Framing and Interactivism

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Two perspectives

- The negative account

A critique of encodingism –correspondence theories of representation– via frame problems. What mental representations cannot be. What could not have been done without framing.

- The positive account

How to think about our capacity for framing and re-framing. Aspects of emergent mental representations. Implicit & explicit representation. Framing successfully.

Outline of subjects

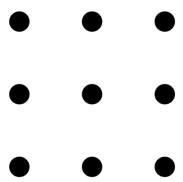
1. Problem solving: Well-defined, ill-defined and insight problems
2. Preliminary definitions: Framing, interpreting and heuristics
3. Scope of heuristics: semantic classification via properties
4. Interactivist representation: contact content distinction
5. Interpreting encodings vs indicators in interaction

1. Framing in Problem Solving

Framing in problem solving

- There is a class of problems researchers call “insight problems”, which require the problem solver to perceptually or cognitively restructure the way they perceive the problem, in order to succeed in solving the puzzles:

A famous example is the 9 dots problem: how do you connect these 9 dots with 4 lines?



Another example: Marsha and Marjorie were born on the same day of the same month of the same year to the same mother and the same father yet they are not twins. How is that possible?

Insight problems

- Accordingly, Vervaeke & Ferraro (2013) connect the capability of construing/restructuring patterns that are relevant to a problem/solution with insight.

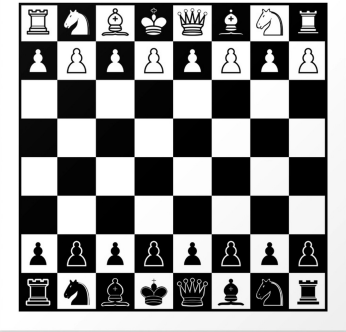
- They differentiate between
  - rationality of computation: of deductively following inference and
  - rationality of construal: as framing and insight,

as two cognitive styles that have different norms

- Insight problems are contrasted to non-insight problems (like board games), which are designed to be solvable via systematic consideration of knowledge and logical deduction, or exhaustive search.

Well-defined problems

Solving problems via exhuastive, brute search strategies:



A well-defined problem = the initial state, the goal states, the rules and constraints of operation in between these states are known.

Yet, depending on the context of operation defined or the size of the problem space

Vast numbers of possible operations may easily lead to “combinatorial explosion” of possibilities

The alternative is using some sort of heuristics in (re)formulating the problem, or “framing”:

Here framing concerns (re)formulating the problem so that the possibilities of solutions are limited, in such a way that the problem becomes combinatorially possible to solve

Ill-defined problems

- The importance of framing becomes even more obvious when we consider ill-defined problems, which correspond to most of life's problems:
- If the agent does not know, either one or all of what constitutes the initial state, the goal state, the allowable operations they can make, the constraints that bind them, or the problem does not have a unique solution, how do they go about, solving the problem?
    Typical examples are finding a perfect mate, or writing a novel

- Here the case is not limiting the problem space through reinterpretation of the available operations in terms of a known goal, one first needs to formulate what the problem and the goal is.
- Any act to the extent that it requires creativity seems to call for the capacity of framing and/or restructuring.

Conclusion

- Framing is required to avoid computational intractibilities
    - To avoid combinatorial explosion of possible operations via heuristics
    - To reformulate the way we perceive a problem via reframing
    - To interpret a situation as a problem that can be solved via framing

- As a result;

Framing is a prior or at least a precondition for exhaustive systematic inference or computing

2. Preliminary Definitions

Some working definitions

- Frame problems

Computational intractabilities resulting from combinatorial explosion of possibilities.

- Framing

Contextualization in specifying context of operation. Carving out the problem space. Realizing relevance in a situation. Interpreting.

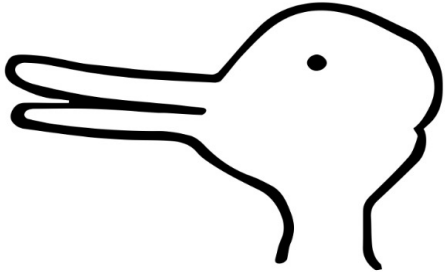
- Re-framing

Re-interpreting. Perceptual or cognitive restructing of the way we see the situation or the problem space.

- Do we have to frame every situation every time?

