Plato's Ambisonic Musical Garden

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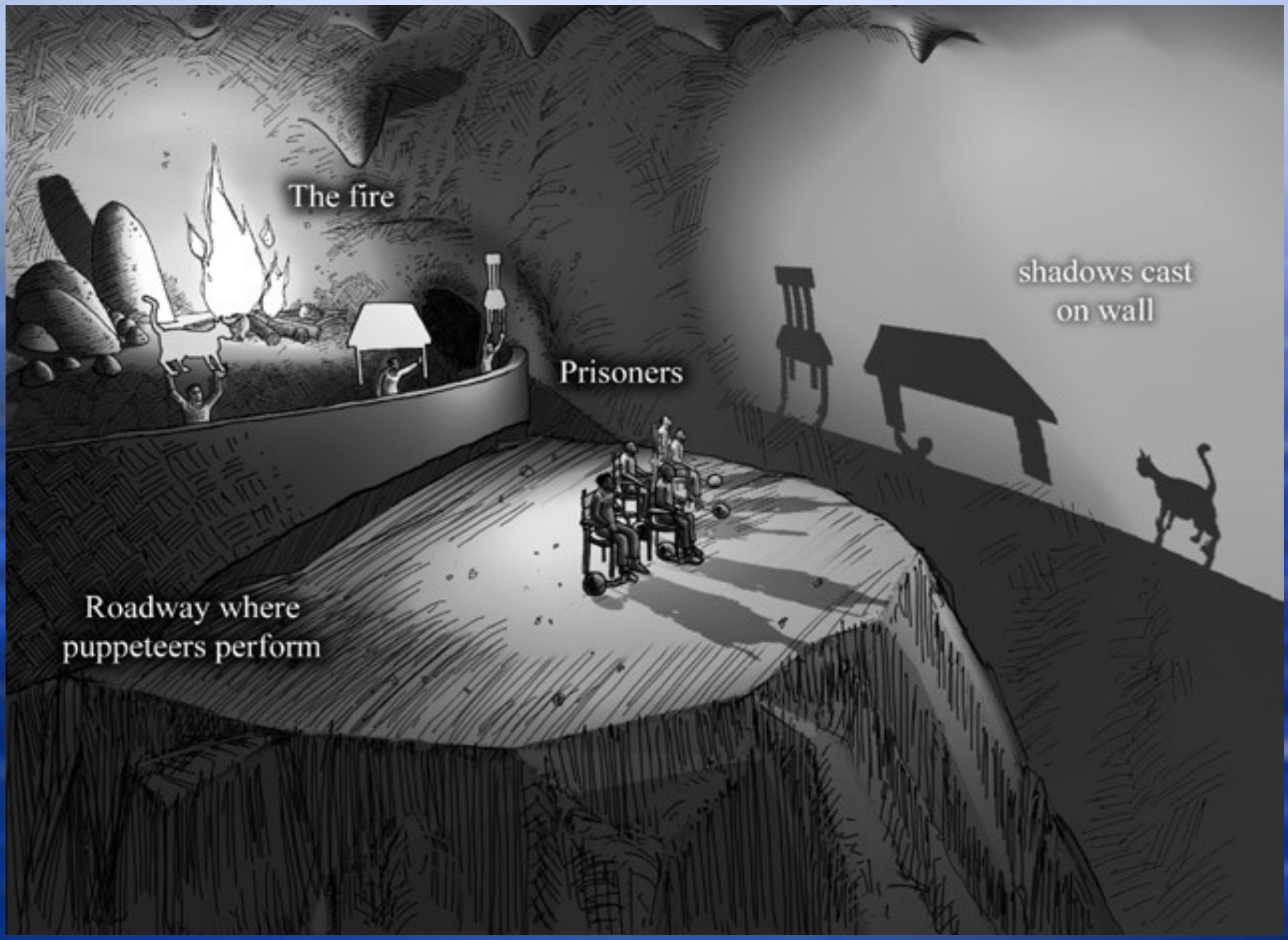
Plato’s Cave

- Plato, in his cave allegory, asks us to consider what ontologically ***exists*** and what is mere perceptual artefact.
- Environments need ontological description; this requirement has driven western philosophy for documented history.

Ontology:

What entities exist?

How are they hierarchically related?


The fire
shadows cast
on wall
Prisoners
Roadway where
puppeteers perform

Perception: the “black box”

Perception remains the most complex set of processes of which we know. We cannot easily prove ***as fundamentally real*** the items, relationships and events in perception.

Plato's Ambisonic Musical Garden

- Investigations of what is 'real' in artificial environments are at a comparatively immature stage.

- There must be some kind of internal logic, some intrinsic physics that constrains entities in this environment.

Plato's Ambisonic Musical Garden

This paper presents a discussion of progress in technologically implementing a provisional ontology for spatial music – a musical environment in which perceivers can immerse themselves, exploring and interacting in plausible ways.

