ITERATION IN ITALIAN

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0. Introduction

Iteration and habituality phenomena are relevant with respect to Machine Translation since in some languages they are expressed by means of modifiers or are implicit in the context, while in others they affect the morphological form of verbs.

For example, English has an habitual form for the present tense which causes well-known translational problems. Another problematic case is represented by Greek, whose verbal paradigm is formed by two aspectual sub-systems, the aorist and the imperfective, which semantically correspond respectively to perfectivity and single or numerically definite occurrence of the predicate vs. imperfectivity or frequency indication\(^1\). As a consequence, in translation from other languages, e.g. Romance languages, sentences should be disambiguated not only as for perfectivity vs. duration, but also as for single or numerically definite occurrence of the predicate vs. frequency specification.

With respect to predicate iteration we can distinguish the following cases:

- **single occurrence**, corresponding to the adverbiaal *once*
- **cardinal quantification**, represented by expressions as "twice", "three hundred times", etc.
- **definite frequency**, corresponding to frequency indications of the type "twice a week", "every day", etc.
- **indefinite frequency**, corresponding to adverbials of the type "sometimes", "always", "rarely", etc.
- **habituality**, which defines a pragmatic norm about the frequency of occurrence of a specified event\(^2\).

Definite and indefinite frequency represent the more interesting cases, since they can either be explicit, i.e. marked by a temporal quantifier or a temporal quantifying clause, ex.\(^3\):

1) *John always carries his umbrella (when it rains)*
2) *John often carries his umbrella (when it rains)*
3) *John carries his umbrella whenever it rains*

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\(^1\) For a detailed description of Greek aspectual phenomena with respect to iteration, see e.g. Newton 1979.

\(^2\) Various definitions of habituality can be found e.g. in Vet 1980, van Eynade 1986 and many others. Here we only report an intuitive and short version of the one by Vet, who takes into account presuppositions and pragmatic factors related to temporal meaning.

\(^3\) Examples from Newton 1979.
or they can be **implicit**, i.e. completely ambiguous with respect to a single occurrence of the same predicate. In fact, a sentence can have an unambiguous iterative meaning even lacking a temporal quantifier or a temporal modifier whatsoever:

4) *John licked stamps from 8 to 9*
5) *John visited each of his aunts*

In other cases, iterative meaning is excluded with no need of specification:

6) *John likes fishing*

or the sentence can be perfectly ambiguous between a non-iterative and an iterative reading:

7) *John met all of his friends*

**Frequency** can be defined by distinguishing among the occurrence of an event and the **conditions** under which it can occur: frequency expresses in fact the rate of occurrence with respect to the given conditions, which can be either specified by a temporal quantifying clause or be implicit. On the other hand, the conditions can be interpreted as the **spatio-temporal location** of occurrence.

We will refer in our analysis to the following temporal representation of iteration following van Eynde 1985 and 1987:

