ISO-Space Annotation Guidelines
Pilot Annotation

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1 Introduction

This is a companion document to the ISO-Space Specification, version 1.6.

ISO-Space is an emerging standard for the annotation of spatial and spatiotemporal information. These guidelines provide details on how to apply the specification to a text as well as how to use MAE, an annotation environment, for ISO-Space annotation.

This document is organized as follows: Sections 2, 3, and 4 are divided into subsections covering the different extent tags. In each subsection, first, we describe what should be captured by each tag (the extent) and then we explain what additional information must be supplied (the attributes for that tag). Section 5 then explains how to annotate spatial relationships by constructing links between tagged extents. Section 7 outlines a phased approach for dividing the annotation task. Section 8 provides fully annotated examples and some discussions of the annotation decisions involved. Note that when examples are given in this document, they are shown using a predicate argument structure for readability. That is, the tagged extent is marked in the example text as [**extent**$_{id\#}$] and then the attributes assigned for that tag are listed separately in a format such as TAG_TYPE(`id`=`id#`, `attribute1`=VALUE, `attribute2`=VALUE, ...). When an attribute does not receive a value or the default value is assigned, it may not be included in the briefer examples in Sections 2-5. In Section 9 we list some heuristics and other generally helpful tips. Finally, Section 10 provides directions on how to use MAE for ISO-Space annotation.

It is important to note that these guidelines were created for a pilot annotation project begun in the summer of 2012. That is to say that they are somewhat task specific. When using ISO-Space for other tasks, it may be necessary to modify these guidelines.

2 Places, Paths, and Spatial Named Entities

2.1 Places

The PLACE tag is used in ISO-Space to annotate geographic entities and regions like *lakes* or *mountains* as well as administrative entities like *towns* or *countries*. This tag is predominantly inherited from SpatialML, but, for the purposes of this Pilot Annotation, PLACE tags will be manually annotated as follows.

2.1.1 Place Extents

In general, places are referred to explicitly in language such that there is a text extent to capture, i.e., consume, with a PLACE tag. A place is generally a noun phrase (NP) and, in this Pilot Annotation, only the head nouns of NPs should be marked. The examples in (1) show some PLACE extents that should be captured with this tag. Notice that in (1c), the extent includes both *Boston* and *MA*. This could be annotated with two PLACE tags, but, since it is really describing only one location, it is preferred to keep this as one PLACE extent.

(1) a. [**Boston**$_{pl1}$] is north of [**New York**$_{pl2}$].

b. John entered the [**store**$_{pl3}$].

c. [**Boston, MA**$_{pl4}$] – It was reported today that...

d. [**Back Bay**$_{pl5}$] is also served by Amtrak...

e. My father flew to [**Managua**$_{pl6}$] with a silly looking bicycle.

2.1.2 Place Attributes

The majority of attributes for the PLACE tag (shown in Table 1) are inherited directly from SpatialML. For the most part, the annotator in this Pilot Annotation does not need to fill in values for these attributes with the following exceptions.

Attribute	Value
`id`	`pl1`, `pl2`, `pl3`, ...
`type`	BODYOFWATER, CELESTIAL, CIVIL, CONTINENT, COUNTRY, GRID, LATLONG MTN, MTS, POSTALCODE, POSTBOX, PPL, PPLA, PPLC, RGN, ROAD, STATE, UTM
`form`	NAM or NOM
`continent`	AF, AN,AI, AU, EU, GO, LA, NA, PA, SA
`country`	a two letter ISO 3166 country code See `http://www.iso.org/iso/country_codes/iso_3166_code_list/`.
`state`	a principal subdivision of a country like state, province or parish, again following ISO 3661.
`county`	a subdivision below the state level
`ctv`	CITY, TOWN or VILLAGE
`gazref`	gazetteer name plus a colon plus an identifier, e.g., IGDB:2104656
`latLong`	a coordinate from the gazetteer
`elevation`	a MEASURE ID
`mod`	a spatially relevant modifier
`dcl`	TRUE or FALSE (default: FALSE)
`countable`	TRUE or FALSE
`amount`	a quantificational constraint
`quant`	a generalized quantifier
`scopes`	an ID of a location/entity/event tag that is the *scopee* in a $scopes(scoper, scopee)$ relation

Table 1: PLACE Tag Attributes

The first exception for this Pilot Annotation is the `form` attribute. Annotators for this Pilot Annotation should mark whether the extent of a PLACE is a nominal form as in *the mountain* or a named location as in *Mount Everest*. This is done using the `form` attribute with the values NOM and NAM, respectively.

