It-TimeML & the Italian TimeBank: Temporal Annotation in Italian

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Outline

- Expressing temporality in Italian
- Adapting TimeML to Italian: It-TimeML
- The TempEval experience: what we have learned
- The Italian TimeBank
- Critical and open issues
Temporality in Italian

- Core elements: TENSE and (viewpoint) ASPECT → verb
  - Verb morphology
- other linguistic elements: temporal expressions, signals (explicit and implicit), lexical aspect
- non linguistics elements: commonsense knowledge
- proposal of an hierarchical order:

  COMMONSENSE KNOWLEDGE < (IMPLIED SIGNALS < TENSE < VIEWPOINT ASPECT < LEXICAL ASPECT < TEMPORAL EXPRESSIONS < EXPLICIT SIGNALS)
It-TimeML @ glance

- Main differences wrt. TimeML are in the annotation of the <event> tag
  - in the extension
  - in some attributes
- Same philosophy: minimal chunk + attention to the superficial form
- Same POS which may realize events, signals, temporal expressions
- Same set of linguistic entities for expressing temporality in text/discourse
Going into the details...

- Tag <event>: marks every instance of *specific* events, i.e., both things that happen in the world and states which *temporally* holds.

- POS: verbs, nouns, pps, adjectives + predicative sections
- different POS = different annotation rules
- different annotation rules = different annotation specifications
\textbf{<event>} = \textbf{VERB}

- Verb head = \textbf{<event>}
- Light verb constructions: single event realized by 2 tokens
  - \textbf{<verb head>} + \textbf{<complement>}
  - fare la spesa (\textit{to do shopping}) = \textbf{<fare> la <spesa>}
  - development of detailed specifications
- Modal verbs and modal periphrases are annotated as \textbf{<event>}
  - Marco poteva cadere (\textit{Marco could fall}) = \textbf{Marco \textit{<event>poteva</event> <event>cadere</event>}}
<event> = VERB (2)

- idiomatic expressions = only verb head + multiword features
- causative constructions FARE + INF = both elements
  - ho fatto sapere (I let it know) = <event>fatto</event> <event>sapere</event>
  - causative faire different status wrt to the light verb
<event> = NOUN

- Event status of a noun is not trivial
- <event>:
  - second-order nominals
  - nouns complements of aspectual verbs
  - nouns complements of inchoative predicates
  - nouns which denote causes or effects or are complements of causative verbs
  - nouns denoting sortal states when co-occur with a temporal expression or a temporal modifier
<event> = NOUN (2)

- deverbal nouns in their event reading
- nouns which denote a set of actions: politica, piano, progetto, attività, lavori…
- nouns modified by a temporal expression
- functional nouns (FNs) are events but only in special contexts:
  - FN + copula + NUMBER | DI + NUMBER
  - FN + incrementative predicates + DA + NUMBER | DI + NUMBER
  - deverbal noun + FN + DI + NUMBER
<event> = NOUN (3)

- Complex nominal constructions: NP + DI + NP → special set of *formal* rules: compositional principle
  - if NP is an event, mark it
  - else do not mark it
→ post-modifier DI + NP may have different roles
  (bare post-modification e.g. attacco di panico [*panic attack*], to complement e.g. l’ipotesi di acquisto [*the hypothesis of buying*])

Idiomatic expressions and collocations: only the first NP + feature *mw*
<event> = ADJECTIVE

- Only predicative adjectives
  - Non persistent properties
  - Properties temporally bounded
  - Complements of copulative constructions when expressing beliefs, opinions, commitments, knowledge etc.
<event> = PPs

- PPs are annotated as events only when the PP express an event e.g. a bordo (*on board*), a giudizio (*on trial*),.. 
  - constructions of the kind PREP + EVENT, where EVENT can be annotated as <event> on its own are not event realized by PP
<event> = copula

- The verb “essere” (to be) can be used as
  - auxiliary: active voice of movement verbs + passive voice transitive ones
  - copular contruction
- the verb “essere” has always to be marked up
- the complements only when the conditions described for NPs, ADJs, PPs apply
<event> : attributes

- List of attributes that apply in Italian larger:
  - class
  - tense
  - aspect
  - pos
  - polarity
  - vForm: superficial form of the verb; NONE, INFINITIVE, GERUND, PARTICIPLE
  - mood: category of verbs; SUBJUNCTIVE, CONDITIONAL, IMPERATIVE, NONE
  - modality: applies to the modal verbs and to modal periphrases
<event> class