Heuristics

- Heuristics are familiar ways of interpreting things
- A heuristic is a rule of framing
- Shortcuts that optimize cognitive resources
- They are also biases that can be exploited:
    - The framing effect is a cognitive bias that impacts decision making when said (framed) in different ways. In other words, we are influenced by how the same fact or question is presented. In social psychology participants are presented two or more options, but the outcome is the same, where they predominantly prefer one option over the other. “framing” or “priming” in social psychology literature (Tversky & Kahneman, 2017, 2018).
- A functional blindness



PROCEDURAL AS WELL AS PROPOSITIONAL

- We can talk about biases towards situational aspects as well as cognitive problems

Visual
Auditory
Body language
Value frames
Insight problems
…

- So framing is common to procedural as well as propositional knowledge

Procedural knowledge knowing how to interact with the world
Propositional knowledge knowing that, knowledge of facts, patterns of patterns, invariant across wider contexts

albeit in different ways.

Scope of Heuristics

The classical frame problem

- For a situation that can be characterized as a problem, (that has an initial state, a goal state, possible operations that allow one to go from the former to the latter, and constraints on the operations),
- We face three issues that disallow exhaustive strategies and necessitate framing:

First, combinatorial explosion of alternative paths,
Second, ill-defined nature of most problems and solutions,
Third, ruling out to consider irrelevant data in the environment (such as irrelevant consequences of possible operations) without explicitly considering them.

- All three issues pose problems for computation since computation is explicit.
- How to avoid this problem?

How to avoid this problem?

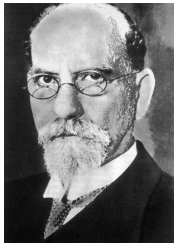
Can we have a general, all purpose heuristic (one or few!) that constrains formally, without having to make explicit that which is left out?

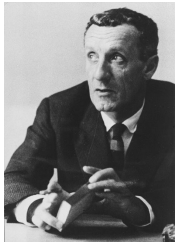
A general heuristic?

- Heuristics are background or general rules
- Indeed, they can be learnt, construed and flexibly (or rigidly) used by human agents depending on context
- Artificial systems also use heuristics for their fields of operation, which are tailored by their designers. Current working AI provides examples of varieties of systems which are delimited in their context, subject to controlled stimulus, encapsulated and or supervised and therefore specialized.

- But can we define all background knowledge as a rule (or few rules)?

No!





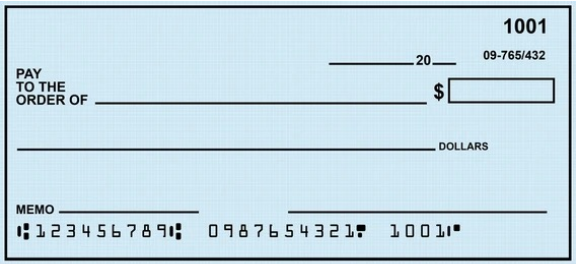
Perpetual beginner

We can adopt the method of phenomenology and attempt to willfully ignore heuristics, trying to define background or common-sense knowledge, we will be in the position of a “perpetual beginner” (Husserl, Merleau-Ponty)

What would a general heuristic look like?

1) For a general-purpose system, hypothetically any fact may become relevant at some point of its operation.
2) What would a default heuristic look like for such a system?
3) A background assumption has to make a generalization of the environment, for instance saying that:

General properties of a situation do not change (as a result of action) unless otherwise stated.



How to cash it out?

General properties of a situation do not change (as a result of action) unless otherwise stated.

- What are those “properties”?
- Shall we make a list of properties?
- Or is there a way to carve out properties without mentioning them?
- How about made-up properties like GRUE?

GRUE = Applies to any object observed before t and is green and observed after t and is blue

Goodman's new riddle of induction

Grue = Applies to any object observed before t and is green and observed after t and is blue

Say we have observed 1000 emeralds up to now (time t), and they were all green.

- Both predicates apply to our observations: Emeralds 1-1000 are green
  Emeralds 1-1000 are grue
  Emeralds 1-1000 are green and grue

- Then the inductive hypotheses:

(H1) All emeralds are green.
(H2) All emeralds are grue.

With the conflicting predictions for times after t:
(P1) Emeralds observed after t will be green.
(P2) Emeralds observed after t will be blue.

Both predicates are confirmed by the same evidence base, but they give rise to different hypotheses and therefore conflicting predictions.

Why do we accept green and not grue as a property?

Both predicates are well-defined regularities:
they are supported by the same evidence base, both allow hypothesis forming and predictions.