The second attribute that annotators should fill is the `elevation` attribute. This attribute takes a MEASURE ID[1] if a location's elevation is established as in *The city of Zacatecas, at 8,000 feet ...* This is an optional attribute, thus if no explicit elevation is mentioned in the text, the annotator should leave this attribute unspecified.

[1]Refer to Section 4.2 for more details regarding the MEASURE tag

The `mod` attribute is used to capture cases like *tall mountain*, *upper observation deck*, and *longest lake*, where *tall*, *upper*, and *longest* do not constrain the location of the location but they do contribute spatial information. The following is a list of scalar adjectival terms in English that may act as spatial modifiers, however it is not intended to be an exhaustive list of modifiers, and it's possible that these terms may not always act as modifiers: *long, short, tall, low, high, deep, shallow, thin, narrow, wide, upper, lower, inner, outer, inland, near, far, northern*. Remember that it is only the head of an NP that gets tagged as a PLACE extent in ISO-Space, but the modifier should also be noted in the `mod` attribute as shown in example (2a) below. Like the `elevation` attribute, if no spatially relevant modifier is mentioned, this attribute should be left unspecified.

The `dcl` attribute is used to specify the Document Creation Location (DCL). The DCL is a special location that the author must declare as the location where the text was written. Such a location is often used in newswire text. Any given text can have at most one DCL and the default value for this attribute is set to FALSE. If the annotator can determine that a locatin tag is the DCL, the value of the `dcl` attribute for the first instance of that location should be set to TRUE and, from that point on, no other location tag in the text can also be declared the DCL even if the same location is referenced later in the text. Example (2b) shows an example where it would be appropriate to mark a PLACE tag as the DCL. Note that the second reference to *Boston* in this example is not the DCL.

The `countable` attribute is used to distinguish between countable (e.g., *continents, countries, cities, suburbs, towns, parks, lakes, islands, ...*) and uncountable (e.g., *highlands, foothills, waters, backcountry, countryside, ...*) locations. Note that these are not exhaustive lists, and in fact, in English, it is possible to coerce many countable terms to act like mass terms. Annotators should make their decisions for this attribute based on the context. Refer to Sepcial Section 6 for a more complete explanation of the `countable`, `amount`, `quant` and `scopes` attributes.

Sometimes it is necessary to create non-consuming PLACE tags for locations when they are referred to indirectly in the text. For further details regarding non-consuming tags refer to Special Section 2.5.

(2) a. John visited the tall [**building**$_{pl1}$].
PLACE (`id`=`pl1`, `form`=NOM, `mod`="tall")

b. [**Boston, MA**$_{pl2}$] – It was reported today in [**Boston**$_{pl3}$] that...
PLACE (`id`=`pl2`, `form`=NAM, `dcl`=TRUE)
PLACE (`id`=`pl3`, `form`=NAM, `dcl`=FALSE)

c. [**It**$_{pl4}$] contains 1.2 million square feet (111,484 square meters) of commercial and retail [**space**$_{pl5}$].
PLACE (`id`=`pl4`, `form`=NOM)
PLACE (`id`=`pl5`, `form`=NOM)

d. The new [**skyscraper**$_{pl6}$] at [**111 Huntington Avenue**$_{pl7}$] was completed in 2002...
PLACE (`id`=`pl6`, `form`=NOM)
PLACE (`id`=`pl7`, `form`=NAM)

e. [**The Plaza de Armas**$_{pl8}$] is one of the most visited places in [**Cochabamba**$_{pl9}$]
PLACE (`id`=`pl8`, `form`=NAM)

PLACE (id=pl9, form=NAM)

f. There are two [**Dunkin' Donuts**$_{pl10}$] in the [**area**$_{pl11}$].
PLACE (id=pl10, form=NAM, countable=TRUE)
PLACE (id=pl11, form=NOM, countable=TRUE)

2.2 Paths

The PATH tag captures locations where the focus is on the potential for traversal or the location functions as a boundary. This includes common nouns like *road*, *river*, and *border* as well as proper names like *Route 66* and *Kangamangus Highway*. The distinction between places and paths is not always clear-cut. Take for example the case of *river* in *follow the river* and *cross the river*. The first case clearly is a path, but one could argue that in the second case the traversal functionality is not accessed and therefore *river* could be annotated as a PLACE. While the inferences that can be made with both places and paths are actually identical, it is important for inter-annotator agreement to try to apply a diagnostic test in order to determine if a location should be tagged as a PLACE or a PATH.

