PROMOTING THE SCIENTIFIC EXPLORATION OF COMPUTATIONAL CREATIVITY

Computational Approaches to Conceptual Blending (part I)

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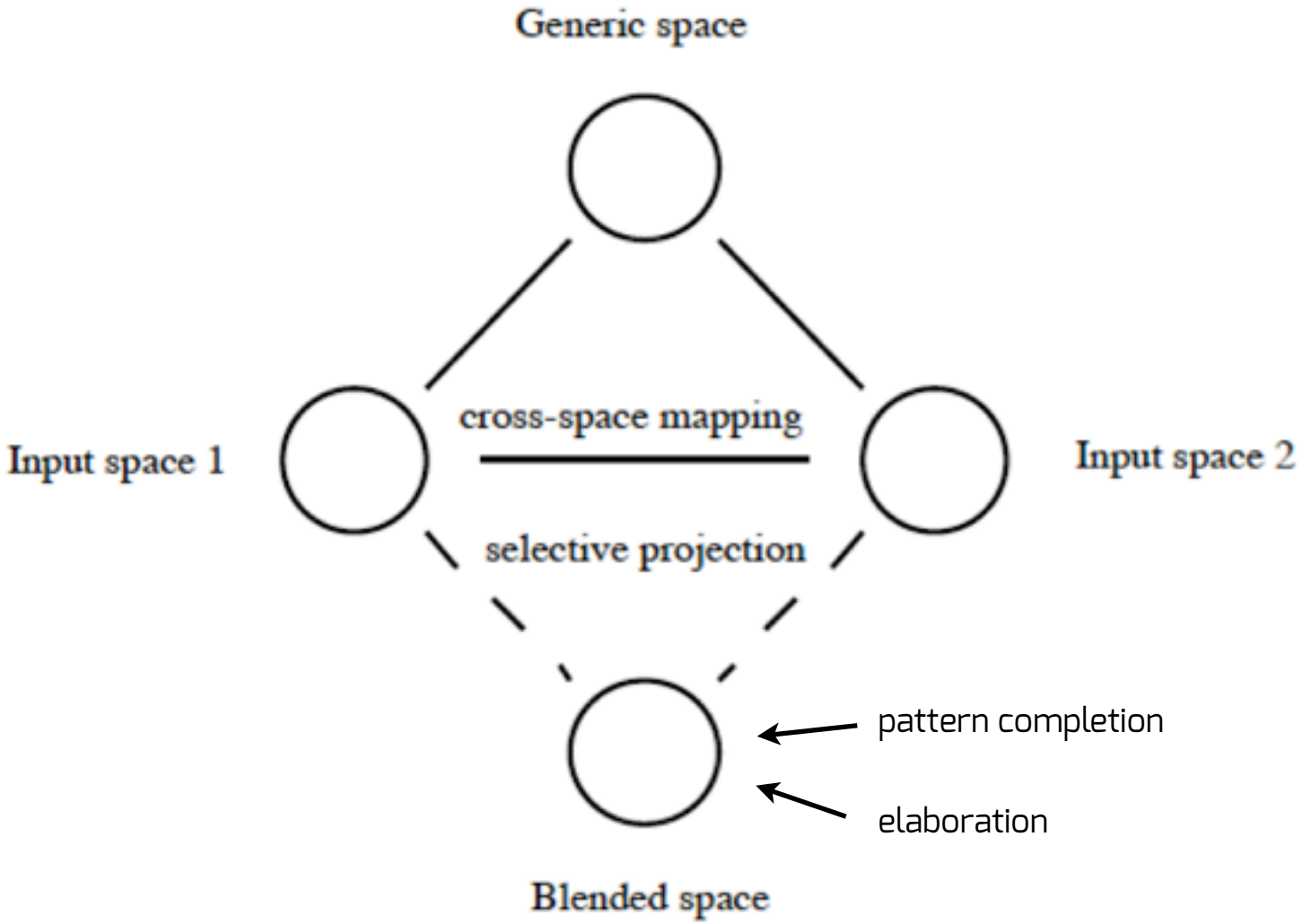
Conceptual Blending

- Fauconnier and Turner [1998, 2002, 2003]
- *"Basic mental operation that leads to new meaning, global insight, and conceptual compressions useful for memory and manipulation of otherwise diffuse ranges of meaning".*
- Blend: a concept (or web of concepts) whose existence and identity, although attached to the pieces of knowledge that participated in its generation (the inputs), acquires gradual independence through use.
- Ex: Pegasus, Pokemon, Computer Desktop

Conceptual Blending

- Fauconnier and Turner (1998, 2002, 2003)
- *"Basic mental operation that leads to new meaning, global insight, and conceptual compressions useful for memory and manipulation of otherwise diffuse ranges of meaning".*
- *"Plays a fundamental role in the construction of meaning in everyday life"*


