Constructs

- On a naive view, the world consists of things or objects with an independent existence.
- An alternative is to think of the things we speak about as constructed out of patterns that we discern in the world around us.
- These may not correspond to “things” in the ordinary, physical sense.

shadows

holes

Reification

- Neither a hole nor a shadow that we see behind the man are physical objects; yet we can easily think of them as such.
- Moreover, they arguably have an objective existence in the sense that they are visible and their location can be objectively determined.
- By the process of **reification** we create or construct objects that we can speak about; we treat them as entities which exist, can be referred to, quantified over and have properties that can be predicated of them

What is a boundary?

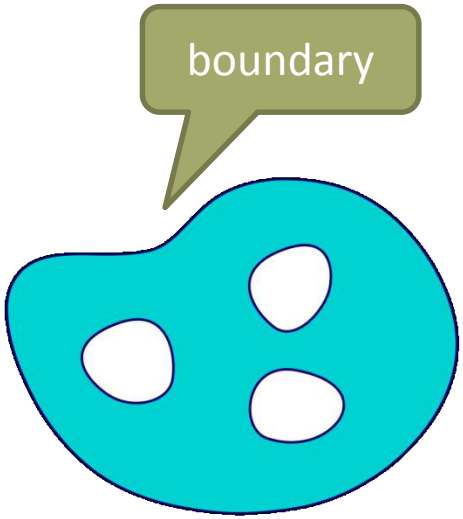
- A boundary is a construct – the ”imaginary” line between two objects, or two sets of objects.

”The national boundary follows the stream” (text in Swedish and Norwegian)

Stockholm University

Boundaries

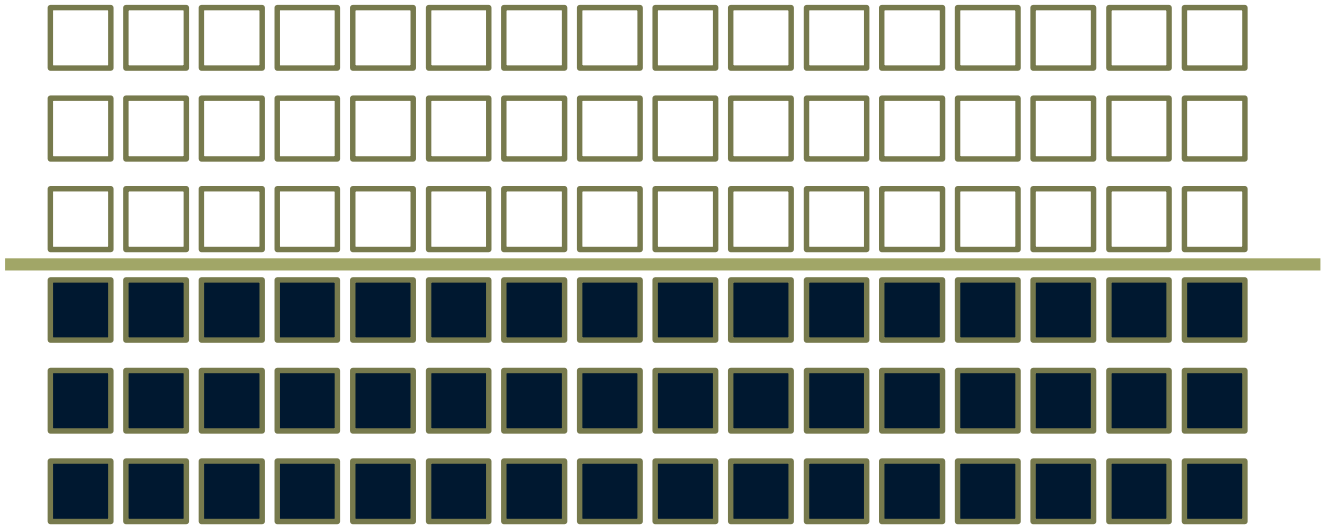
- In mathematics (topology), boundaries are sets of points on a surface:
  - In topology and mathematics in general, the boundary of a subset *S* of a topological space *X* is the set of points
    which can be approached both from *S*
    and from the outside of *S*.
- Cognitively, however, it is more natural to think of boundaries as something existing between what we can see.