One useful heuristic is the "*be-at/take*" test. That is, while you can *be at* a place or path location, you can only *take* or *follow* a path. In general, for this Pilot Annotation, we are looking for consistency such that when an annotator comes across something like a *road* that typically has the potential to be traversed or followed the annotator need not consider whether that particular road is actually functioning more like a place in that particular context. For example, *roads, rivers, alleys, walls, stairways, shorelines, ridgelines* and *mountain ranges*, among other locations, should be consistently marked with the PATH tag for this round of annotation.

2.2.1 Path Extents

Paths occur within noun phrases, and, consistent with the PLACE tag, only the head of the NP should be captured as the extent for the PATH tag. Note that the PATH tag in ISO-Space is only used to capture static, non-stative paths. Stative or dynamic event-paths are captured using the MOTION tag[2]. As an example, *trip* in *the trip from Los Angeles to Hollywood* would not be tagged as a PATH, but *road* in *the road from Los Angeles to Hollywood*, would.

2.2.2 Path Attributes

PATH tags have some overlapping attributes with the PLACE tag. The PATH attributes are shown in Table 2.

Though it is possible for paths to be continuous loops, they typically have endpoints. Those endpoint locations may not be explicit in the text, however. Example (3a) illustrates a PATH tag for which the endpoints happen to be explicit and (3b) shows a case where the endpoints are unspecified.

(3) a. the [**railroad**$_{p1}$] between [**Boston**$_{pl1}$] and [**New York**$_{pl2}$]
PATH (id=p1, beginID=pl1, endID=pl2, form=NOM)

[2]Refer to Section 3.2 for more details regarding the MOTION tag.

Attribute	Value
id	p1, p2, p3, ...
type	BODYOFWATER, MTS, ROAD
beginID	ID of a location/entity/event tag whose location is a bounding point for the PATH
endID	ID of a location/entity/event tag whose location is a bounding point for the PATH
midIDs	ID(s) list of midpoint locations
form	NAM or NOM
gazref	gazetteer name plus a colon plus an identifier, e.g., IGDB:2104656
latLong	a coordinate from the gazetteer
elevation	a MEASURE ID
mod	a spatially relevant modifier
countable	TRUE or FALSE
amount	a quantificational constraint
quant	a generalized quantifier
scopes	an ID of a location/entity/event tag that is the *scopee* in a $scopes(scoper, scopee)$ relation

Table 2: PATH Tag Attributes

b. We descended into a long [**valley**$_{p2}$].
PATH (id=p2, form=NOM, mod="long")

In such a case as example (3a), the annotator should include the IDs for the relevant end point locations as values for the appropriate attributes in the PATH tag. Some paths may even have an explicit midpoint as shown in example (4a) below. PATH tags also have the optional mod attribute as in examples (3b) and (4b).

(4) a. John took the [**road**$_{p1}$] through [**Boston**$_{pl1}$].
PATH (id=p1, midIDs=pl1, form=NOM)

b. The car took the upper [**ramp**$_{p1}$].
PATH (id=p2, form=NOM, mod="upper")

c. The police assured me that the [**road**$_{p1}$] ahead was safe during the day, but that is also what we had heard of the [**road**$_{p2}$] behind.
PATH (id=p3, form=NOM, mod="ahead")
PATH (id=p4, form=NOM, mod="behind")

The form attribute indicates whether the PATH is a nominal form as in *road* or a named path as in *Massachusetts Avenue*. The remaining attributes are the same as those for the PLACE tag considering PATH tags are a special kind of PLACE. Refer to Section 2.1.2 for detailed explanation of the elevation, mod, countable, and quant attributes. Also, like PLACE tags, it is possible to have non-consuming PATH tags (i.e., ones that do not have an extent in the text associated with them)[3].

[3]Refer to Special Section 2.5 for more details regarding non-consuming tags.

2.3 Spatial Named Entities

A spatial named entity in ISO-Space is generally anything that is spatially relevant but that does not fit into either the PLACE or PATH categories. In order to be considered spatially relevant, the entity must be both located in real-space and participate in an ISO-Space link tag. In practice, moving objects and objects that have the potential to move are most commonly tagged as a SPATIAL_NE. For example, *car* in both of the examples in (5) should be marked as a SPATIAL_NE. In the first case, it is the mover and, in the second case, it behaves like a PLACE. Note, though, that it should still be annotated as a SPATIAL_NE and not be annotated as a PLACE since cars still have the potential for movement.

