

# Bridges Between Events. Bridging Reference to Eventualities

Matthias Irmer

University of Leipzig

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- an entity introduced in a discourse *stands in a particular relation* to some previously mentioned discourse entity

## The Bridging Relation

- is not explicitly stated
  - is an essential part of the discourse content
  - the knowledge of this relation is needed for successfully interpreting the discourse
- 
- Clark (1977) [4]: distinction of various type of bridging inferences

# Types of Discourse Anaphora

## Direct Reference

- antecedent is an entity just mentioned

(1) I met a man yesterday. He told me a story.

## Indirect Reference by Association

- antecedent is not directly mentioned, but *closely associated* with an entity mentioned before

(2) I walked into the room. The chandeliers sparkled brightly.

## Indirect Reference by Characterization

- the bridging relation *characterizes a role that something implicitly plays* in an event or circumstance mentioned before

(3) John was murdered yesterday. The knife lay nearby and the murderer got away.

- (4) a. John was murdered yesterday.  
b. The knife lay nearby.

## Utterance (a)

- describes a killing event which took place the day preceding the utterance
- the individual referred to by *John* is the victim of the event

## Utterance (b)

- describes a state of the entity denoted by the definite NP *the knife*
- this entity is new in the discourse, but stands in an implicit bridging relation to the event described in utterance (a): the knife served probably as the instrument of the killing event

# The Need for Pragmatic Inference

- the bridging relation is not expressed directly by linguistic means
- instead, the hearer has to infer it using contextual knowledge
- world knowledge needed for interpreting (4):
  - in a murdering event, there must be a *victim* and a *killer*, and normally there is also an *instrument* used for performing the act
  - a knife can serve as a killing instrument
- this inference is defeasible: can be overridden by subsequent information

# The Discourse Model

- interpretation involves constructing incrementally a structured mental representation of the discourse
- in a successful interpretation, all inferred information will be part of the discourse model

## Discourse Model

- Cornish (1999) [5]: “a constantly evolving representation of the entities, propositions, eventualities, properties, and states, as well as their interrelations, which are introduced into the discourse, or are assumed already to exist therein, at particular points”
- a formal theory of modelling discourse structures: SDRT (Asher & Lascarides 2003 [3])

- Asher & Lascarides (1998) [1]: “bridging inferences are a byproduct of computing how the current sentence connects to the previous ones in the discourse”

## 4 meta-rules for bridging

- 1 **If possible use identity.**
- 2 **Bridges must be plausible.**
  - World knowledge “specifies certain plausible ways of filling the underspecified parameters in the presupposed material”
  - Plausibility relies on world knowledge, but is not defined precisely
- 3 **Discourse structure determines bridging.**
- 4 **Maximize discourse coherence.**

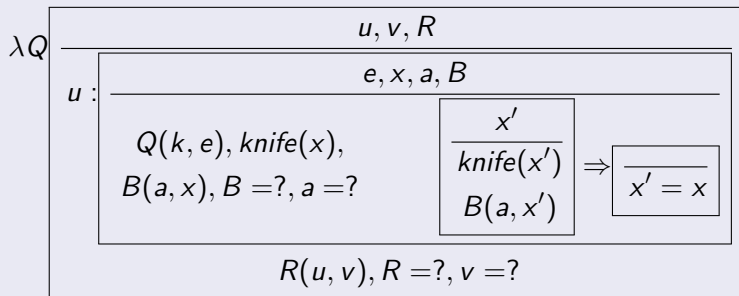


## Bridging in SDRT (ctd.)

- meaning of a definite noun phrase (e.g. *the knife*):

$\lambda Q.Q(\iota x(B(a, x) \wedge \textit{knife}(x)))$

- representation in SDRT:



## Bridging in SDRT (ctd.)

to be specified by pragmatic inference:

the Coherence Relation (A & L 1998b [2])

$$R(u, v)$$

- a definite description triggers a coherence relation between the current utterance  $u$  and some previous utterance  $v$

the Bridging Relation (A & L 1998a [1])

$$B(a, x)$$

- for direct anaphora:  $B$  is *identity*
- for indirect reference by association:  $B$  can be *part-of* or *member-of*
- for indirect reference by characterization:  $B$  is a thematic role, e.g. *agent, theme, instrument*

