Lecture 23: Time and temporal

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Where we’re at in the class

Language conveys information about (real or imagined, concrete or abstract) entities; events and facts, their properties and relations.

**Entities** and **events** may exist/take place in time and space.

**What kind of information** about (entities/events/time/space/…) do we need/want to represent?

**How is that information expressed** in language?

How can a **meaning representation capture that information**?
United Airlines said Friday it has increased fares by $6 per round trip on flights to some cities also served by lower-cost carriers. American Airlines, a unit of AMR Corp., immediately matched the move, spokesman Tim Wagner said. United, a unit of UAL Corp., said the increase took effect Thursday.

**Temporal expressions:** Friday, Thursday, 3:30pm, last July, today, ....

Can we **normalize** these expressions (map them to calendar dates/times)?

What is the **temporal sequence** of events described here?
Key questions for today

Language conveys information about entities, events and facts that take place in **time**.

What kind of **temporal information** do we need to represent to capture that aspect of language?

How does **language express** temporal information?

How can a **meaning representation** capture that information?
Temporal expressions in language

References to **points** in time:
- July 1, 2023; 9:00am;
- today; last week; next year; the week before;

References to **intervals** of time:
- one hour; fifteen minutes; a decade, …

References to **temporal relations**:
- first, …then; after; during;….
- every hour; once a week;
- the first…;
Representing temporal relations

Figure 22.1 The 13 temporal relations from Allen (1984).
TimeML

A markup language for temporal information, based on Allen’s intervals.

Three kinds of basic objects:

**Event:** represents events and states

**Time:** for time expressions (e.g. dates)

**Link:** relations between times/events

- **tlink:** temporal relations
- **alink:** aspectual relations
- **slink:** factual relations
Oct 26, 1989
Delta Air Lines earnings soared 33% to a record in the fiscal first quarter, bucking the industry trend toward declining profits.

Times:
- 1989-10-26
- the fiscal first quarter

Events:
- soared
- bucking
- declining

Relations:
- Soared is before 1989-10-26
- Soared is included in the fiscal first quarter
- Soared is simultaneous with the bucking
- Soared is included in Declining
Delta Air Lines earnings soared 33% to a record in the fiscal first quarter, bucking the industry trend toward declining profits.
**Tense**

Present tense: *I walk*
Past perfect: *I had walked*
Simple past: *I walked*
Present perfect: *I have walked*
Simple future: *I will walk*
Future perfect: *I will have walked*

**Reichenbach (1947):** We have to distinguish between:
- the time of the **utterance** \((U)\)
- the time of the **event** that is described \((E)\)
- the **reference** point \((R)\) relative to which the event is described
Present tense: *I walk*

The **Utterance** time is the **Reference** point.
The **Event** happens during the **Reference** point.
Simple future: *I will walk*

The **Utterance** time is the **Reference** point
The **Event** happens after the **Reference** point
Simple Past: *I walked*

The **Reference** point precedes the **Utterance**
The **Event** overlaps with the **Reference**
Present perfect: *I have walked*

The **utterance** is the **reference** point.
The **event** precedes the **reference**.
Past perfect: *I had walked*

The **reference** point precedes the **utterance**.
The **event** precedes the **reference**.
Future perfect: *I will have walked*

The **reference** point comes after the **utterance**.

The **event** precedes the **reference**
(but comes after the utterance)
Aktionsarten

**Stative expressions**: describe a particular state or property that is unchanging at some point in time

- *It is/was raining.*
- *Sue is sleeping.*
- *I used to hate it, but now I like classical music.*
- *Urbana is in Illinois.*

**Eventive expressions** describe events

**Activity**: occurs over a span of time:
*She drove a Mazda.*

**Accomplishment**: occurs over a span of time, has an end point, and results in some state
*He read the book [in an hour]; it took him an hour to read the book.*

**Achievement**: describe the culmination point of an activity
*She reached Chicago. She won the competition.*