(5) a. The [**car**$_{sne1}$] drove down the street.

b. [**John**$_{sne1}$] arrived at the [**car**$_{sne2}$].

c. My [**father**$_{sne1}$] and [**I**$_{sne2}$] biked for two days.

d. Two [**men**$_{sne1}$] with machetes and masks jumped out of the forest.

2.3.1 Spatial Named Entity Extents

The same extent rules apply for SPATIAL_NE as do for PLACE and PATH. I.e., only the head of the NP should be captured as the extent.

2.3.2 Spatial Named Entity Attributes

Because tagging something as a spatial named entity is akin to treating it like a location, the SPATIAL_NE tag shares some attributes with PLACE and PATH. The list of SPATIAL_NE attributes is shown in Table 3.

Attribute	**Value**
`id`	`sne1`, `sne2`, `sne3`, ...
`form`	NAM or NOM
`latLong`	a coordinate
`mod`	a spatially relevant modifier
`countable`	TRUE or FALSE
`amount`	a quantificational constraint
`quant`	a generalized quantifier
`scopes`	an ID of a location/entity/event tag that is the *scopee* in a *scopes*(*scoper*, *scopee*) relation

Table 3: SPATIAL_NE Tag Attributes

For the Pilot Annotation, annotators do not need to fill the `latLong` attribute, but the remaining attributes will require annotation. The `form` attribute should be used to specify whether the SPATIAL_NE is a proper name or a nominal. If a spatially relevant modifier is present, it should be entered as the value for the `mod` attribute. The `countable` attribute is used to distinguish between countable (e.g., *people, cars, ships, planes*) and uncountable (e.g.,

water, oil, sand, concrete) entities. To reiterate, this is context-dependent. The `quant` attribute takes a generalized quantifier. Refer to Sepcial Section 6 for a more complete explanation of the `countable`, `amount`, `quant` and `scopes` attributes.

(6) a. [**John**$_{sne1}$] visited Boston.
SPATIAL_NE (`id`=`sne1`, `form`=NAM, `countable`=TRUE)

b. Two [**cars**$_{sne2}$] are parked on the street.
SPATIAL_NE (`id`=`sne2`, `form`=NOM, `countable`=TRUE)

c. Two [**men**$_{sne3}$] with machetes and masks jumped out of the forest.
SPATIAL_NE (`id`=`sne3`, `form`=NOM, `countable`=TRUE)

d. The [**dogs**$_{sne4}$] in Costa Rica are more likely to chase [**cyclists**$_{sne5}$]
SPATIAL_NE (`id`=`sne4`, `form`=NOM, `countable`=TRUE)
SPATIAL_NE (`id`=`sne5`, `form`=NOM, `countable`=TRUE)

e. So much [**oil**$_{sne6}$] had been extracted from the ground...
SPATIAL_NE (`id`=`sne6`, `form`=NOM, `countable`=FALSE)

2.4 Special Section: Metalinks

Often, in natural language texts, the same named entities are referenced multiple times or a group of entities is created or split. These relationships between spatial named entities are not really spatial in nature, but it is important to keep track of them nonetheless. To do this, the METALINK tag is used.

METALINK[4] is an all purpose tag for relating ISO-Space entities in a non-spatial way. It can be used for any kind of ISO-Space entity (e.g., places, paths), but its current intended purpose is for relating spatial named entities such as the ones in example (7) below.

At present, there are three METALINK attributes as shown in Table 4.

Attribute	**Value**
`id`	`meta1`, `meta2`, `meta3`, ...
`objectID1`	ID of a location/entity/event tag
`objectID2`	ID of the related location/entity/event tag
`relType`	COREFERENCE, PART_OF

Table 4: METALINK Attributes

The key attribute here is `relType`. The value for this attribute describes the relationship that the entities in `objectID1` and `objectID2` share. When the entities refer to the same object, the COREFERENCE value should be used. When a group of entities is created or split, the PART_OF value is appropriate. Notice that the larger group should be stored in `objectID1`. Example (7) includes several cases of METALINK annotations.

[4]In the Pilot Annotation, we are not going to be using METALINK tags. They are included for completeness.