Generic space
Input space 1
cross-space mapping
Input space 2
selective projection
pattern completion
elaboration
Blended space

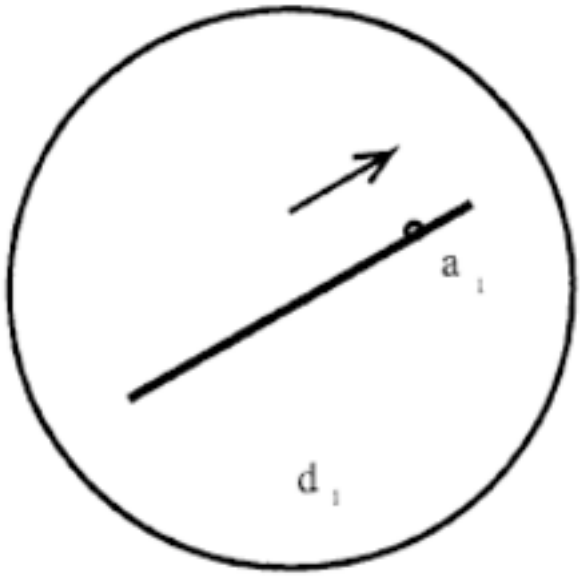
Conceptual Blending

- Not a creative mechanism in itself…
- … but the framework models cognitive processes involved in creativity
- … thus it may be worth to explore it for computational creativity

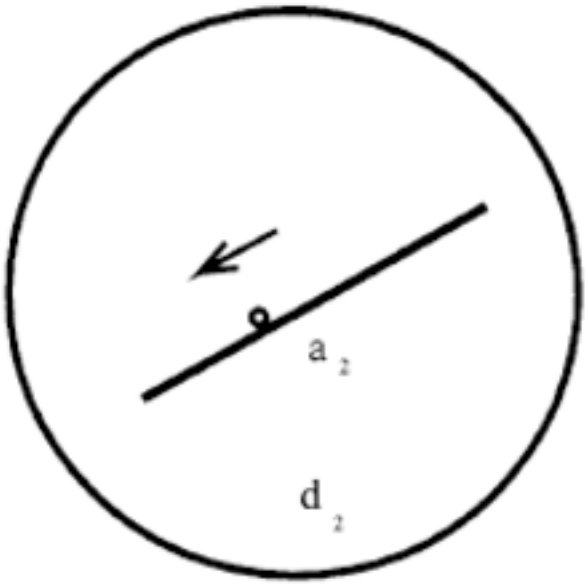
Riddle of the Buddhist Monk (Koestler, 1964)

- *A Buddhist Monk begins at dawn one day walking up a mountain, reaches the top at sunset, meditates at the top for several days until one dawn when he begins to walk back to the foot of the mountain, which he reaches at sunset. Make no assumptions about his starting or stopping or about his pace during the trips.*

- Riddle: Is there a place on the path that the monk occupies at the same hour of the day on the two separate journeys?

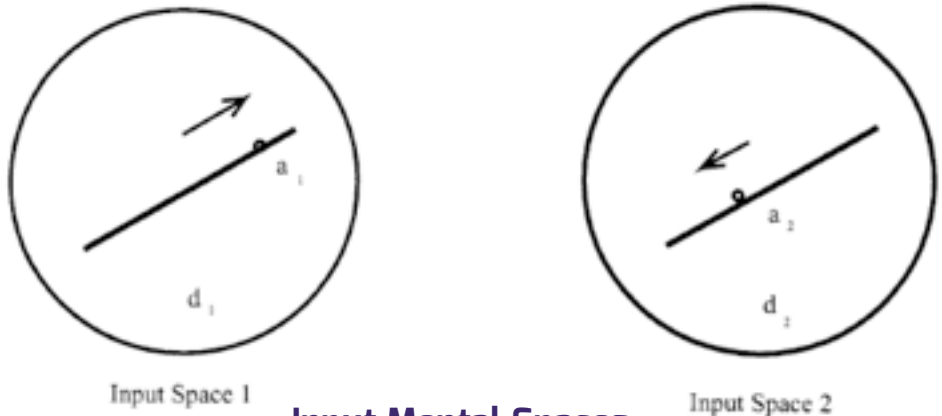


Input Space 1
(time t = d1)