- cf. Fillmore (1976) [6] and subsequent work

## basic idea

- one cannot understand the meaning of a single word without access to all the essential knowledge that relates to that word
- central assumption: world knowledge is organized in **frames**

## basic units

- **Frame**: mental representation of a stereotypical situation whose elements can only be defined relating one to another
- **Lexical Unit**: a pairing of a word with a meaning; polysemous words are represented by several lexical units
- every lexical unit **evokes** a particular frame and can only be understood in relation to that frame

## FrameNet

- a lexical resource providing a body of annotated sentences based on frame semantics
- the database contains around 10,000 lexical units, 800 semantic frames and over 120,000 example sentences
- frames are hierarchically organized: e.g. *killing* inherits from *transitive action* which inherits from *event*

## Frame Elements

- a frame consists of various **Frame Elements**: kinds of entities that can participate in a frame (i.e. thematic roles)
- sometimes conceptually necessary FEs don't show up in a sentence: e.g. omitted agents in passive sentences (Constructional Null Instantiation, CNI)

# The Killing Frame

## Definition

A **Killer** or Cause causes the death of the **Victim**.

## Core Frame Elements

FE	Description	inherited FE
<b>Killer</b>	The person or sentient entity that causes the death of the <b>Victim</b>	Agent
<b>Victim</b>	The living entity that dies as a result of the killing	Patient
<b>Instrument</b>	The device used by the <b>Killer</b> to bring about the death of the <b>Victim</b>	Instrument

## Non-Core Frame Elements

Beneficiary, Manner, Place, Purpose, Time, ...

## Lexical Units

annihilate.v, annihilation.n, ..., murder.n, murder.v, murderer.n, ..., terminate.v

## Lexical Entry: murder.v

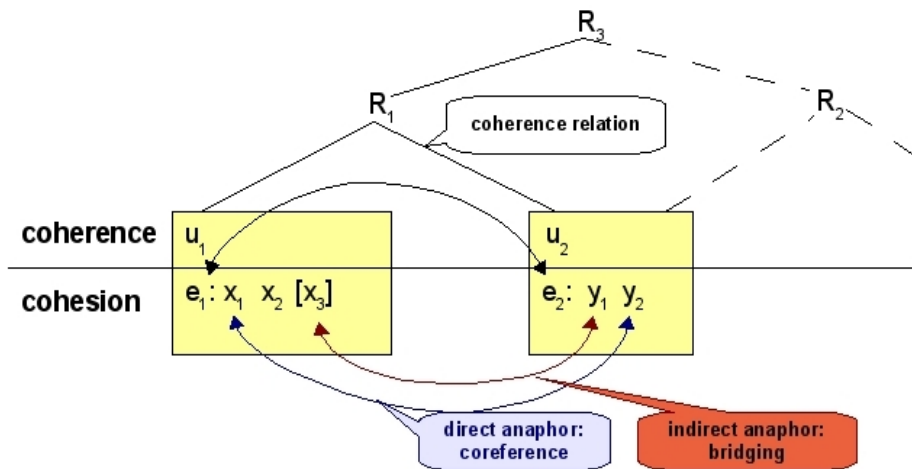
- Frame Elements and Valence Patterns

frame element	realized as			
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Killer	NP.Ext	NP.Ext	PP[by].Dep	CNI.–
Victim	NP.Obj	INI.–	NP.Ext	NP.Ext
(23)	(14)	(1)	(5)	(3)

- each eventuality introduced in a discourse evokes a corresponding frame in the discourse model
- for all core frame elements, there is a representation in the discourse model, i.e. in the SDRS
- in case that some participant is not expressed linguistically, this representation remains underspecified
- in case that the discourse referent for the eventuality remains accessible for anaphoric reference, these roles can be further specified by subsequent information (e.g. by bridging references)

# Coherence and Cohesion

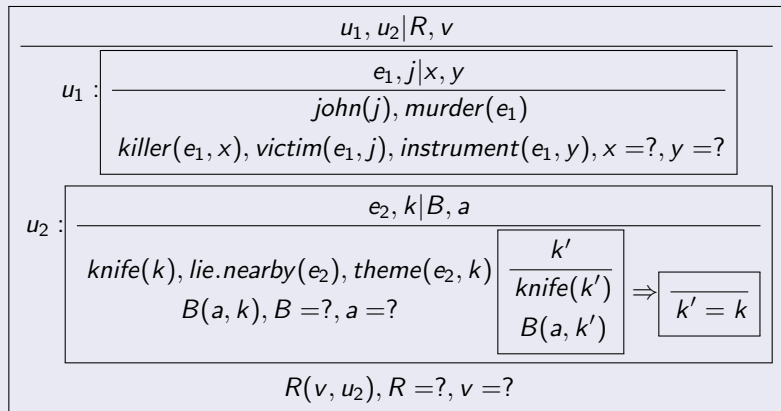




- (4) a. John was murdered yesterday.  
 b. The knife lay nearby.