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E

\[
\begin{array}{cccccccc}
   &   &   &   &   &   &   &   \\
   * & * & * & * & * & * & * & * \\
\hline
e & e & e & e & e & e & e & e
\end{array}
\]
```

in which **E** corresponds the the **frame-time**, i.e. the interval which contains all the instances of the event, **I** represents a set of

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4 Example 5) is from Stirling 1985.
5 Conditions determining frequency have been introduced in literature by Lewis 1975, and successively developed by Mourelatos 1981, which introduced the concept of **occasion**, and by Newton 1979, which introduced the concept of **scenario**.)
contiguous and non-overlapping interval of E which determine the frequency, and finally e specify the time of each occurrence of event and remain constant within the frame-time.

Implicitness (and therefore ambiguity) of iteration is caused by the fact that multiplicity of events does not always implies multiplicity of occasions (or spatio-temporal locations). In this respect, iteration is a particular case of distributivity, since it requires occasions to be different and sequentially ordered as in the given representation.

Implicitness is also produced by the relation existing between duration and iteration: iteration produces a durative situation by means of bounded, either durative or punctual internal situations.

As a consequence, many factors contribute to implicit iteration:
- **Aktionsart**
- **Tense**
- **Temporal location and duration modifiers**
- **Discourse Structure**
- **World Knowledge**

Aktionsart is relevant since it defines the possible or implied boundedness of predicates. On the other hand, tense, which combines the meaning of time and aspect, distinguishes durativity and perfectivity. Temporal adverbials add information concerning both boundedness and duration. World knowledge provides information related to standard duration of events, while discourse structure can specify many relevant factors as temporal reference, specificness vs. genericness of arguments, etc.

Here we will leave apart the last two mentioned factors and we will concentrate on the description of the basic cases of implicit and explicit iteration in Italian (as an example of Romance language). Our analysis will be limited to linguistic factors within the sentence domain, and will therefore take into account Aktionsart, verbal aspect and those classes of temporal adverbials which can explicit iterative meaning or contribute to it.

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7 For an analysis of relationships between distributivity and iteration see Stirling 1985. Longobardi 1987 gives a detailed description as for distributivity, iteration and quantifiers in Italian.
8 Cfr. Bennett et alii 1989 for the relationships between iteration and boundedness.
9 See Bertinetto 1986 for a discussion about 'durativity' of iteration.
10 See Vet 1980 and Borillo 1986 for classifications of temporal modifiers taking into account iteration problems.
11 See Nakhimovsky 1988 for a world knowledge approach to temporal phenomena.
12 See Newton 1979. for generic vs. specific interpretation of arguments.
1. Aktionsart and Iteration

A predicate in order to be iterated must be bound, i.e. it has to imply a culmination point, as events, or to admit a measurement of its duration, as processes which naturally cooccur with duration specifications 13.

As a consequence, states normally exclude iterative meaning:

8) Giovanni ama la lettura
   John likes reading

However, this cannot be taken as a general rule, since some predicates usually classified as states allow iterative reading when explicited by a temporal quantifier:

9) Giovanni è spesso malato
   John is often ill

10) Alle feste Giovanni sta sempre in piedi in un angolo
    At parties John always stands in a corner

This is the case of the so-called interval states14, which are usually interpreted as holding for a limited interval, and therefore admit duration specifications.

On the other hand, processes are very likely to be ambiguous between an iterative and a durative reading, since they have unspecified but measurable duration, and therefore they can either be interpreted as durative or as bound:

11) Giovanni corre
    John is running/runs

12) Giovanni studia
    John is studying/studies

In these cases, as will be shown in the section on temporal adverbials, duration specification can help disambiguating only on the basis of world knowledge.

Finally, events as well can be ambiguous with respect to iteration:

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13 See Bennett et alii 1989.
14 See Bennett et alii 1989.
13) **Giovanni mangia una mela**  
*John is eating/eats an apple*

but we should distinguish between **non-punctual** events, which are compatible with duration specifications of the type "*in two hours*, "*in ten minutes*", etc., and **punctual** events which are not compatible with any duration specification.

Non punctual events cause ambiguity with respect to iteration, especially in case of plural objects, due to the distributive/collective ambiguity problem (as in the case of ex. 7). In many cases only pragmatic factors can be source of disambiguation.