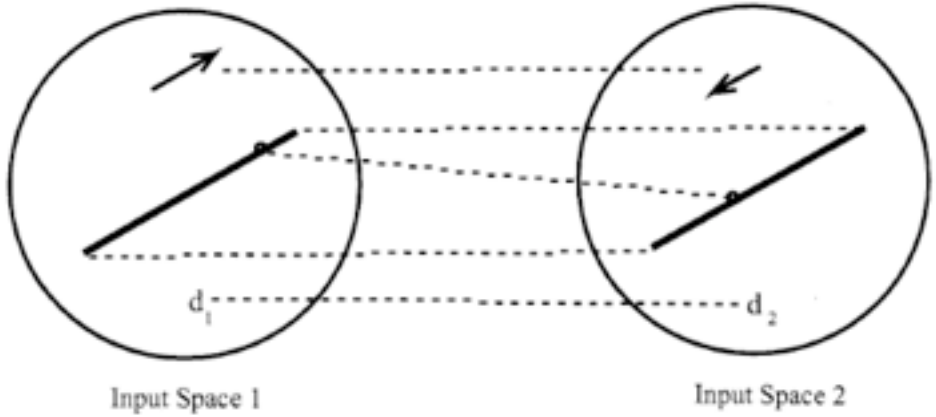


Input Space 2
(time t = d2)