## Representation as Underspecified SDRS

(5)



- in SDRT, the discourse relation *Background* is strongly indicated by the occurrence of an event followed by a state

$$u_1 : event(e_1) \wedge u_2 : state(e_2) > Background(u_1, u_2)$$

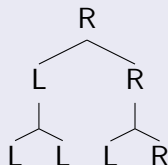
- normally, *Background* is a *subordinating* discourse relation (cf. Vieu & Prevot 2004 [7])

application to example (4):

- *murder.v* evokes the *killing* frame which inherits from the frame *transitive action* which inherits from *event*
- *lie.v* evokes the frame *being located* which inherits from *state*

## The Right Frontier Constraint

- the *right frontier* of a tree are all nodes placed in the right extreme of the tree at any level



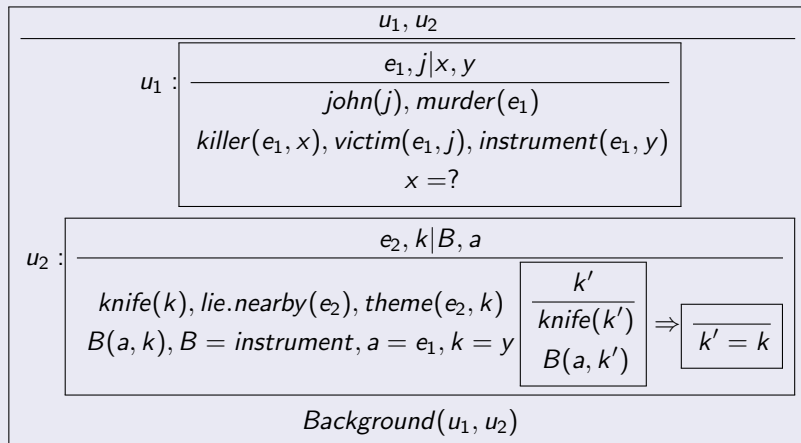
- in SDRT: “an antecedent for an anaphoric expression must be DRS-accessible on the right frontier” (Asher & Lascarides 2003 [3])
- a *coordinating* relation pushes the right frontier to the right, closing off its attachment point
- a *subordinating* relation extends the right frontier downwards and leaves open its attachment point

# Resolving the Bridging Reference

- $u_2$  is subordinated to  $u_1$ , thus  $u_1$  lies on the right frontier of the discourse, so  $e_1$  is accessible for anaphoric reference in  $u_2$
- the underspecified variable  $a$  can be resolved to  $e_1$ , and  $B$  to *instrument*
- as a byproduct,  $y$  can be resolved to  $k$
- driving force behind: the more underspecified parameters are resolved, the more coherent is a discourse
- note: these inferences are defeasible and can be overridden by subsequent information

# Pragmatically Enriched SDRS

(6)



# Weak Discourse Referents

two different kinds of discourse entities:

- 1 'regular' discourse referents introduced by linguistic expressions
- 2 'weak' discourse referents which are not (yet) expressed linguistically

## Weak Discourse Referents

- abstract entities which are evoked or activated in course of the interpretation process
  - often remain underspecified
  - can be specified (e.g. by subsequent anaphoric reference) and help to render a discourse more coherent
- 
- our proposal: restrict the search space for suitable antecedents for bridging anaphora to take into account only accessible 'regular' and 'weak' discourse referents

We have ...

- ... extended SDRT's account of Bridging to cover reference to eventualities
- ... spelled out how world knowledge (represented in Frames) contributes to the interpretation process
- ... made an explicit distinction between two types of discourse referents

We should do ...

- an exact formalization of weak discourse referents in SDRT
- an examination of the usefulness of a notion of weak discourse referents for other phenomena

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