Imagine: the Musical Garden…

All the elements we hear musically related: tonally, timbrally, rhythmically… a whole *piece*..

Wander through the Garden

The exciting challenge for composers in this “musical garden” is to ***discover*** plausible experiences, entities and events that do not have exact analogues in the ‘real’ world.

“spatial music”

- 30+ years (*personally*)
- Does “3-D” quite describe it?
- Is “surround…” the right description?
- Why?
- Who? (…wants it)

Spatial sound *is* an environment

- An “artificial environment”… (rather than “virtual reality” - if it has *all* the virtues, it’s real - if it only has *some*, it’s not - Plato’s cave metaphor)

What is an artificial environment?

- One wherein perception is managed through *design* -implying a *designer*

- Examples: book, film, telephone, car instrument panel, Geiger counter, music...

How to assess an ‘artificial environment’?

Efficiency of *information transactions*

- *Aesthetics* –Not some kind of luxury, but absolutely **central** to perception

Engineering approach

- Perfect what is available to sensation
- So, for spatial sound, that would be the physical sound field(s) that evoke appropriate interaural differences, pinna effects
- Stereo, quad, ambisonics, 5.1, 6.1, 7.1, 10.2, WFS, Xtalk cancel...

Perceptually unsatisfied...

- Perceiver ‘nailed to the spot’ -can’t explore, relies on being spoon fed
- The music-as-environment is a little like a still picture
- This static reception doesn’t seem like perception as we use it, in *real* places...

Richard Gregory…

- Reckons that perception may be 90% memory - that's only 10% sensation!
- From Helmholz on, the *constructivist* position: sensation is impoverished, and must be supplemented by synthetic elements such as 'unconscious inferences'

Something needed to supplement the engineering approach

- If treating *perception* as merely another engineering problem-is only addressing a small percentage of the information transactions during perception, then…?

Kahneman and Tversky

- "Intuitive accessibility" (Kahneman 2002)
- *Real* places are intuitively accessible
- Perception *is* place perception
- "spatial perception" is simply a subset of place perception
- We may focusing too narrowly on "spatial *sensation*"

Remarkable things about place perception

- We deal with a huge amount of information, sort for importance, in a timely fashion…
- We **discard** (or *ignore*) vast amounts of information (e.g.“inattentional blindness”)

Meanings in real places

- Perceptual significance - tied to *causal* significance
- “Cartoonification” - cognitive cartoons must depict the causal significance in our environment..

Meanings in *artificial* places

- Hence, to make an artificial place, we should cater to our innate capacity to cognitively cartoonify the causality around us

Cartoonifying causality

- I assume (like the Gestaltists and Ecological thinkers) that there are *rules* on which cognitive cartoons are predicated
- One such general rule is that *exploration* - the active interrogation of a place – should, when that which is available to sensation is momentarily insufficient, yield more information

Natural hierarchy of causal significance

Appeals to '*perceptual* significance' as:

- **Background** (place),
- **Mid-ground** (*features* in place),
- **Foreground** (things = objects or organisms)

More perceptual rules

- Moving = ‘interesting’
- Moving toward me = *more* interesting
- Moving toward me fast= even more so
- Organism+moving+toward = very,*very* interesting

Other ‘rules’

- Spatial perception for ‘**things**’ (sources) and **features** (reflective or occluding bodies) and **place-characteristics *differs***.
- Sources = correlated ear signals, features less so, place character even less so

Attention...

- In artificial environments, it is often difficult to arrange matters in such hierarchies, to *focus* attention, to make ‘cognitive maps’
- This mapping - of the causal layout around one - *is* what we mean by perception in real paces

Explorable artificial places

- I’d like to be able to do that in an artificial place
- I should be able to move and interact with my surroundings to extract ***more*** information - this is what I mean by ‘perceptually satisfying’

Explorable music?

- This is what I mean by a “musical garden” - one that I *could* work at to enjoy more
- Such a place doesn’t have a constrictive ‘sweet spot’

How?

- WFS lets me move about, somewhat.
- But… I don’t get *much* more from it
- Higher-order ambisonic likewise.
- Cross-talk cancelling - very fine detail, surprising distance (range) perception, but I really can’t move much.

Odd ways to display artificial places (in sound)

- “Multi-scale” spatial sound – very large *and* very fine scale e.g. ambisonic + crosstalk local fields
- Concentric fields (near-medium-far surround fields)
- Cellular fields – multiple sound fields

These are all hybrids…

- Dedicated to depicting the required spatial parameters
- *Not* dedicated to a particular listening position
- Perceptually satisfying for multiple, mobile listeners
- Could be *explored*

Concluding remarks

- Ontologies in artificial sound environments are *not the same* as for real environments - But they are not arbitrary
- A sophisticated artificial environment needs a technologically implemented ontology, the bedrock of which is the binding principle of **causation**

Finally

- The ontology for one piece of spatial music may be entirely different from that for another!