Stockholm University

Boundaries between discrete objects

- Thus, a boundary may go between discrete objects, in which case it is counter-intuitive to think of it as coinciding with a subset of those:



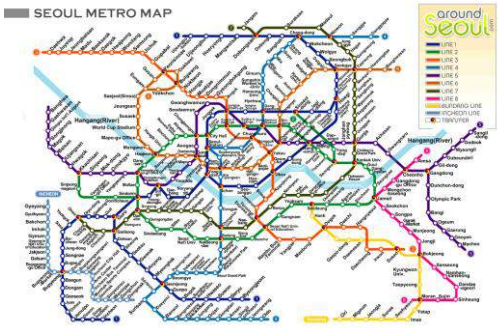
Continuous and discrete representations

- A timeline is a continuous representation of a dimension of reality, similar to a spatial representation such as a two-dimensional topographical map.
- But representations need not be continuous, they can also be discrete – like underground (subway) maps.

Stockholm University

What does an underground map show?

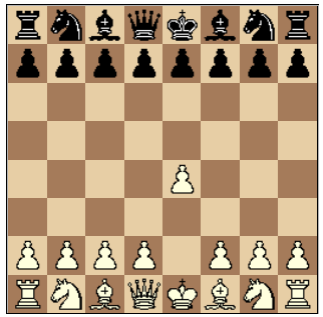
- Basically, it displays a structure consisting of a set of individual objects (stations) and connections between these objects.
- The distance between the stations is not shown in a systematic way – a line between two stations tells us that the stations are connected but not how far they are from each other.

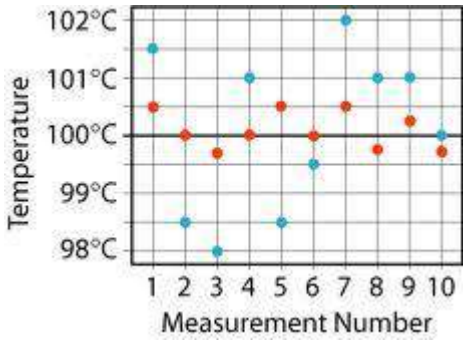


Stockholm University

When discrete representations of time are called for

- Games such as chess which consist of discrete moves
- Series of observations at regular intervals
- Representations of computer processes (computers have discrete internal clocks)

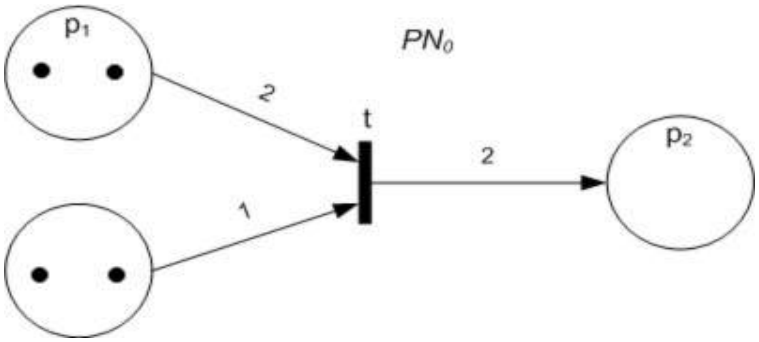




Stockholm University

”Discrete Event Simulation Systems”

- “Discrete event simulation” represents a system as a sequence of events, where the events are instantaneous changes or transitions between states in the system.