Punctual events, on the other hand, usually have a clearly iterative meaning in contexts where duration is specified, i.e. a specification of duration forces iteration with these predicates, as in the case of ex. 4). Iterative meaning can however unambiguously result from arguments quantification combined with the predicate semantics:

14) **Tutti i bravi studenti si laureano**  
*All good students get a degree*

Some events, however, can be interpreted as giving rise to a consequent state which admits duration and therefore iteration (see Borillo 1986):

15) **Giovanni si ferma per 3 ore**  
*John stops for 3 hours*
2. Tense and Iteration

Italian has a tense system very similar to French. It shows three time meanings, present, past and future, and three main aspectual meanings, perfective, durative and perfect: the perfect/non-perfect opposition holds for present, past and future, while the perfective/imperfective opposition is morphologically realized only in the past.

All tenses are compatible with implicit iteration. However, the combination of Aktionsart and aspectual meaning poses constraints on the iterative interpretation, since durative aspect can force iterative meaning. In particular:

- perfective and perfect aspect are compatible with iterative meaning in combination with processes and events; most frequently in these cases iteration is explicited by some quantifying expression. E.g.:

16) Giovanni ha corso (tutti i giorni) perfect
   John ran (every day)

17) Giovanni ha letto un libro (tutti i giorni) perfect
   John read a book (every day)

- imperfective aspect produces ambiguity between a durative and an iterative reading in combination with processes and non-punctual events:

18) Giovanni mangiava (tutti i giorni) imperfective
   John ate (every day)

19) Giovanni scriveva una lettera (tutti i giorni) imperfective
   John wrote a letter (every day)

while with punctual events it forces iterative meaning, since these predicates are not normally compatible with duration:

20) Giovanni dimenticava il suo numero di telefono imperfect.
   John kept forgetting his telephone number
3. Temporal Modifiers and Iteration

In this final section we deal with temporal modifiers and their relation with iteration. Two classes of temporal expression can be distinguished:

- modifiers which contribute with Aktionsart and aspect to implicit iterative meaning
- temporal quantifiers and quantifying expressions which explicitly express iteration.

The first class can be further subdivided into **time-indicators** and **frame-time indicators**. Time-indicators correspond to locational time adverbials of the type "at 8 o' clock", "on Monday", etc. With respect to iteration these adverbials refer to event-time of each occurrence of the event within the sequence, and therefore are compatible with iterative meanings in all contexts:

21) *Il bambino cena alle sette.*
   *The baby dines at seven o'clock*

22) *In Agosto Giovanni va al mare.*
   *In August John goes to the seaside*

23) *Di lunedì l lunedì David lavorava fino a tardi.*
   *On Mondays David worked until late*

In ex. 23) unambiguous iterative meaning is given by the PP "di lunedì" ("on Mondays"), which combines temporal indication with frequency, i.e. it means "once a week on a specific day".

Frame-time indicators express the whole interval during which a sequence of iterated events takes place. They can either be represented by simple temporal location adverbials, for example "last week", "in the 18th century", etc., or by duration adverbials.

Temporal location adverbials are therefore ambiguous between simple time and frame-time indication. Disambiguation purely depends on pragmatic factors, i.e. the length of the interval and the commonsense knowledge about the duration of the event expressed by the predicate:

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15 In this section Rosita Rosini is responsible for the part dealing with modifiers which contribute with some others factors to implicit iteration and Rita Benamor for the part dealing with temporal quantifiers and quantifying expressions.
16 Clock-calendar adverbs in Smith 1981.
24) L'anno scorso giocavano a scacchi  
    Last year they played chess

25) Lo scorso lunedì giocavano a scacchi  
    Last Monday they played chess

    The same problem occurs with PP of the type "durante NP"  
    ("during NP"):

26) Durante la festa Maria ha mangiato molti dolci  
    During the party Mary ate many cakes

    When the NP in the during-PP has plural number, it indicates a  
    sequence of occasions and therefore it becomes a frequency  
    indicator. E.g.:

27) Durante le feste Maria mangia molti dolci  
    During parties Mary eats many sandwiches

    Duration expression of the type "per NP" ("for NP")  
    unambiguously determine iteration in combination with events  
    which do not accept duration specifications:

28) David si è fermato davanti a quella vetrina per tre anni.  
    David has stopped in front of that shop-window for three years