- It is not metaphysical - whether there are uniformities in nature at all
- It is not epistemological - whether this particular uniformity - is justified or grounded
- It is semantic - The same phenomena can be described as a different regularity

- What counts as an instance of a regularity for us in a particular situation is not dependent on evidence base alone
- It is about how we might frame the same experience as different regularities: Pragmatic entrenchment

So

No place for general heuristics

4) There is no a priori reason a predicate like grue could not have become relevant in another context
5) What rules to take as properties is not semantically given, they are pragmatically assumed
6) Relevance has to be present in order to have meaningful properties, the semantics is not given before relevance
7) background familiarity commits us a to a specific kind of ontology, otherwise we could include grues and fridgeons
8) The solution of a general heuristic would be circular. If we can assume a background rule, we can formulate it. If that rule is given, the context is already given, then it is a particular “specialized” context.
9) The selection, construction and development of heuristics are dynamic and subject to relevance.

Recap

- The examples so far show that framing is a fundamental aspect of cognition that cannot be accounted for on behalf of other cognitive capacities such as categorisation, induction, perception etc.

- The reason is that these other cognitive capacities themselves presuppose framing, and claiming otherwise results in circularity.

Pragmatic entrenchment

- Goodman's GRUE was a critique of syntactic and semantic models in favor of pragmatic entrenchment
- Interactivism specifies a pragmatist solution by means of the contrasts between contact and content; truth value and truth conditions

Interactivist notion of representation

Frame Problems

- Apperceptive flow of interaction is implicit,

It is intrinsically relational
It is already constituted out of indications of interactive relevancies

- Any attempt to model this flow in terms of explicit, context-independent, atomized representations “encodings” results in frame problems,

These encodings are never direct (foundational or given in nature), they have to be rendered and interpreted to be stripped of their relational characteristics

Describing an apperceptive situation in all its contextual possibilities in terms of encodings requires the relations to be built back in, intractable

Interactive representation

- The general course of an interaction will depend on

the organization of the functional system in the organism that is engaged in the interaction, *and* it will depend upon properties of the environment being interacted with

EPISTEMIC CONTACT, correspondence or coupling with the environment

Which internal outcome is attained after a particular interaction serves to differentiate types of environments

those environments yielding internal outcome **S** are grouped together

contact is provided by ‘‘backward looking’’ differentiations

Allows for selection

TRUTH VALUE

If the associated internal outcome of the indications of interactive possibilities is not reached after an interaction, the indication (of interaction) was false and is falsified

CONTENT Implicit, epistemic = Presupposed dynamics of the interaction

presupposed dynamics are certain implicitly defined conditions being the case in the environment, presupposed dynamics are satisfied by the environment or not;

the presupposed dynamics constitute indications of interactive possibilities as representations

content is provided by ‘‘forward looking’’ indications of potentiality

Representation is emergent in indication and selection

Grue

TRUTH VALUE

If the associated internal outcome of the indications of interactive possibilities is not reached after an interaction, the indication (of interaction) was false and is falsified

- Notice that truth value is specified, while truth conditions (contact and content) are unbounded in an interaction
- If you specify a predicate with truth conditions without truth value, it lacks relevance

Capacity to control interaction or not

- Possibility of control of interaction by the organism is already sufficient to capture foundational properties of representation by means of implicit indicators

AND

- Explicating an interaction in terms of explicit encodings ends up with frame problems so this cannot be the basic nature of human representations

Epistemology of objects

Closed and invariant patterns of possible actions = physical object representations

- closed web of interactions
- invariant under large class of interactions

object representations emergent out of interactive representations

The representation of the toy block is already construed out of webs of possible interactions, so relevance is built into it
Representation is of future potentialities for further interactions.

Implicit definition

- Possibilities of interaction covary with environmental properties, but those properties are implicitly and not explicitly represented

"An indication for the frog, for example, that there is a tongue flicking and eating opportunity is unbounded with respect to the number of actual flies, or fly conditions (or tossed BBs), that would support it."

- Interactive implicit definitions are generalized from model theoretic interpretation of axioms that implicitly define (fix) a class of models that satisfy them.
  - The class of models that satisfy are unbounded - there is no a priori limit on them
  - Appropriate satisfiers are said to interpret a sentence such that they make it true

How?

- What is the role of implicit and explicit definitions in framing or re-framing situations?

(On to variation and selection processes)

Framing in Interaction

Framing and interpretation

- Framing is an act of interpretation

Where (relations of) relevance are realized

- Framing applies to any situation which is interpreted, procedural or propositional, BUT in different ways

- Hinges on the distinction between how indicators are interpreted vs how encodings are interpreted

Encodings vs Indicators

- Encodings = not direct encodings!
- Indicators = interactive outcome indicator.