A ”Petri net”

Stockholm University

State descriptions

- Consider a “world” or system consisting of three elements or objects denoted by the letter a, b, and c.
- Each object has a value represented by an integer.
- Let’s call this a state description.

a=2

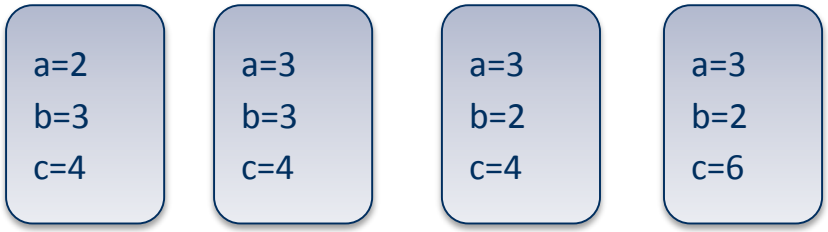
b=3

c=4

similar to ”Discourse Representation Structures” (Hans Kamp)

States and state spaces

- We make the assumption that the elements are constant in the system, their values are not fixed but can vary between different states of the system.
- The set of all possible states makes up the state space of the system.
- This does not imply any temporal relationship between the states or that the states hold at some point in time -- so far they exist only as logical possibilities



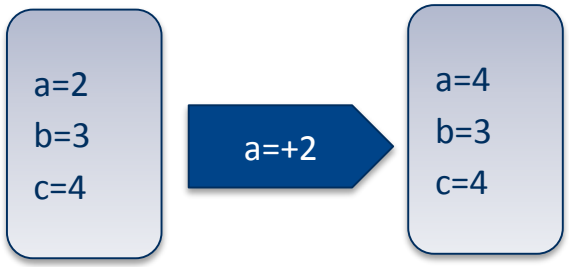
Stockholm University

The term “state” is multiply ambiguous

- “State” may refer to
  - a global state: ”the totality of what can be said of an object or a system at a specific point in time or just as one logical possibility in a “state space”, as in “The State of the Union Speech”
  - a stative concept: the content of a stative predicate such as “be happy”
  - a state as an “eventuality”: the manifestation of a generic state in a given individual during the period it lasts

Introducing temporal relations

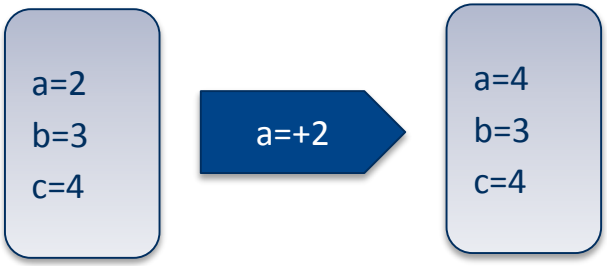
- So far the representations have not contained any temporal dimension.
- An important step towards introducing such a dimension is to introduce operations by which one state is transformed into another.
- We can for instance derive the second state description below by adding 2 to the value of the element **a**



Stockholm University

Transitions

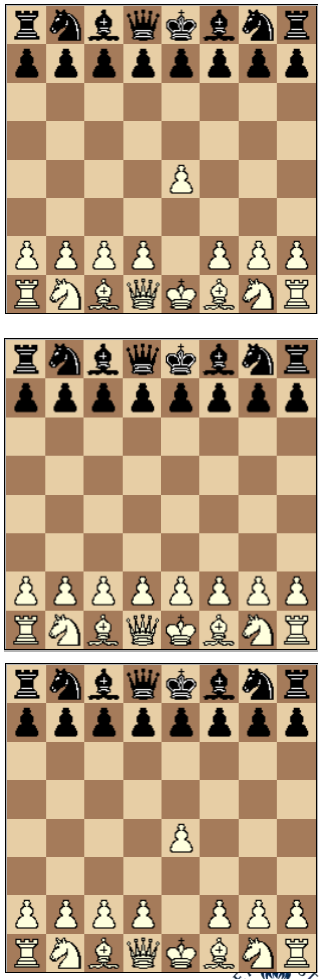
- We may now see the relationship as a temporal one: we first have the state to the left, then it is transformed into the state to the right.
- The transformation of the first state into the second can be seen as a **transition** that takes place in real time -- or in simpler terms, as a kind of **event**, that we can call a transition event.