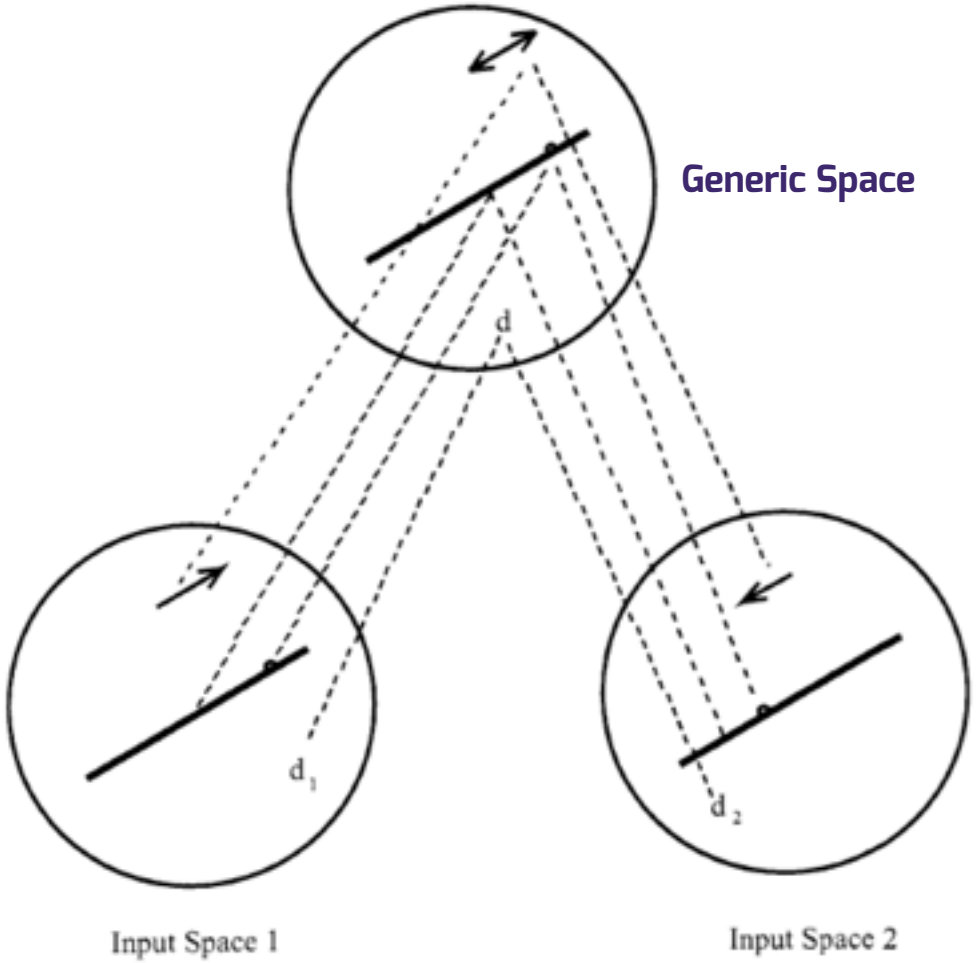
Input Mental Spaces

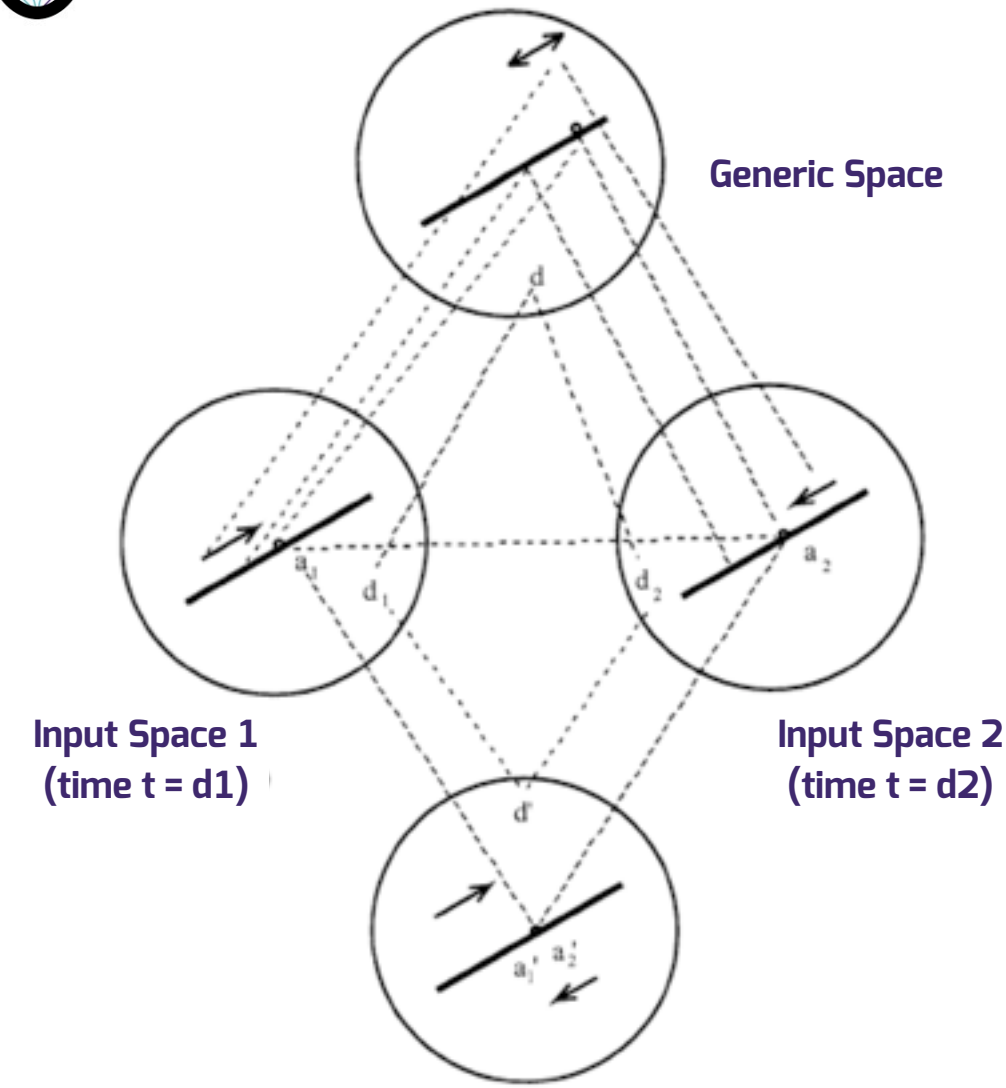


Input Mental Spaces



Cross-Space Mapping

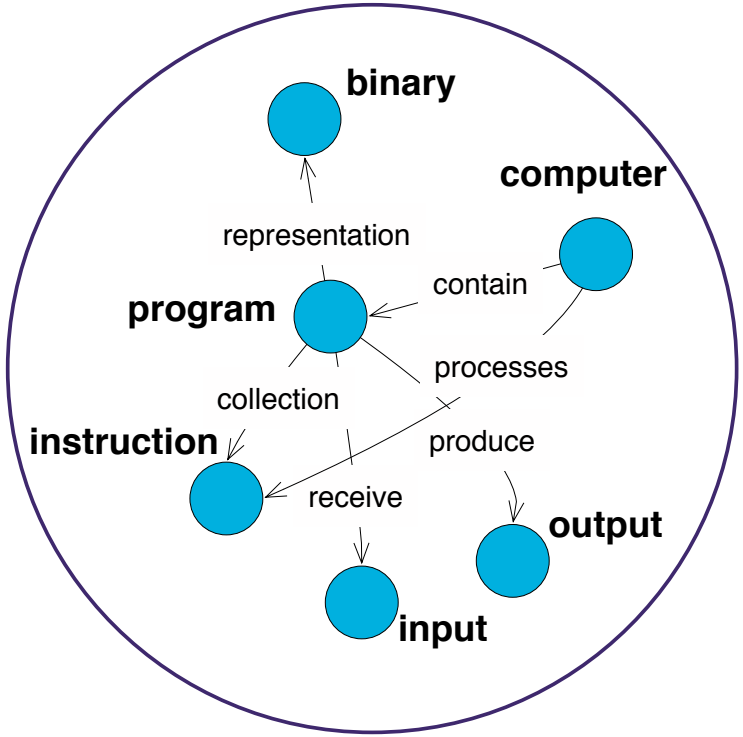

Generic Space
d
d 1
d 2
Input Space 1
Input Space 2


Generic Space
d
Input Space 1
(time t = d1)
Input Space 2
(time t = d2)
d'
Blended Space
(time t = t')