29) Il film è stato proiettato per un anno.  
    The film was shown for an year

    while with processes they cause ambiguity:

30) Giovanni ha corso per un anno/un'ora  
    John has run for a year/an hour

    Finally, boundary adverbials as e.g. "a lungo" ("for a long  
    time"/"often") also produce ambiguity and cause the additional  
    problem of lexical translation into English:

31) L'abbiamo visto a lungo.  
    We saw him often/for a long time

32) A lungo Giovanni ha preso le sue vacanze in Agosto.  
    John has often taken his holidays in August
Temporal quantifiers can either express **cardinal quantification** or **frequency**\(^\text{17}\). Cardinal quantification is expressed by Nps of the form "*Num volte*" ("*Num times*") and is always explicit:

33) *Il progetto è stato analizzato quattro volte.*

The project has been analysed four times.

Frequency on its turn can be **definite** or **indefinite**. As already mentioned, frequency usually implies defining a set of possible spatio-temporal locations which can be explicitly expressed by means of a modifier clause of the type "*quando CL*" ("*when/whenever CL*"), "nel momento i cui CL" ("*at the moment in which CL*"), etc., but also by a distributive NP with temporal meaning of the type "*ogni lunedi*" ("*every Monday*"), "*all'anno*" ("*every year*"), etc.. Definite frequency implies distribution over spatio-temporal location, e.g. "*tre volte l'anno*" ("*three times every year*"), while indefinite frequency can express **universal**, **existential** or **non-standard** quantification\(^\text{18}\), e.g. "*sempre*" ("*always*"), "*spesso*" ("*often*"), "*qualche volta*" ("*sometimes*"), "*raramente*" ("*rarely*"), etc.\(^\text{19}\):

34) *Giovanni va spesso al cinema.*

John often goes to the cinema.

35) *Gli utilizatori devono poter accedere (...) a tutte le fonti di informazione (...) nel momento in cui risultano necessarie.*

The users should be able to get (...) to all the information sources (...) in the moment in which they will be necessary.

36) *Ogni anno la commissione distribuirà i fondi.*

Every year the comission will distribute the funds

We don't take into account here the case of the adverbial "*mai*" ("*never*") expressing zero-frequency. Instead we will analyze in some detail the adverbial "*sempre*", which is in itself ambiguous between a duration and a frequency meaning. In combination with events it clearly expresses iteration:

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\(^{17}\) Mourelatos 1981 divides temporal modifiers into 'cardinal count adverbials' and 'frequency adverbials', without taking into account the distinction between definite and indefinite frequency.

\(^{18}\) See Lewis 1975.

\(^{19}\) Ex. 35) is extracted from the EUROTRA Esprit Corpus.
37) Giovanni compra sempre macchine tedesche.
    John always buys german cars.

38) Maria nota sempre come sono vestite le persone.
    Mary always notices the way people are dressed.

39) Giovanni si sveglia sempre di notte.
    John always wakes up during the night.

while with processes it is ambiguous between a durative and an
iterative reading unless a temporal clause specify the multiple
occurrence:

40) Giovanni dorme sempre
    John always sleeps/is still sleeping

41) David disegnava sempre mentre era al telefono.
    David always drew while he was on the phone.

42) David disegna sempre mentre è al telefono.
    David always drew while he was on the phone.

Another interesting adverbial is "ancora", which also shows a
lexical ambiguity with respect to English: it can be translated into
"still" or into "again" according to the durative or iterative reading.
It cannot however be properly defined as a frequency adverbial20:

43) Giovanni si é fermato ancora davanti a quella vetrina.
    Peter stopped again at that shop-window.

44) Giovanni si ferma ancora davanti a quella vetrina.
    Peter stops again at that shop-window.

45) Maria fa ancora la spesa.
    Mary is shopping again.
    Mary is still shopping.

Finally, we should mention some adverbials with non properly
temporal meaning, which nevertheless imply a frequency of
occurrence, as e.g. "abitualmente" ("usually"), "frequentemente"
("frequently"), etc.:

20 Vet 1980 classifies the French adverbial "encore," corresponding to
"ancora", as a presuppositional adverbial.
46) Abitalmente vado in vacanze a Luglio.
I usually go on holiday in July

47) Giovanni beve frequentemente vino durante i pasti.
John frequently drinks wine with his meals.

Some other adverbials of this type are ambiguous between a
distributive and an iterative reading, e.g. "sistematicamente" ("systematically"), "regolarmente" ("regularly"), "periodicamente" ("periodically"), etc.21:

48) Le proposte sarranno sistematicamente analizzate.
The proposals will be systematically analysed.

49) Giovanni va regolarmente al cinema.
John goes regularly to the movies.

50) Periodicamente appariranno inviti pubblici a presentare
proposte.*
Periodically public invitations to present proposals will appear.

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21 Ex. 50) is extracted from the EUROTRA Esprit Corpus.