Stockholm University

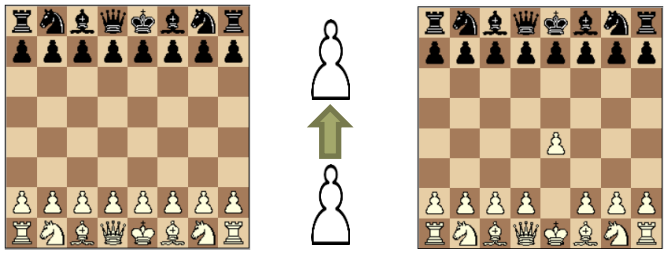
Events

- When we see two static pictures in rapid succession, we perceive it as an event in which the first state changes into another
- We have in essence performed a mental reification of the transition from the first state to the second



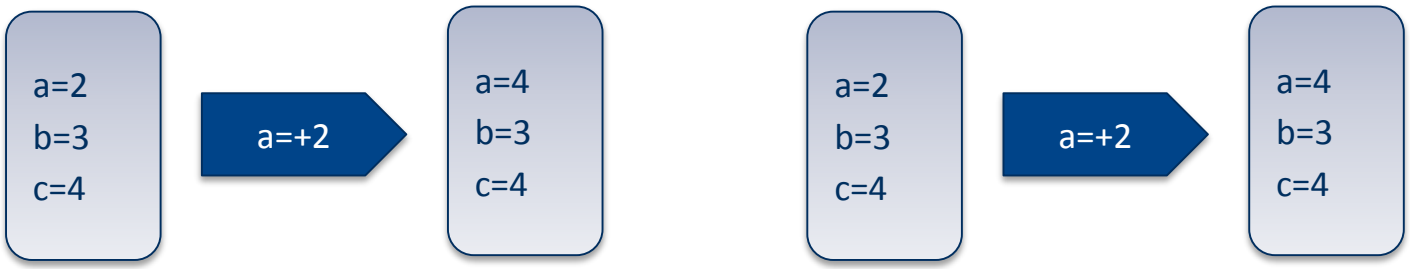
Are events real?

- There is nothing in the representation belowl that we can identify with an event.
- We can only start speaking of an event when we see the two pictures as two successive states of an object and identify the way the object changes between those two states.
- Philosophers have had different opinion about the necessity of reifying events
- From a cognitive point of view it seems to clear that we think of events as entities in themselves, and this is also reflected in the way we speak about them
- Actually, the very fact that we can speak about events implies that they are seen as entities albeit abstract ones.
- Arguably, events are **constructs**



Duality

- There is a duality relationship between states and transition events
- The source state and the transition event together unequivocally determine the target state, but also, the two states together unequivocally determine the transition.



Stockholm University

Reducing the representation

- Thus, the following representations carry the same information:

a=2 b=3 c=4	a=3 b=3 c=4	a=3 b=2 c=4	a=3 b=2 c=6

- A representation which specifies an initial state and a series of transition events that transform it is usually the most economical one

Initial state

a = 3

b = 3

c = 2

Transition events

a=+2

b=+1

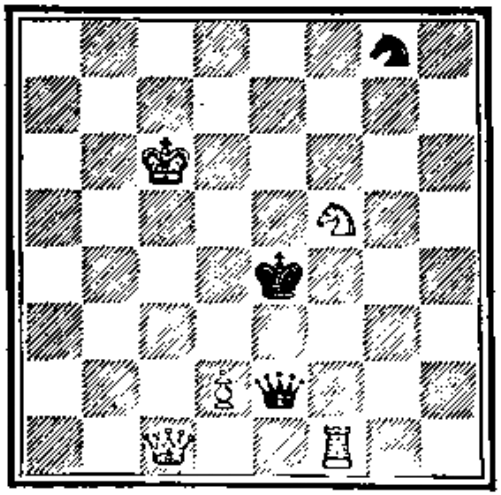
c=-1

Chess and narratives

- This kind of representation is typical of (among other things)
  - representations of chess games
  - narratives

- The page from *Alice behind the mirror* exemplifies both of these

RED.



WHITE.

White Pawn (Alice) to play, and win in eleven moves.