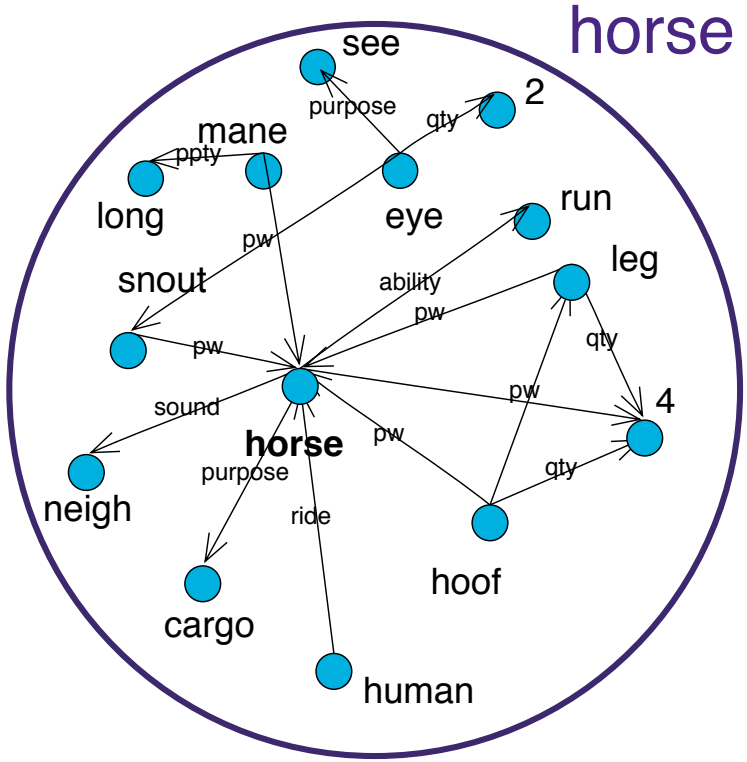
Mental spaces

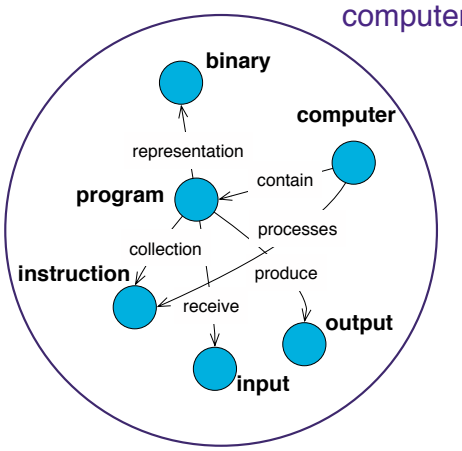
- "Small conceptual packets constructed as we think and talk, for purposes of local understanding and action" (F&T)
- "They are interconnected, and can be modified as thought and discourse unfold" (idem)
- "can be used generally to model dynamic mappings in thought and language" (idem)

