A possible approach to a motion design pattern based on the PATH image schema

Criteria / Features

- scale-free (in space and time!)

- use cases from navigation, transportation, and applicability to metaphorical spaces (news, careers, currencies…)

- leverage Timpf et al. and other ideas of path aggregates

Image Schemas provide ...

- **schematic descriptions** of basic processes

  containment, support, cover, link, location, motion, connection, collection, split/merge, enablement, force, balance, attract, block, match, ...

- **participation roles** for endurants in perdurants

  container, support, path, moving object, center, periphery, ...

- **ontology mappings** through common schemas

  different types of roads, buildings, resources, ...
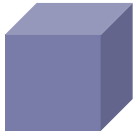
The SUPPORT Schema

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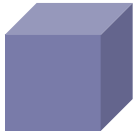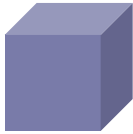
- participants: supported object, support

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- perdurants: get on, be on, get off

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The PATH Schema

For details, see:
Kuhn, W., 2007. An Image-Schematic Account of Spatial Categories. *Spatial Information Theory, 8th International Conference, COSIT 2007*. Melbourne, Australia: Springer Lecture Notes in Computer Science 4736: 152-168

The PATH Schema

- participants: path, moving object, start, goal

For details, see:
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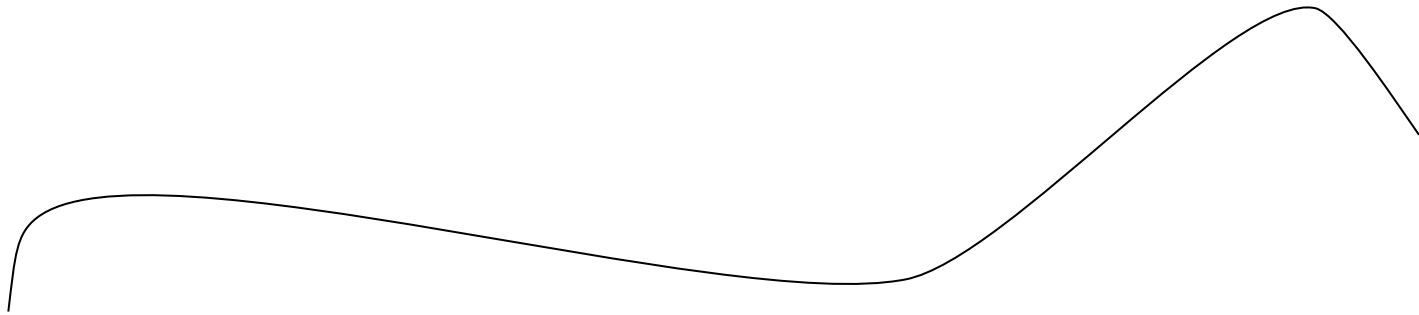
- participants: path, moving object, start, goal
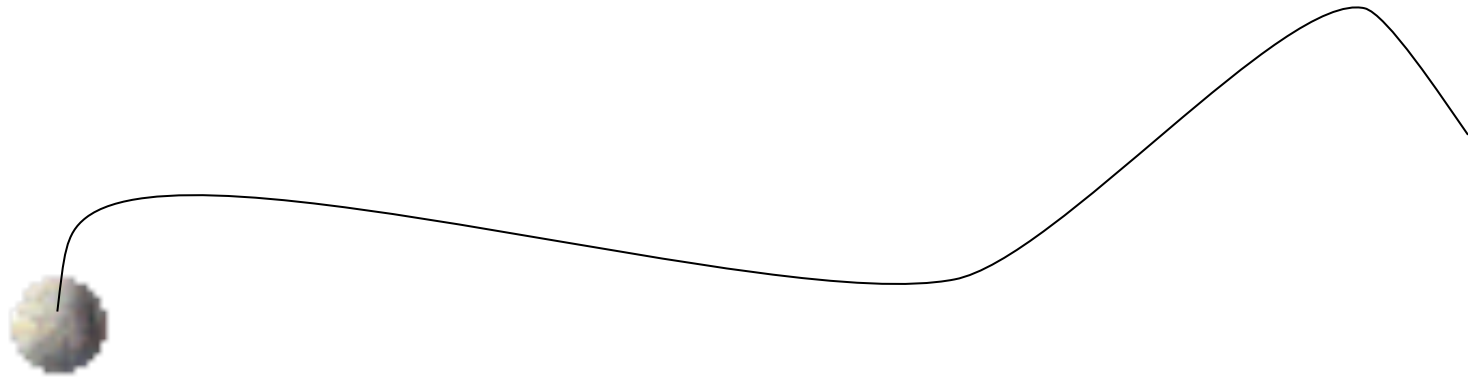
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- participants: path, moving object, start, goal