	PAGE
1. Alice meets R. Q...	35
2. Alice through Q's 3d (*by railway*).....	44
to Q's 4th (*Tweedledum and Tweedledee*)	49
3. Alice meets W. Q. (*with shawl*)	75
4. Alice to Q's 5th (*shop, river, shop*)	82
5. Alice to Q's 6th (*Humpty Dumpty*)	90
6. Alice to Q's 7th (*forest*).....	120
7. W. Kt. takes R. Kt.	125
8. Alice to Q's 8th (*coronation*).....	141
9. Alice becomes Queen.....	142
10. Alice castles (*feast*)	156
11. Alice takes R. Q. and wins	163

	PAGE
1. R. Q. to K. R's 4th.	41
2. W. Q. to Q. B's 4th (*after shawl*).....	75
3. W. Q. to Q. B's 5th (*becomes sheep*)...	81
4. W. Q. to K. B's 8th (*leaves egg on shelf*)	90
5. W. Q. to Q. B's 8th (*flying from R. Kt.*)	116
6. R. Kt. to K's 2d (check).....	122
7. W. Kt. to K. B's 5th	140
8. R. Q. to K's sq. (*examination*)	143
9. Queens castle.....	156
10. W. Q. to Q. R's 6th (*soup*)	162

Narrative progression

John opened the door. The cat ran out.
John opened the door. The cat sat on the mat.

- An event sentence "moves a narration forward", a state sentence does not.
- "Moving the narration forward" suggests that the narration moves along a timeline.
- An alternative approach is to say that each event sentence **creates time** by introducing a transition to a new state.

Narrative progression

- Narrative progression works analogously to the cursor or "insertion point" in a text editor, that is, the point where text is added, deleted or changed.
- In a text file, the default location for the insertion point is at the end of the file; similarly, when telling a story, we insert new material at the end, if nothing is said to the contrary.
- Pressing RETURN creates a new line at the end of the file; similarly, an event creates a new state.

Stockholm University

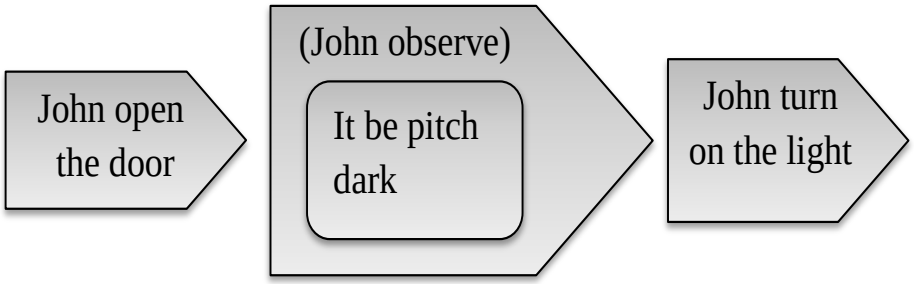
Time creation outside narratives

The temperature has risen to 22 degrees

- Outside a narrative context, an event sentence will function to update the view of the present situation.
- We learn that the world has changed.
- Thus, a new state description is created….
- … but there is no movement ”forward in time”, rather, the previous picture of the world is pushed back and stored in memory

The role of observation

- John opened the door. The room was pitch dark. John turned on the light.
- Although the room was (presumably) dark even before John opened the door, the "topic time" of the second sentence is arguably after the event in the first.
- Typically, such sequences involve (implicitly) the perception of a state by a story character. This perception can be seen as an event in itself