Mental spaces

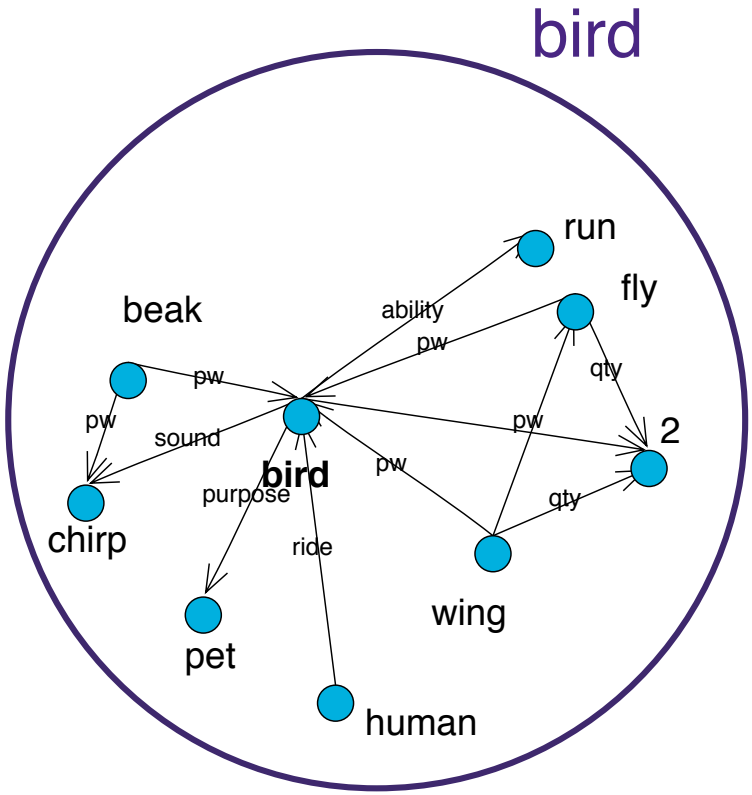


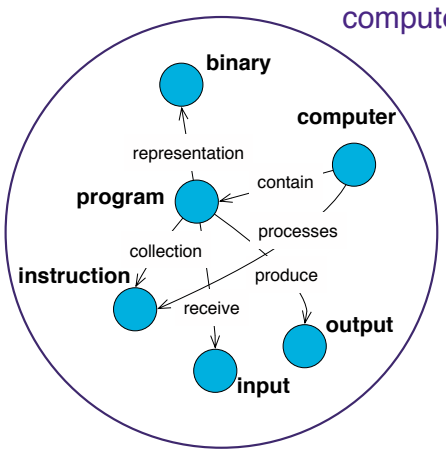
Mental spaces

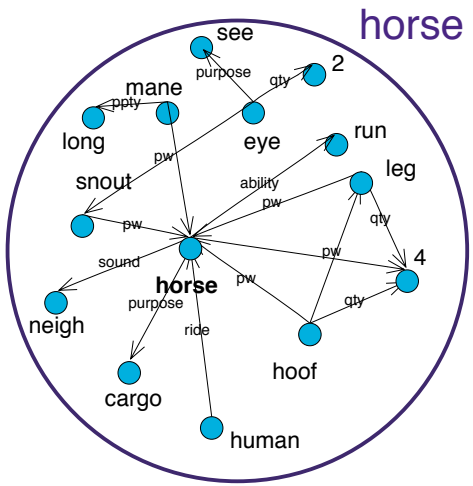




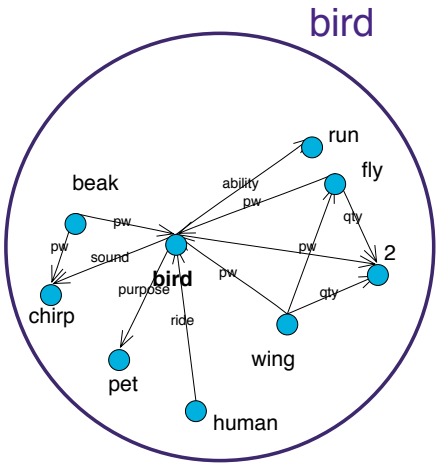
Mental spaces

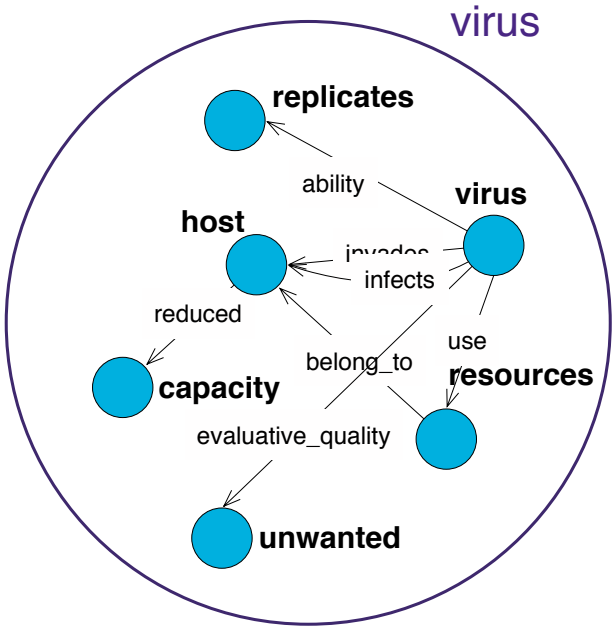


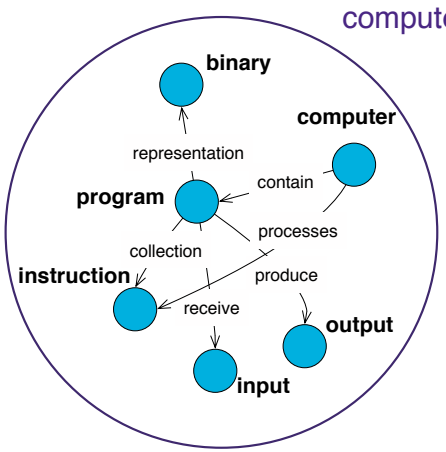


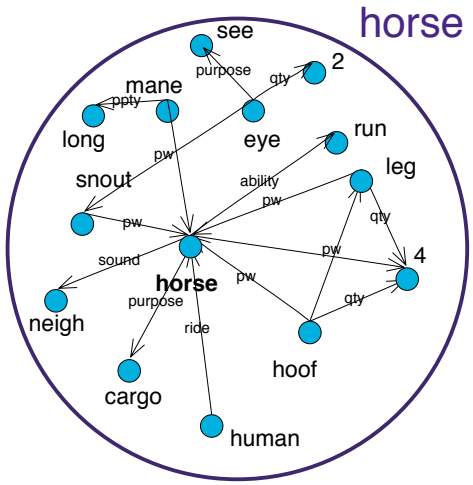


Mental spaces









Boat race

As we went to press, Rich Wilson and Bill Biewenga were barely maintaining a 4.5 day lead over the ghost of the clipper *Northern Light*, whose record run from San Francisco to Boston they're trying to beat. In 1853, the clipper made the passage in 76 days, 8 hours[1].