(7) a. Two [**cars**$_{sne1}$] are on the street. [**One**$_{sne2}$] turns left.
SPATIAL_NE(id=sne1, form=NOM, countable=TRUE)
SPATIAL_NE(id=sne2, form=NOM, countable=TRUE)
METALINK(id=meta1, objectID1=sne1, objectID2=sne2, relType=PART_OF)

b. [**John Smith**$_{sne3}$] left Boston. [**John**$_{sne4}$] arrived in New York.
SPATIAL_NE(id=sne3, form=NAM, countable=TRUE)
SPATIAL_NE(id=sne4, form=NAM, countable=TRUE)
metalink(meta2, objectID1=sne3, objectID2=sne4, relType=COREFERENCE)

c. [**John**$_{sne5}$] and [**Mary**$_{sne6}$] met at the store. [**They**$_{sne7}$] went shopping.
SPATIAL_NE(id=sne5, form=NAM, countable=TRUE)
SPATIAL_NE(id=sne6, form=NAM, countable=TRUE)
SPATIAL_NE(id=sne7, form=NOM, countable=TRUE)
METALINK(id=meta3, objectID1=sne7, objectID2=sne5, relType=PART_OF)
METALINK(id=meta4, objectID1=sne7, objectID2=sne6, relType=PART_OF)

d. [**The Prudential Tower**$_{pl1}$], also known as [**the Prudential Building**$_{pl2}$] or, colloquially, [**The Pru**$_{pl3}$]...
PLACE(id=pl1, form=NAM, countable=TRUE)
PLACE(id=pl2, form=NAM, countable=TRUE)
PLACE(id=pl3, form=NAM, countable=TRUE)
METALINK(id=meta5, objectID1=pl1, objectID2=pl2, relType=COREFERENCE)
METALINK(id=meta6, objectID1=pl2, objectID2=pl3, relType=COREFERENCE)
METALINK(id=meta7, objectID1=pl1, objectID2=pl3, relType=COREFERENCE)

e. [**I**$_{sne8}$] biked with [**Gregg**$_{sne9}$] and [**Brooks**$_{sne10}$] for one more day. [**We**$_{sne11}$] climbed over the mountains.
SPATIAL_NE(id=sne8, form=NOM, countable=TRUE)
SPATIAL_NE(id=sne9, form=NAM, countable=TRUE)
SPATIAL_NE(id=sne10, form=NAM, countable=TRUE)
SPATIAL_NE(id=sne11, form=NOM, countable=TRUE)
METALINK(id=meta8, objectID1=sne8, objectID2=sne11, relType=PART_OF)
METALINK(id=meta9, objectID1=sne9, objectID2=sne11, relType=PART_OF)
METALINK(id=meta10, objectID1=sne10, objectID2=sne11, relType=PART_OF)

2.5 Special Section: Non-consuming Tags

Annotators may encounter situations where a spatially relevant location or entity is referenced indirectly. In such situations, it is possible to create so-called 'non-consuming' tags in order to generate tag IDs which can then be filled as attributes for other tags or participate in links where appropriate. At this time, the only non-consuming tags which are allowed by the ISO-Space specification are PLACE and PATH tags.

Normally, for 'consuming' tags, there is some word or string in the text which is associated with the tag (called the tag's extent). Non-consuming tags are named as such because they have no associated extent in the text which is 'consumed'. That is to say, the extent of a non-consuming tag is a 'null' string.

Generally, non-consuming tags are not necessary to capture relevant spatial objects and relations. For this reason, non-consuming tags will be a tag of last resort, and thus, should be used sparingly. If an annotator is considering using a non-consuming tag, it may be worth reconsidering if there is anything spatially relevant being described at all or whether there is an extent that was missed.

That said, the following are situations where the use of non-consuming tags is necessary:

1. ***Locations referenced by a* MEASURE.** When a relevant location is referenced indirectly by an elevation that will be captured as a MEASURE tag[5], a non-consuming PLACE tag can be used so that its PLACE ID may fill an attribute for other tags or links. In cases such as (8b) where the MEASURE is not clearly an elevation, an MLINK[6] that links the non-consuming PLACE to some other object will be necessary.

   (8) a. John climbed to [**9,000 feet**$_{me1}$]. [$\varnothing_{pl1}$][7]
   PLACE (`id`=`pl1`, `elevation`=`me1`)

   b. We camped [**three miles**$_{me2}$] from the [**river**$_{p1}$]. [$\varnothing_{pl2}$]
   PLACE (`id`=`pl2`)
   MEASURE (`id`=`me2`, `value`=6, `unit`=miles)
   MLINK (`id`=`ml1`, `figure`=`pl2`, GROUND=`p1`, `relType`=DISTANCE, `val`=`me2`)

2. ***Locations implied by 'cross' and 'across'.*** When the path traversed by an object 'crosses' a region, but there is no explicit PATH in the text, the use of non-consuming PLACE tags may be appropriate. This may occur in cases of CROSS class MOTION events. It also may be necessary in instances where some location is 'across' from another relative to some reference location. In example (9a), the event-path, that is, the path traversed by *John*, is interpreted as entirely within the *town*, so the `source`, and `goal` for the MOVELINK[8] that would be triggered by the motion event *walked* must be created by the annotator. These IDs of these non-consuming PLACE tags can then participate in links with the PLACE tag for *town*. The QSLINK tags[9] `qsl1` and `qsl2` illustrate this. Then the non-consuming PLACE tag IDs are linked to the *town* and each other via an OLINK to establish a 3-way relation such that, relative to the *town* (`pl2`), `pl3` is *across* from `pl2`.