- perdurant: move

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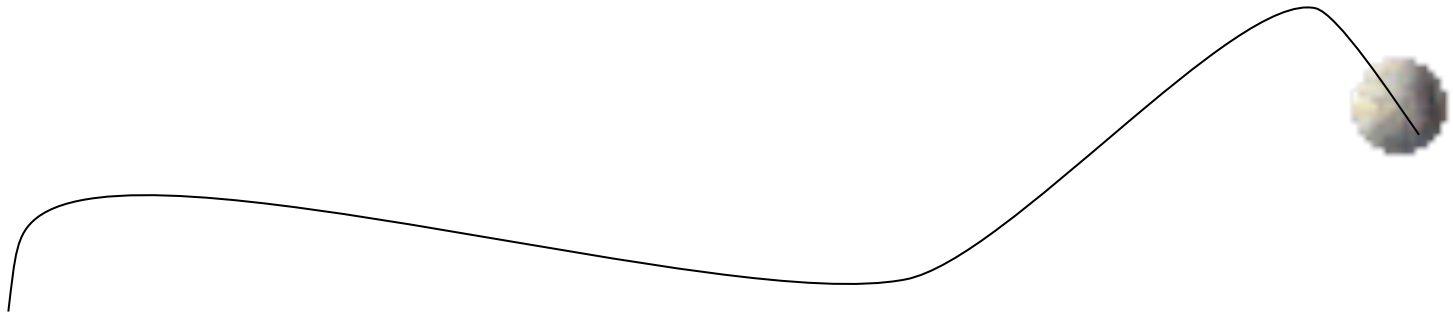
- participants: path, moving object, start, goal

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For details, see:
Kuhn, W., 2007. <u>An Image-Schematic Account of Spatial Categories</u>. *Spatial Information Theory, 8th International Conference, COSIT 2007*. Melbourne, Australia: Springer Lecture Notes in Computer Science 4736: 152-168

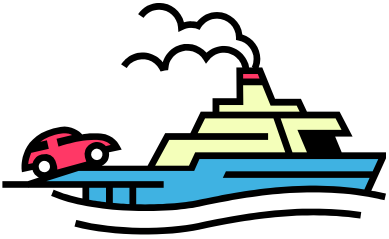# Transportation combines PATH + SUPPORT

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Cases of Motion

Motion

something moves

participant: moving object

example: a hike

Motion from to

something moves from start to goal

participants: moving object, start, goal

example: a hike from Goleta Beach to Ellwood Beach

Motion from to along

something moves from start to goal along a route

participants: moving object, start, goal, route (= path geometry)

example: a hike from Goleta Beach to Ellwood Beach along the shore

Motion from to along in

something moves from start to goal along a route in a medium

participants: moving object, start, goal, route, medium embedding the path

example: a hike from Goleta Beach to Ellwood Beach along the shore in the fog

Motion from to along on

something moves from start to goal on a route on a surface

participants: moving object, start, goal, route, surface supporting the path

example: a hike from Goleta Beach to Ellwood Beach along the shore on the sand

Transportation of from to by

something is transported from start to goal by something that moves on a route

participants: moving and transported objects, start, goal

example: a baby carried by its mother, who is hiking from Goleta Beach to Ellwood Beach

Challenging Cases of Motion

Napoleon's Russia Campaign (Minard's map)

Napoleon's troops moved to Moscow and back on the route mapped by Minard in air getting very cold on swamps and frozen ground.

The Gulf Stream

water moves from the Gulf of Mexico to the North Atlantic, and in a separate path to Western Africa, on vaguely known routes.

Singing a Song

a human voice moves up and down along the path of a melody, from its beginning to its end; the melody path is the sequence of notes (pitch, duration, possibly additional aspects like timbre).

Cases of Path

Route 101

- start object: Los Angeles

- end object: Oregon

- geometry: an OGC feature geometry

extensible to, for example, a run-off model using the surface material information

Observable Elements of a Motion Event

- name
- moving object
- start event (may or may not be a motion)
- end event (may or may not be a motion)
- motion description
- path (see separate pattern)
- transported object
- is part of (a motion)
- has part (a motion)
- reference frame

notes
- all slots are optional and can occur multiply
- a generic motion pattern
- needs an event pattern, with time slot(s)
- motion description covers aspects like speed, cost, length, kind of motion etc. (examples: tweens in animation, dance movements)
- transportation may be possible to handle as one motion being part of another.

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Observable Elements of a Path Object

- name
- start object
- end object
- path description (can be specialized to geometry in geospatial paths)
- medium (through which the path runs)
- surface (on which the path lies)
- is part (of a path)
- has part (a path)

notes
- all slots are optional and can occur multiply
- a generic path pattern
- for geospatial domain: use feature from GeoSPARQL ontology
- use part from W3C simple part-whole ontology
- paths can be used to locate objects

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Cases not (yet) covered

- growth
- spread and diffusion
- force dynamics

These are expected to benefit from combinations with further image schemas (CENTER-PERIPHERY, FORCE, others).

Also: this needs to be related (how?) to

http://ontologydesignpatterns.org/wiki/Submissions:Move