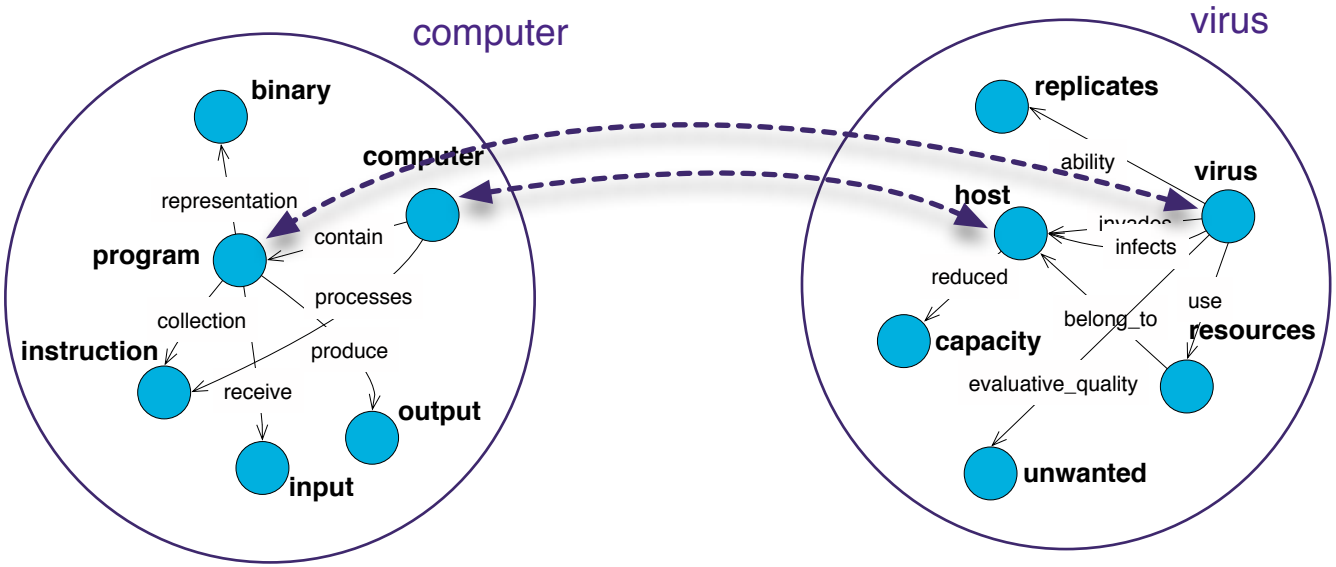
- Two input spaces: clipper in 1853, catamaran in 1993
- Generic space: sailing from S. Francisco to Boston
- Blend: single event, two boats, 1993
  - pattern completion: “race” frame imported from background
  - elaboration: we imagine relative positions and dynamics