- Encodings are derivative on indicators,
- Encodings are explicit and explicitly constructed
- Representation via stand-in relationships is the peculiar ‘essence’ of encodings

(Representation that ultimately stand in for indicators)

- Encodings are never interpreted directly like indicators are

Tricky bit: the difference between them is FUNCTIONAL in the way they are interpreted, and with sufficient practice (learning or convention), an encoding may become an indication for an agent

How encodings are used

- Or Processed
- Interpreted via inference, processed to trace back to the indicators
- Processing involves: explication, filling in, tracing back the relevant stand-in relationships
- Interpretation involves: stand in explication analysis of explicit definitions

How indicators are used

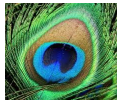
- Or Picked up
- ‘Interpreted directly’ by feeding into organism internal procedures (apperceptive flow)
- Via causal correlation
- Interpretation involves: model theoretic implicit definitions
- We don’t know what (characteristic) they stand in for or correlate with in the environment, yet they satisfy or not

Model theoretic interpretation

We have the folowing properties in the environment

P1 P2 P3

We don’t know the common characteristic, “roundness”
Or “blackness” “leggyness” “fast-moving-ness”
We know they serve the same purpose and different from P4 P5 P6…



- Their relationship to each other is defined
- We can differentiate them
- But we don’t know what they stand-in for or represent in the environment

Is it explicit?

- Please read the below sentence:

POLICE POLICE POLICE POLICE POLICE

(Example from Kirsh, 2010)

How practice works

- The previous example demonstrates the difference between explicit and implicit interpretation is not structural but FUNCTIONAL
- There can be a FUNCTIONAL shift between explicit encodings and implicit indicators via practice
- Practice is interactive, it may be mental, coginitive, imaginary, projective… as well as physical

Example: Marking in dance (Kirsh, 2011)

"In dance, there is a practice called "marking". When dancers mark, they execute a dance phrase in a simplified, schematic or abstracted form."

Using explicit representation for practice

Marking for self = The practice of creating a simplified version of a process – a *personal model* to work and think with (Kirsh, 2011)

"Based on our interviews with professional dancers in the classical, modern, and contemporary traditions, it is fair to assume that most dancers mark in the normal course of rehearsal and practice. When marking, dancers use their body-in-motion to represent some aspect of the full-out phrase they are thinking about. Their stated reason for marking is that it saves energy, avoids strenuous movement such as jumps, and sometimes it facilitates review of specific aspects of a phrase, such as tempo, movement sequence, or intention, all without the mental and physical complexity involved in creating a phrase full-out. It facilitates real-time reflection."

"... sometimes even when you know something it is good to mark it through – to rework it in your brain, to make another idea of what the movement is. (Dancer M in interview)"

Back and forth between explicit and implicit

Framing: Back and forth between explicit and implicit

Conflicting goals:

- Computational efficiency: requires specialization
- Developmental efficiency: requires generality

During the construction of new elements, while solving novel problems, working with ‘copies’ as working models, as single whole elements, to flexibly try out and interact with satisfies both.

Practice (frequency of use) enables these copies to be integrated into specialized procedures

So

Constructed as new specialized heuristics!

Operating on Indicator-derived encodings

- To transform the general heuristic into specialized ones
- To retain the original indictors from the result of a try-out - which may or may not work, so may be falsified
- To separate and protect the information in the encoding from the ongoing operations of interactive flow of apperceptions (while computing takes time and resources)

Encoding and decoding procedures enable copying into stand-in specialized or toy models and integrating them back into derived indicators thru practice

So (derived) encodings as stand-ins for indicators, like working copies created to be used in novel situations to make inferential operations on them more efficient and powerful
But they are always subordinate within an interactive knowing system which is at base indicator based

Step out and step in

- Encodings, then, are used in novel situations in order to make use of the potentially immense power of a potentially vast array of strategy, decision- making, and inference procedures. In so doing, they tend to step out of ongoing interactive and apperceptive processes via the encoding step and then, if relevant, to step back in via the decoding step. With use, both the encodings and the general procedures tend to disappear (from those computations) in favor of directly interpreted indicators and specialized procedures whose computations participate directly in the interactive and apperceptive flow. (Bickhard and Richie, 1983, p. 71)

Recap

1. Problem solving shows that framing is a precondition for computation
2. Framing and heuristics apply to procedural as well as propositional contexts
3. There cannot be all-purpose heuristics because semantic classification is parasitic upon pragmatics
4. Interactivism materializes pragmatist solution by means of the contrast between contact and content, truth value and truth conditions
5. Difference between encodings and indicators lie in their use (the way they are interpreted)

End