Stockholm University

States vs. events

Löbner, Herweg

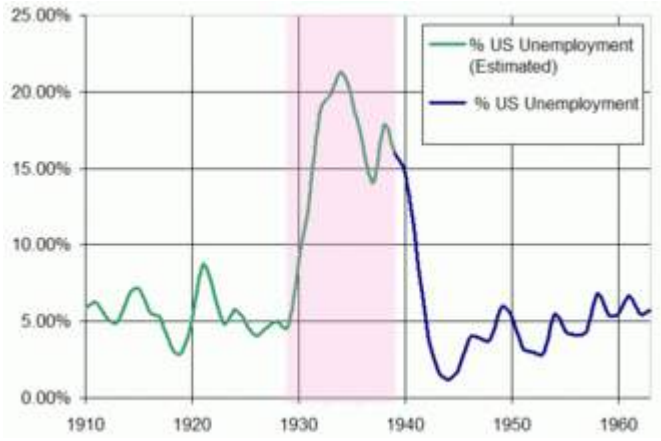
- The semantics proposed here is a **hybrid** one in that states and events are on different levels in the structure.
- Only events have their own nodes – they are **temporal individuals**.
- Stative predicates are just that – predicates of characterizing global states.

Why is there no good word for ”situation/eventuality”?

- States and events (accomplishments and achievements) are very different kinds of animals
- Events can be generic (types) and specific (individuals):
  - murders of presidents
  - the murder of Kennedy

Delimited states

- However, stative concepts also be reified so as to become temporal individuals
- … but only if we **delimit** them by somehow identifying the events that start and end them
- "The great depression" in the 1930's started with a steep rise in unemployment and ended with a steep fall in unemployment figures



Stockholm University

Defining intervals

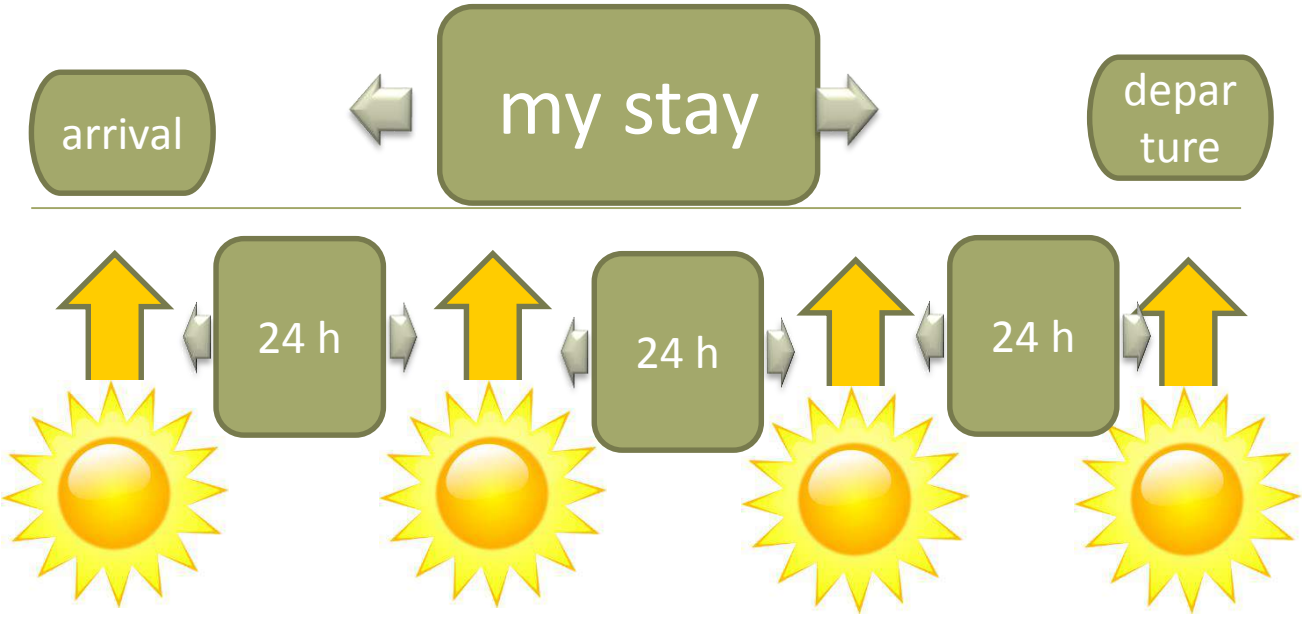
- A day can be seen as a delimited state characterized by a sunrise and and a sunset event
- But any two events that are not simultaneous could be used to define an interval.