Boat race

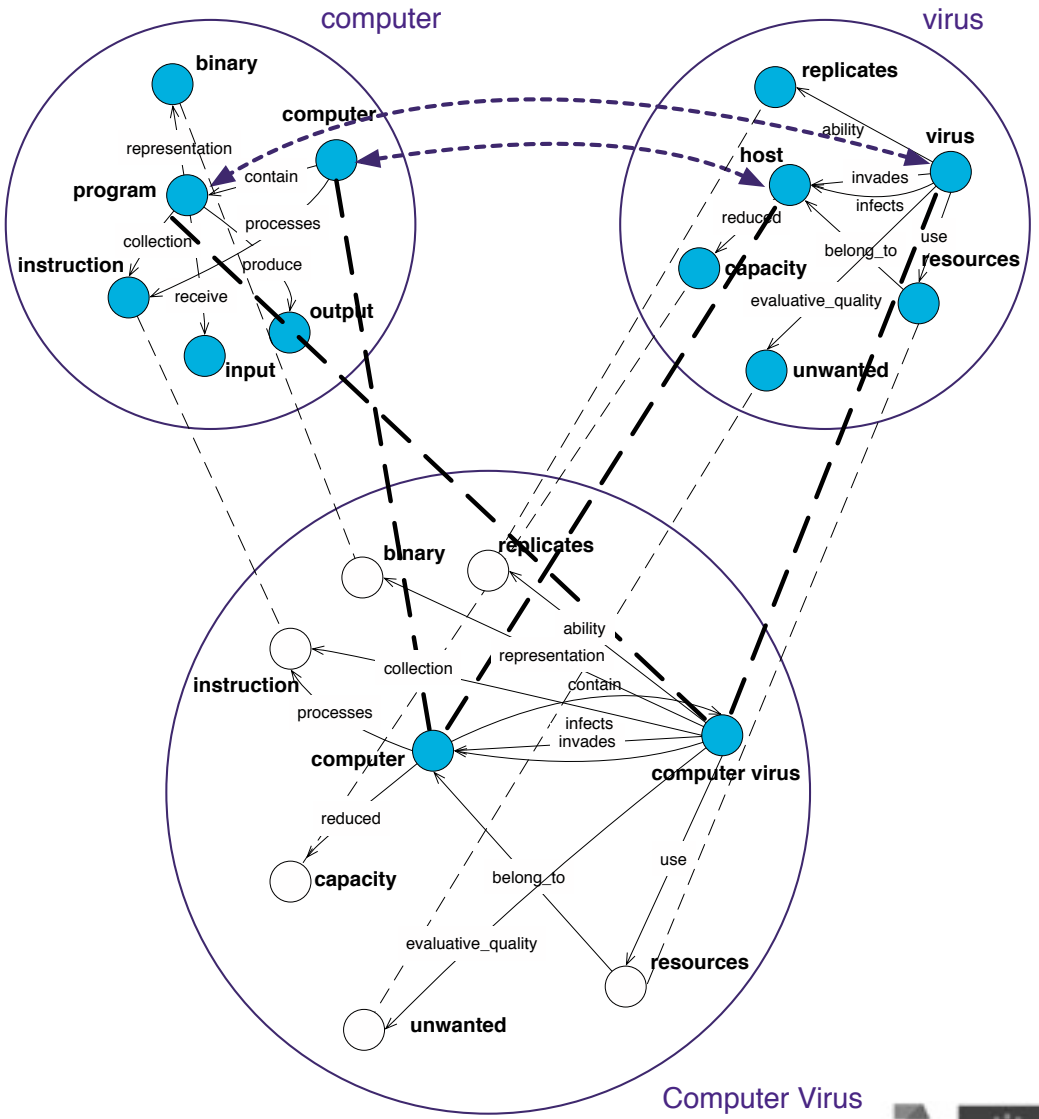
As we went to press, Rich Wilson and Bill Biewenga were barely maintaining a 4.5 day lead over the ghost of the clipper *Northern Light*, whose record run from San Francisco to Boston they're trying to beat. In 1853, the clipper made the passage in 76 days, 8 hours[1].

- Blend: single event, two boats, 1993
  - pattern completion: “race” frame imported from background
  - elaboration: we imagine relative positions and dynamics
- The blended space remains connected to the inputs by the mappings:
  - the catamaran is going faster than the clipper, and how much

Cross-space Mappings



- Process: identity, structure alignment, slot-filling, analogy, ...


computer
virus
binary
computer
representation
contain
program
processes
collection
instruction
produce
receive
output
input
replicates
ability
virus
host
invades
infects
reduced
use
belong_to
capacity
resources
evaluative_quality
unwanted
binary
replicates
ability
collection
representation
instruction
contain
processes
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computer
computer virus
reduced
use
capacity
belong_to
evaluative_quality
resources
unwanted
Computer Virus

Principles

- Constitutive principles:
  - Partial cross-space mappings, selective projection, completion, elaboration
- Governing principles:
  - strategies for optimising emergent structure
  - competing pressures
  - 8 principles in original theory, later on distilled to 4

Governing Principles

- Topology:
  - Other things being equal, set up the blend and the inputs so that useful topology in the inputs and their outer-space relations is reflected by inner-space relations in the blend.
- Unpacking:
  - Other things being equal, the blend all by itself should prompt for the reconstruction of the entire network.

Governing Principles

- Web:
  - Other things being equal, manipulating the blend as a unit must maintain the web of appropriate connections to the input spaces easily and without additional surveillance or computation.
- Integration:
  - achieve an integrated blend.

Integration networks

- Four main types of integration networks:
  - Simplex: one input consists of a frame and the other consists of specific elements.
  - Mirror: a common organising frame is shared by all spaces in the network
  - Single-Scope: the organising frames of the inputs are different, and the blend inherits only one of those frames.
  - Double-Scope: essential frame and identity properties are brought in from both inputs (Frame Blending)

Integration networks

- Four main types of integration networks:
  - Simplex: one input consists of a frame and the other consists of specific elements.
    - example: “James is the father of John”
  - Mirror: a common organising frame is shared by all spaces in the network
    - Buddhist Monk, Regatta

Integration networks

- Examples:
  - Single-Scope: the organising frames of the inputs are different, and the blend inherits only one of those frames.
    - “Presidential shoot-out”
  - Double-Scope: essential frame and identity properties are brought in from both inputs (Frame Blending)
    - “The president is snatching the rice bowl out of the child's hands”
    - Two frames: one for "snatching", another for “political decision”