The 7 event classes are:

REPORTING: *say, tell, report, state…*

PERCEPTION: *see, hear, view, listen…*

ASPECTUAL: *begin, finish, start…*

I_ACTION: *try, claim, avoid, delay…*

I_STATE: *think, want, desire…*

STATE: *on board, injured, peace…*

OCCURRENCE: *open, close, erupt…*

SEMANTIC CRITERIA (lexical meaning)

SEMANTIC (including lexical aspect) + SYNTACTIC CRITERIA
Goal: facilitate class identification

Solution: mapping of TimeML classes to an ontology-based lexical resource (SIMPLE/CLIPS)

the information from the ontology works like a default template window for event classification

the co-textual information may modify the default classification

development of heuristics for TimeML event classes based on the mapping

improvement of K value: \( 0.71 \rightarrow 0.84 \)
grammatical and relational criteria guide the annotation

modification to the tag extension due to language specific reasons:

- prepositions and modifiers which contributes to the normalization of the timex are included into the tag e.g.:

  <timex3>verso le 21.30</timex3>
  <timex3>l’anno in esame</timex3>
<timex3> (2)

- multiword timexes are annotated into a unique tag e.g.: *per ora*, *al momento*, *dopodomani*, *di recente*

- clock times composed by more than one token are annotated into a unique tag e.g.: *11 e 30*, *le 12 e mezza*.

- identification of special timex triggers e.g.: *ex*, *recente*, *attuale*, *corrente*, *passato* (ADJ), *presente* (ADJ), *futuro* (ADJ)...
<timex3>: normalization

- normalize up to the minimal granularity expressed by the superficial form of the timex:
  - next month (anchor = 2010-05-29)
    val = 2010-06 (NOT 2010-06-29)

- some timexes cannot be normalized, though they are annotated into a unique tag:
  - <timex3>la stagione calcistica 2009</timex3>
    type = DATE | val = ????
  vs
  - <timex3>l’anno fiscale 1992</timex3>
    type = DATE | val = FY1992

- introduction of special DATE values:
  - B = bimester
  - Qu = quadrimester
TempEval 2 – Italian data

- 71 articles – 31K tokens
- 7,215 <event> tokens
- 2,536 <timex3> tokens (NOT timexes)
- 1,738 <signal>
- 5,384 tlinks between events and DCT
- 994 tlinks between main events
- 534 tlinks between timex and event (same sentence)
TempEval 2 – Italian data (2)

- extensive evaluation of the specifications – IAA
- development of annotation specifications for tlink annotation:
  - tlink event-dct
  - tlink main events in consecutive sentences
  - tlink between event and timex in the same sentence
TempEval 2 – Italian data (3)

- IAA event detection (4 annotators + 2 judges)
  - $K = 0.83$ – $P & R = 0.84$

- IAA event attributes (2 annotators + 1 judge + mapping SIMPLE)
  - tense – $K = 0.95$
  - aspect – $K = 0.93$
  - **class** – $K = 0.83$
  - polarity – $K = 0.75$
  - pos – $K = 0.94$
  - vForm – $K = 0.93$

- IAA signal detection (4 annotators + 2 judges)
  - $K = 0.89$ – $P & R = 0.89$
TempEval 2 – Italian data (4)

- IAA timex detection (4 annotators + 2 judges)
  - $K = 0.95$ – P&R = 0.96

- IAA timex attributes (2 annotators + 1 judge)
  - type – $K = 0.96$
  - val – $K = 0.96$
  - quant – $K = 0.98$
  - mod – $K = 0.97$
  - freq – $K = 0.96$
  - beginPoint – $K = 0.90$
  - endPoint – $K = 0.89$
  - anchor – $K = 0.95$
TempEval 2 – Italian data (5)

- **tlink event-dct:**
  - finite verb forms in main sentences
  - subordinate events (verbs) have tlink = vague → inferrable from the relation between the main event and dct
  - modal + verb = same tlink
  - copula + complement = same tlink
  - nouns, adjectives and pps have tlink = vague, unless modified by a timex
  - events modified by a timex havs tlink with DCT according to the relation between timex - DCT
TempEval 2 – Italian data (6)

- tlink event-dct: figures
  - 1,190 before relations
  - 265 after relations
  - 2,930 vague relations (mainly NP, ADJ, and PP) → specifications
  - 1,038 overlap relations
  - 31 before-or-overlap
  - 8 overlap-or-after

