Ripley the Robot in the Anima Mundi

Plato’s Timaeus and Computational Intelligence
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Anima Mundi

"... Therefore, we may consequently state that: this world is indeed a living being endowed with a soul and intelligence ... a single visible living entity containing all other living entities, which by their nature are all related."

- Plato, Timaeus, 29/30; 4th century B.C.
A Vision and a Promise

- Great thinkers: Philosophy, Religion
- Vision: Computational Intelligence
- Method:
  - Direct references to relevant ideas
  - Map apparently non-relevant ideas by Analogy
- Promise:
  - Show how much Plato has predicted
  - Illustrate some aspects in a real-world robot
Today’s Menu

■ 1. Introduction
■ 2. Background
■ 3. The “reasonable story”
■ 4. Timaeus in 2000 AD
■ 5. Ripley the Robot
■ 6. Conclusion
1. Introduction: Plato

"The safest general characterization of the European philosophical tradition is that it consists of a series of footnotes to Plato"
A. N. Whitehead, Process and Reality, 1929

Timeline

- Pythagoras: 569-475 BC
- Socrates: 469-399 BC
- Plato: 427-347 BC
- Aristotle: 384-322 BC, Alexander...
Timaeus

- Context: A late dialogue
- Form: (Analogy [Gentner] everywhere!)
  - A “reasonable story” of the world until man (the best we can do, as truth exists only about Ideas; else, opinion...)
- WHY ARE WE INTERESTED IN A COSMOLOGY?
- Speaker:
  - Timaeus, a pythagorean math/astronomer
- Beginning:
  - Socrates: Ideal State, Kritias: Atlantis
2. Background: Pythagorean Ideals

- Philosophy, Mathematics / Acusmatics
- Fixations / Aesthetics:
  - “Number is the origin of all things”
  - Harmony of the spheres
  - Symmetries, Triplets, Triangles...
- The Being of Parmenides: (created world)
  - One and only, closed and compact, complete, spherical, self-sufficient...
The theory of Ideas

- Three parts:

  IDEAS (Archetypes, Eternal, Unchanging)

  CHORA (Pre-“Spacetime”, Random Perturbation)

  SENSORY WORLD (Imperfect, Changing)
Teleology vs. Necessity?

- **Teleology**: (Creation - 4 aitia, also finite-horizon)
  - Teliko: final goal
  - Poitico: the creator (agent)
  - Eidiko: the archetypical Idea
  - Yliko: the material to be shaped

- **Necessity**: (local, mechanistic)
  - A causes B causes C
  - Example: “Equals attract one another”

- **Relation**: Force Dynamics [Talmy], Jackendoff, Denett

- What should be attributed to which???
Soul

- Tripartite soul: (5 in Hasidism)
  - Nous: Reason (Eternal)
  - Thymoeides: Will (connects reason to desire)
  - Epithimitikon: Desire

- Composition / Function of Reason:
  - Ratios of: $\exists, =, \neq$ for changing/unchanging
  - I.e. Matching within/across domains
  - Placing in hierarchies, Producing inferences
  - Directly connects to Ideas!
  - Ullman’s bidirectional matching
Embodiment

- Parts: Body has parts (as soul does), soul has locus...
- Interface: (soul-body)
  - Action: Soul moves body (selfmotion=animacy)
  - Sensing:
    - Mechanistic: Sensory world interfaces to soul through body
    - Teleological: **Approximate Ideas!**
      - Vision: Essence of heavenly body motion
      - Hearing: Essence of musical harmony
      - Speech: Reasonable tuition
- 6xxx: Grounding [larson], elevation of peripherals [phw]!
3. The “reasonable story”: The Cosmic Being

- **Creator**: image of Idea of Goodness
- **Cosmic Being**: image of Idea of all-inclusive living being
- **Preexisting**: World of Ideas, Chora and Sensory World
- **Qualities of cosmic being**: parmenidnian, perfect movement
- **Body**: triangles -> regular solids -> transform. symmetries
- **Soul**: harmonic division, and sets into motion: *TIME begins!*

  “Wherefore he resolved to have a moving image of eternity, and when he set in order the heaven, he made this image eternal but moving according to number, while eternity itself rests in unity; and this image we call time.”