   (9) a. John walked across [**town**$_{pl1}$]. [$\varnothing_{pl2}$] [$\varnothing_{pl3}$]
   PLACE (`id`=`pl1`)
   PLACE (`id`=`pl2`)
   PLACE (`id`=`pl3`)
   QSLINK (`id`=`qsl1`, `relType`=IN, `figure`=`pl2`, GROUND=`pl1`)
   QSLINK (`id`=`qsl2`, `relType`=IN, `figure`=`pl3`, GROUND=`pl1`)
   OLINK (`id`=`ol1`, `relType`="ACROSS", `figure`=`pl3`, `ground`=`pl1`,
   `frame_type`=RELATIVE, `referencePt`=`pl2`)

[5]Refer to Section 4.2 for more details regarding the MEASURE tag
[6]Refer to Section 5.4 for more details regarding MLINK tags.
[7]The symbol $\varnothing$ is used here to indicate a non-consuming tag.
[8]Refer to Section 5.3 for further details regarding MOVELINK tags.
[9]Refer to Section 5.1 for further details regarding QSLINK tags.

b. The [**forest**$_{pl4}$] sits across the [**border**$_{p1}$]. [$\varnothing_{pl5}$]
PLACE (id=pl4)
PATH (id=p1)
PLACE (id=pl5)
OLINK (id=ol2, relType=ACROSS, figure=pl4, ground=p1,
frame_type=RELATIVE, referencePt=pl5)

3 Events and Motions

3.1 Events

The term "event" is borrowed directly from TimeML. It has the following definition:

> *Event* is used as a cover term for situations that *happen*, *occur*, *hold*, or *take place*. Events can be punctual (10) or last for a period of time (11).

(10) a. Ferdinand Magellan, a Portuguese explorer, first **reached** the islands in search of spices.

b. A fresh flow of lava, gas and debris **erupted** there Saturday.

(11) a. 11,024 people, including local Aeta aborigines, **were evacuated** to 18 disaster relief centers.

b. "We're **expecting** a major eruption," he said in a telephone interview early today.

c. Tropical Depression Seven **formed** Wednesday in the far eastern Atlantic.

For the purposes of ISO-Space, the EVENT tag captures TimeML events that are spatially relevant in that ***they are directly related to another ISO-Space element by way of a link tag but that do not involve movement***. In this Pilot Annotation, TimeML events will not be pre-annotated, so it will be up to the annotator both to identify when something is an event and when it is deemed spatially relevant.

3.1.1 Event Extents

The following information on EVENT extents is taken directly from the TimeML Annotation Guidelines. This information is meant to help identify events in general, but, remember that for ISO-Space, only events that are spatially interesting should be tagged. For the pilot annotation, annotate an EVENT if all of the following hold: the EVENT is directly, spatially related to a PLACE, PATH, SPATIAL_NE or other EVENT or MOTION, and the EVENT advances the narrative. E.g., *party* in *the party lasted for hours* wouldn't be annotated as an EVENT (at least not without further context), but in *the party on the roof lasted for hours* it would be. Additionally, for the purposes of ISO-Space, emotional states should not be tagged as an EVENT since such eventualities do not exist in "real space" (i.e., emotions should be considered non-spatial even if they are associated with an "experiencer" that is a spatial entity).

TimeML events are always single tokens (words) in the text. For example, in the phrase *may not leave*, only **leave** is actually tagged as an event while the modality and polarity markers are represented as attributes for that event. So, we say that the *head* of the expression is what is actually marked up. In the examples that follow, the actual extent of the event is in **boldface** and the rest of the expression, whether in be a verb phrase, noun phrase, or some other construction, is surrounded by square brackets.

As always, it is a good idea to be thinking ahead to the next part of the annotation as you mark event extents. Remember that events must participate in some kind of TimeML link. The discussion and examples below should help you identify event extents in most cases, but, if you are unsure about a particular event candidate, think about how it would be anchored to a time or ordered relative to other events in the annotation.