- IAA
  - $K = 0.85$
TempEval 2 – Italian data (7)

- **tlinks main events**
  - specification for the identification of main events = syntactic NOT semantic
  - main events identified by means of a parser (Attardi-Dell'Orletta 2009)
  - main events in adjacent sentences = linear progression

- **tlink main events: figures**
  - 357 before relations (35.91%)
  - 218 after relations (21.93%)
  - 181 vague relations (18.20%)  
  - 238 overlap relations (23.94%)  
  \[
  \begin{align*}
  \text{non linear order} & \quad (64.07\%) \\
  \end{align*}
  \]

- **IAA:**
  - K = 0.59
TempEval 2 – Italian data (8)

- tlink event-timex
  - paraphrase tests to identify the tlink e.g.:
    
    Sono presidente da ieri \( [\text{I am president from yesterday}] \)
    
    The state of being president has begun yesterday
  
  - timex with scope over the sentence, only the main event is linked

  - coordinated events: only the first event is linked to the timex

  - non-verbal events are linked only when they are modified by a timex;

  - relative clauses are considered modifiers;
    “event_nonVerbal + relative clause + timex” = tlink (event_nonVerbal, timex)

  - a timex in a subordinated clause give rise to 2 tlinks:
    - sub_event - timex_sub;
    - main_event + timex_sub.
TempEval 2 – Italian data (9)

- tlink event-timex: figures
  - 12 before relations
  - 52 after relations
  - 362 overlap relations
  - 19 ended_by relations
  - 21 begun_by relations
  - 67 vague relations
  - 1 before-or-overlap

- IAA
  - relationToTime – K = 0.94
  - relatedToTime – K = 0.96
Italian TimeBank

- 172 articles
- 67,140 articles (ISST, PAROLE, Web)
- Maintainance of the specifications developed for:
  - Event detection
  - Event attributes
  - Timex detection
  - Timex attributes
  - Signal
- Introduction of new relations
- Extension of the specifications for tlink
Italian TimeBank (2)

- new relations:
  - event anaphora; new task, not related to the TimeML specifications
  - tlink between timexes

- extensions of previous relations:
  - tlink event-timex same sentence
    - all coordinated events take a tlink with the timex
    - timex main clause + explicit temporal subordinated clauses = tlink between the event(s) in the temp. sub. clause and the timex
    - no more link between timex_sub – main_event
## Italian TimeBank (2)

**tlink event-timex: figures**

<table>
<thead>
<tr>
<th>ITB part1 (28,463 tokens)</th>
<th>ITB part2 (20,293 tokens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>68 after</td>
<td>60 after</td>
</tr>
<tr>
<td>13 before</td>
<td>2 before</td>
</tr>
<tr>
<td>0 ended</td>
<td>10 ended</td>
</tr>
<tr>
<td>23 is_begun</td>
<td>17 is_begun</td>
</tr>
<tr>
<td>31 is_ended</td>
<td>25 is_ended</td>
</tr>
<tr>
<td>428 is_included</td>
<td>321 is_included</td>
</tr>
<tr>
<td>0 i_after</td>
<td>1 i_after</td>
</tr>
<tr>
<td>1 i_before</td>
<td>0 i_before</td>
</tr>
<tr>
<td>41 measure</td>
<td>14 measure</td>
</tr>
<tr>
<td>10 simultaneus</td>
<td>1 simultaneus</td>
</tr>
<tr>
<td>6 vague</td>
<td>7 vague</td>
</tr>
</tbody>
</table>
Italian TimeBank (3)

- specifications for tlink between events in the same sentence
  - main_V – sub_V
  - explicit tlink
  - causal relations
  - V_event – NP|PP|ADJ_event with explicit signal
  - NP|PP|ADJ_event - NP|PP|ADJ_event with explicit signal
  - coordinated events hierarchically ordered as they appear:
    E1, E2 and E3 -> E1 – E2; E2-E3…(NO E1-E3)

- tlink = identity relations
  - copula + complement
  - light verb constructions
Critical issues

- complex task: good strategy to create subtasks
- we are working on linear (i.e. non-structured) text: discourse structure may improve the identification of tlink
  - isn’t it circular? temporal relations may facilitate the identification of discourse structures
- syntactic criteria for main event detection is not satisfying: how to provide better (consistent) semantic criteria?
- narratives could improve tlink annotation and NO circularity seems to be involved
References
