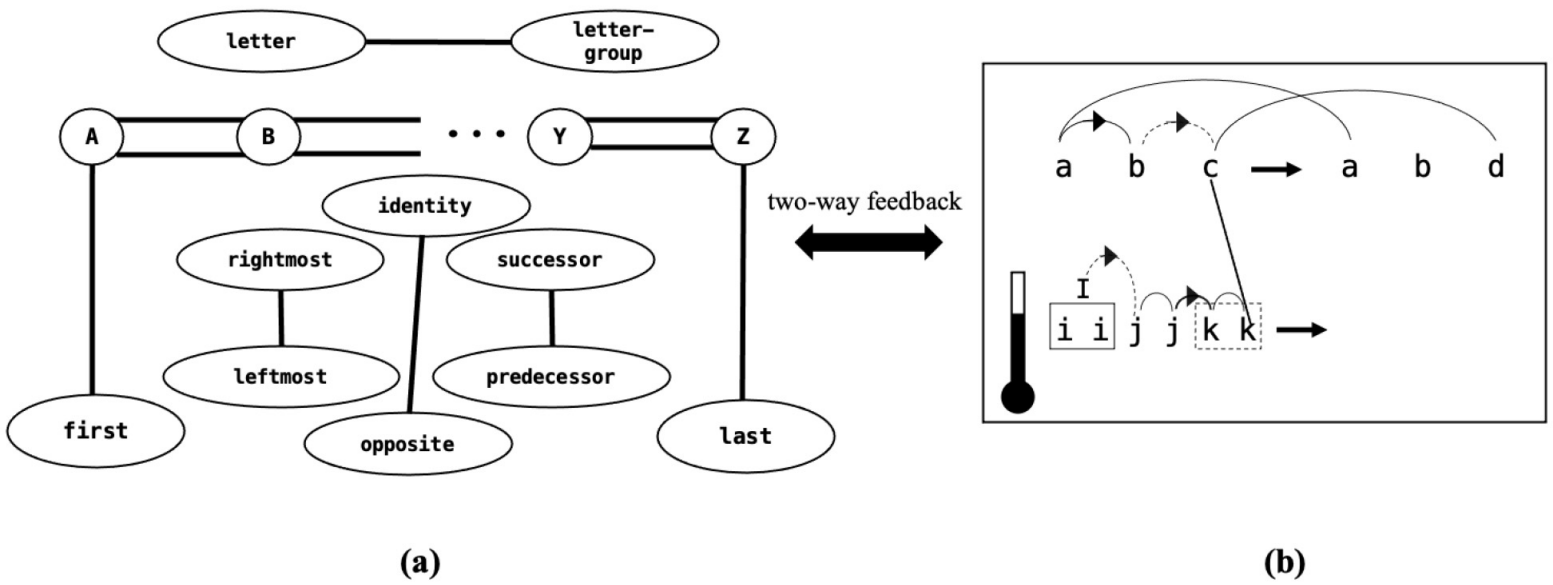


Figure 1: (a) Illustration of part of Copycat's concept network. (b) Illustration of Copycat's workspace, during a run of the program.