Events denoted by VERBS**.** We consider that all verbal predicates express an event and hence will be marked up as such, including those which denote states. In the following examples, the event extent to be marked appears in bold.

(12) a. The citizens of Loudon county [**embrace**] religious and human freedom.

b. Amir, 27, [is **serving**] a life sentence for the November 1995 assassination of Rabin at a Tel Aviv peace rally.

c. President Clinton [**says**] he and Blair [will **stand**] together not just on Iraq but also on arresting the terrorists.

d. We [are **going**] [to **maintain**] our forces in the region for the foreseeable future.

e. "Some of these bands of kidnappers [are **made** up] of foreigners," Toledo [**said**].

f. Only Saudi Arabia [**has**] more oil reserves.

g. With Kuwait now [**annexed**], Iraq [has **control**] of 20 percent of the world's oil reserves.

h. Israel [has been **scrambling**] [to **buy**] more masks abroad, after a shortage of several hundred thousand gas masks.

For simple VPs (13a), the event tag covers just the verbal head, as stipulated by the general rule. As in several of the above examples, when a complex VP (13b) is present (i.e. the verb is accompanied by auxilliaries and related particles), the event extent is again only the head of the VP. The same is true for phrasal verbs (13c) as well as idioms (13d). Additional examples of each of these constructions are shown below:

(13) a. A fresh flow of lava, gas, and debris [**erupted**] there Sunday.

b. Amir [may have been **trying**] [to **impress**] Har-Shefi.

c. Additional distribution centers would be [**set** up] next week.

d. Even more hard drives [**kick** the bucket].

Events denoted by NOUNS**.** Not all nouns are considered TimeML events. A nominal event must be able to appear in at least two of the following contexts:

- NOUN lasted for several seconds/minutes/days/years/...
- NOUN was very fast/immediate/...
- NOUN took/takes/will take place in TEMPORAL EXPRESSION
- NOUN began/continued/ended in TEMPORAL EXPRESSION

Event-denoting nouns will be marked up according to the following guidelines:

1. ***Prenominal modifiers.*** Event-donoting nouns acting as prenominal modifiers, like those underlined below, are NEVER annotated as events.

   (14) a. Many of the same reactions occur in a [panic attack].
   b. The likely shape of the [leadership contest] emerged yesterday as Labour began an inquest on its [election defeat].

   The same policy applies for present participle forms as in:

   (15) a. the waiting room
   b. knitting needle
   c. shooting match
   d. drinking problem

2. ***Sortal states.*** Sortal states are generally expressed by:

   - Agentive nominals; that is, nouns referring to the agents of certain activities or actions. In most cases they correspond to deverbal nouns (e.g., *employer, winner, customer*), but not always (e.g., *passenger, pedestrian*).
   - Nouns denoting professions, roles, or positions (e.g., *doctor, plumber, CTO, scholar*).
   - Rigid designators; that is, terms referring to the same entity in all possible worlds; e.g., *the 3rd president of America*.

   These elements will be annotated as events ONLY when functioning as the head of a *predicative complement*. A predicative complement expresses a predication and is the complement of a verb belonging to one of the classes listed below, among others. In the examples that follow, the predicative complement is in square brackets and the sortal state in bold face.

   - Copulative predicates (e.g., *to be, seem*, etc.)–underlined below.
     (16) Currently she is [**President** of the Macedonian Teachers Association in Victoria].
   - Inchoative predicates (e.g., *become*). They express the coming to existence of a situation.

(17) In 1821 Simn Bolvar became [the first **president** of the Republic of Bolivia].

- Aspectual predicates (e.g., *begin, continue, end, finish*, etc.).

  (18) He continued as [**director** of research at the Bell Telephone. Laboratories established in 1925].

- Change of state predicates, that is, any predicate expressing the coming to be or ending of the position expressed by the sortal state, such as *retire, appoint, elect, resign*, etc.

  (19) In 1998 she retired as [a **professor** emeritus of mathematics].

- Predicates of evaluation and description (e.g., *consider, describe, depict, evaluate*, etc.).

  (20) Daimler is considered [the first **inventor** to have invented a practical internal-combustion engine].

3. ***All other event-denoting nouns.*** will ALWAYS be marked as events. For example:

   (21) a. An **embargo** on Iraq could plunge the U.S. into a **depression** and the rest of the world into an economic **crisis**.

   b. The economic **chokehold** appears to be working.

   c. Through the Pope, Cuba can begin a more productive **relationship** with the world.

   d. The men explained that that was an **attack** by masked individuals.

   e. Here again, it was the democratic government that quickly became a **threat** to the United States.

   f. Moscow depicted the **situation** as a **conflict** between "the forces of democracy and progress against those of reaction."