Stockholm University

Measuring intervals

- We can measure an interval by aligning it with a series of "**clock events"**

I stayed for three days



Stockholm University

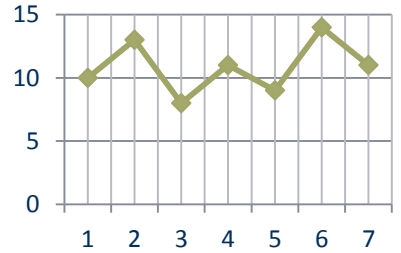
Only telic temporal entities create time

- All Vendler's types except state involve change
- … although only the telic ones create time…
- … in the sense that they define a **before** and an **after**

Atelic and telic events

- Activities (in Vendler's sense) are atelic – although they involve change.
- *Fluctuate* is a verb whose basic meaning is an activity:

Last week, the temperature fluctuated.



- The picture of the world that this sentence induces contains a series of changes,
- … but there is no definite transition relative to which we can speak of a "before" and an "after"
- Thus, activities do not "create time".

Stockholm University

Activities

- Although they involve change, activities are atelic
- Activities do not involve a definite boundary
- They thus do not create time in the sense of a before and an after
- An activity predicate is analogous to a mass noun
- It does not point to a temporal individual
- Activities can often be seen as being built up by (an unspecified number) of component events

Delimited activities

- Like a state, an activity can be delimited and thus become telic (in Vendler's terms: an accomplishment), or perhaps better, bounded

  - by indicating a result to be attained:
    - write → write a letter

  - by indicating a time limit:
    - run → run for twenty minutes

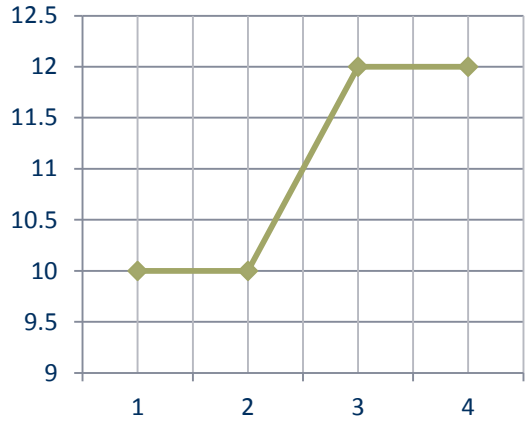
  - by indicating a measure of some kind (quantizing):
    - run → run a kilometer

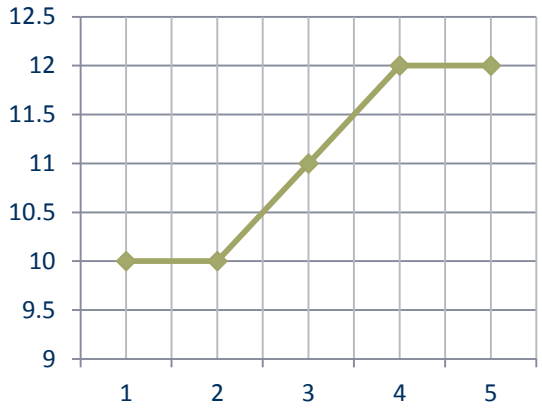
Two perspectives on accomplishments

- An accomplishment could be seen either
  - as an activity followed by a boundary (the activity is basic)

  or
  - as an event preceded by whatever led up to that event (the event is basic)
- Consider ”build a house”:
  - No activity can be part of building a house without having the completion of the house as final goal
  - This argues for seeing the event rather than the activity as basic

Simple and complex events





- In a discrete representation, whether an event is ”instantaneous” or ”has duration”, depends on the number of observations, not on the duration in physical time

Stockholm University

What I have tried to do in this lecture

- to see how temporal semantics can be approached by building by taking state descriptions and precedence relations between them as the basic building stones

States

- States are either
  - types: the state of being asleep
  - global: the state of the union

- …but we seldom speak of anything corresponding to an individual event:
  - ?John’s state of being asleep

Reification

- …if we don't reify it – that is, make it into a delimited individual, by adding boundary events:
  - my visit to London