- Senses itself, good company for itself!
- The seven planets, measures of time!
The Gods (Creators)

- Creator

- Heavenly Gods:
  - Earth, 7 Planets, Stars

- Lower Gods:
  - Through Heaven and Earth

- Humans (potentially creators!):
  - Soul: eternal, by creator, in stars!
  - Body: by lower Gods

- Robots?
Necessity jumps in...

- “Now, when they (souls) should be implanted in bodies by necessity, and be always gaining or losing some part of their bodily substance, then in the first place it would be necessary that they should all have in them one and the same faculty of sensation, arising out of irresistible impressions; in the second place, they must have love, in which pleasure and pain mingle; also fear and anger, and the feelings which are akin or opposite to them; if they conquered these they would live righteously, and if they were conquered by them, unrighteously. He who lived well during his appointed time was to return and dwell in his native star…”

- Know Necessity, tame Necessity, re-attain Harmony!

- Becoming an approximation of the Creator...
The elevation of the real-world engineer-mathematician, I.e. the MIT ideal
The rest of Timaeus

- Works of C (Creator):
  - What we’ve seen so far
  - Human senses and body

- Works of N (Necessity):
  - 4 elements through regular solids
  - Sensory qualities: heat, weight, color...

- Combination of C and N:
  - Human soul parts, and body organs
  - Health, other species
4. Timaeus in 2000AD

- Exemplar of scientific exposition and beauty, with deep self-reflection on validity

- Descendants:
  - Scientific:
    - Mathematical astronomy, particle physics, elemental chemistry, sensory science, homeostasis, aging theories, probabilistic models, mechanistic physiology...
  - Philosophical – religious: ...
  - 6xxx: We’ve mentioned so many!
Timaeus’s world
Ripley’s Internalised World

PROTOTYPES (Coding, tuition)

RED

WORLD (COMPOUND_AGENT)

AGENTs

AGENT

AGENT_RELATIONs

AGENT_RELATION

BODY (COMPOUND_OBJECT)

OBJECTs

OBJECT_RELATIONs

INTERFACE

VIEWPOINT

MOVER

SOUL

MENTAL MODEL

GOALS

AFFECT

SPACETIME

SENSORY WORLD
5. Ripley the robot
Internalised Mental Models

- Representationalist approach:
  - The state of the world as best known (me, you, others)
  - MM = Representations AND Processes for updating!

- Consequences of bounded spacetime:
  - Object creation/deletion
  - Update of “surface” properties

- Internalised vs. Cosmological genesis
  - Knowledge of own body

- State of the system:
  - “Pick up the green ball on my left!” -
Rip’s view of Anima Mundi

- WORLD HIERARCHY: (Everything Animate!)
  - World = Compound Agent
  - Compound Agent = Agents + Agent Relations
  - Agent = Body + Soul + Interfaces
  - Body = Objects + Object Relations
  - Soul = Reason(MM) + Will(Goals) + Desire(Affect)
  - Interfaces = Sensing(Viewport) + Action(Mover)
- Space: The chora (spatial occupancy, object permanence)
- World soul missing!!!
Objects & attributes

- Tripartite Attributes (shape, color, weight, ...)
  - Stochastic
  - Deterministic (maximum likelihood)
  - Categorical (quantized for language)

- World of Ideas:
  - Ideal archetypes of attributes (f.e. shapes)
  - Approximation through senses (grounding)

- Open problem:
  - Encoding apparent versus deep attributes + chora
The Architecture

- Modality-specific processes:
  - Visor
  - Proprioceptor
  - Imaginater

- Central processes:
  - MM: Processes proposals
  - Predictor

- Recent Work: Goals, Affect

- Open Questions!!!
Conclusion

- The promise was:
  - Show how much Plato has predicted
  - Illustrate some aspects in a real-world robot

- The future:
  - Clear up things in architecture
  - Study deeper & get ...novel ideas from Plato!
  - So many more texts and authors waiting...
Epilogue

"... We may now say that our discourse about the nature of the universe has an end. The world has received animals, mortal and immortal, and is fulfilled with them, and has become a visible animal containing the visible-the sensible God who is the image of the intellectual, the greatest, best, fairest, most perfect-the one only begotten heaven."

Now Ripley the Robot has just been born; and reason should guide us in choosing which eternal Idea will be its archetype, towards the goal of Harmonia Mundi...?