COPY.CAT

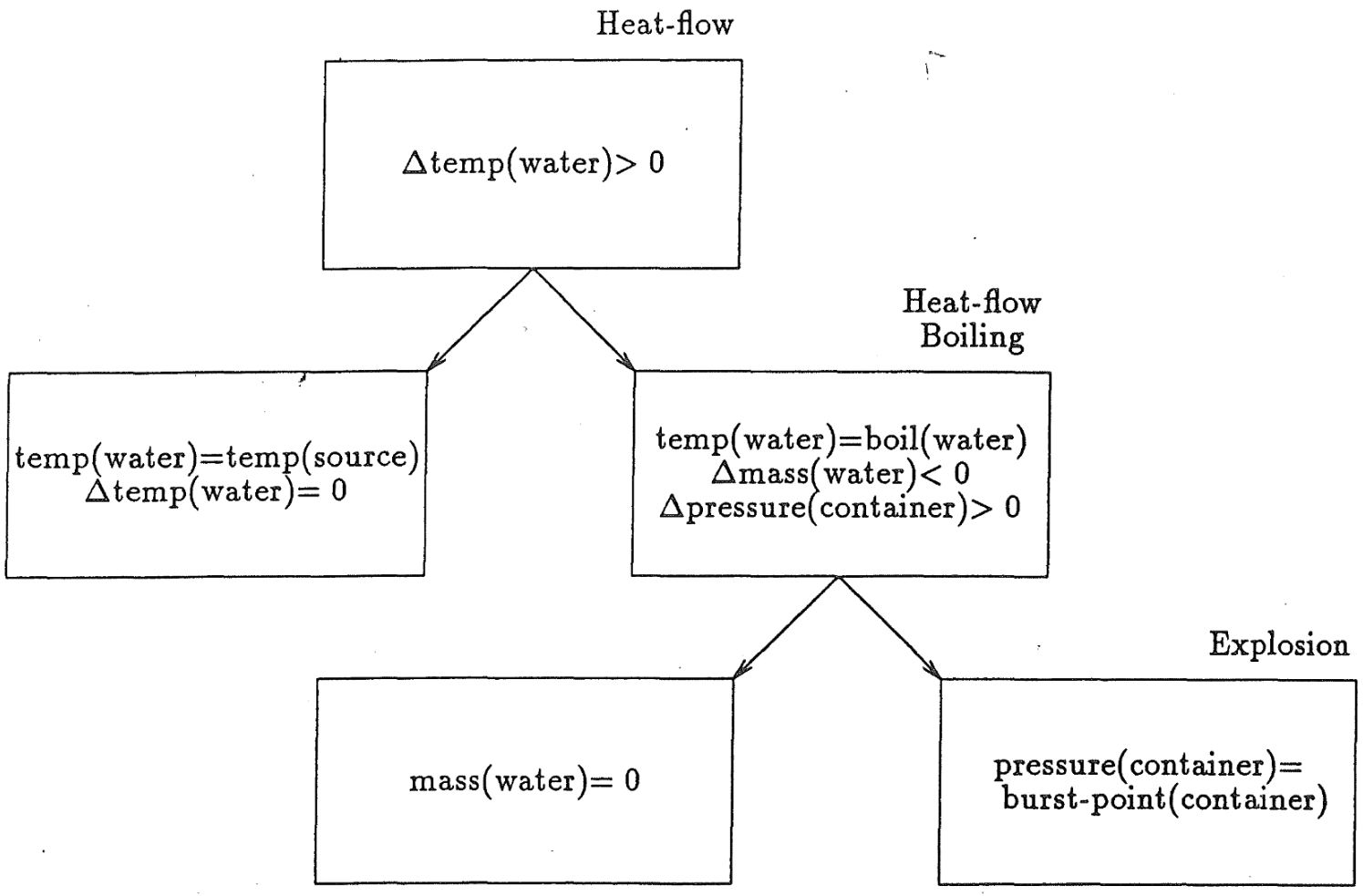


Figure 3. An envisionment for boiling water.

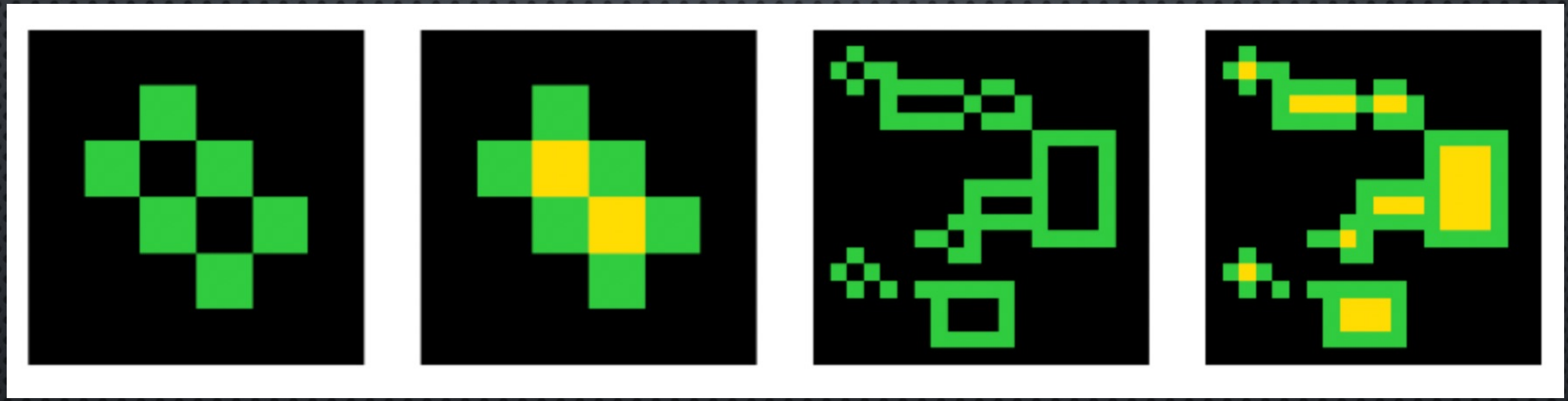
APPROACHES

QUALITATIVE PROCESS MODELS

APPROACHES

- Other ideas
  - Other paths to intelligence (in other species)
  - Abstraction and reasoning corpus and challenges

APPROACHES



ABSTRACTION AND REASONING CORPUS

RESOURCES

- HTTPS://GITHUB.COM/NEELSOUMYA/SPECIAL_TOPICS_UNCONVENTIONAL_AI