4. ***Multiword nomial events.*** The event tag extends only over the head noun, disregarding any determiners, specifiers, complements, or modifiers, as in the following examples:

   (22) a. [The financial **assistance** from the World Bank and the International Monetary Fund] are not helping.

   b. [The Pope's **visit**] will persuade a great many more Cubans to break loose of the Cuban government.

   The same policy is used for named events such as *the Vietnam **War*** and *the Industrial **Revolution***. Finally, as was seen in the examples for sortal states, only the head noun of the construction is tagged as the event.

Events denoted by ADJECTIVES**.** Adjectives generally express a property or attribute of an entity, and as such, they denote an event of a stative nature. Adjectives can appear in attributive or predicative position. *Attributive adjectives* function as premodifiers of the noun:

- **furious** reaction

- **unbearable** pain
- **fair** trial
- **beautiful** garden

On the other hand, *predicative adjectives* act as the predicative complement of a verb belonging to one of the types listed below, among others. In the examples, the main verb is underlined and the predicative adjective is in bold face.

- Copulative predicates (e.g., *be, seem*, etc.).

  (23) The students seemed **exhausted** after three weeks of classes.

- Inchoative predicates (e.g., *become, turn into*). They express the coming to existence of a situation.

  (24) The Chinese dissident said he left China because his life became **unbearable** there.

- Aspectual predicates (e.g., *begin, continue, finish, terminate*, etc.).

  (25) Families kept **hopeful** and many did see the return of their loved ones.

- Causative predicates (e.g., *cause, make*, etc.).

  (26) Dan Hollander, skater and entertainer, really made the audience **happy**.

- Change of state predicates in general.
- Predicates of perception (e.g., *look, hear*, etc.).

  (27) Ellen DeGeneres and Portia de Rossi looked **ecstatic** as they married in an intimate ceremony on Saturday.

- Predicates of evaluation and description (e.g., *consider, describe, present*, etc.).

  (28) He is often characterized as **eccentric**.

When annotating adjectives, the following guidelines apply:

1. ***Attributive adjectives.*** NO adjective in attributive position will be marked up as an event.
2. ***Predicative adjectives.*** We will only annotate as events those predicative adjectives that express a non-persistent property of the entity denoted by the noun.

There are indeed many properties of entities that can be considered as non-persistent. People, for instance, can change their nationality and cars can be painted into a color different that their original one. According to these considerations, the adjectives *Senegalese* in (29a), and *red* in (29b) should be marked up as events.

(29) a. Most of the people aboard were **Senegalese**, including many schoolchildren.

b. The defendants car was **red**.

However, we will ONLY annotate those adjectives satisfying at least one of the following conditions:

1. The property they denote is clearly fluid, non-persistent, such as *red* in (30a) but not in (30b).

   (30) a. Nycks face turned **red** with shame and anger.

   b. The defendants car was **red**.

2. The property is presented as temporally bound to a particular point or period of time as in (31).

   (31) France was**under-developed** in the eighteenth century, and Germany at the beginning of the nineteenth.

3. The property is presented as the opinion, knowledge, or belief of somebody, or as a matter under discussion; e.g., *Senegalese* in (32a) but not in (32b).

   (32) a. The government claims that some abductees are themselves **Senegalese**.

   b. Most of the people aboard were **Senegalese**, including many schoolchildren.

Some cases may be hard to evaluate. **As a general rule, in case of doubt, do NOT annotate adjectives as events**.

Events denoted by PPs**.** PPs denoting events will be annotated ONLY when functioning as predicative complements. This involves PPs that are complement of verbs belonging to the types listed below, among others. The PP in each example is in square brackets while the actual extent of the event is in boldface.

- Copulative predicates (e.g., *be, seem*, etc.).

  (33) No woman has been [**in** charge] of a mission until now.

- Inchoative predicates (e.g., *become*). They express the coming to existence of a situation.

  (34) As a boy, he was an excellent horseman and also became [**on** good terms] with a tribe of Sioux Indians.

- Aspectual predicates (e.g., *begin, continue, finish, end*, etc.).

  (35) The US economic and political embargo has kept Cuba [**in** abox].

- Causative predicates (e.g., *cause, force, put*).

  (36) She says this puts the very existence of women [**at** the hands of their husbands].

Note that when an event is epxressed by means of a PP, **only the head preposition is annotated as the event**. Note that not all PPs which denote events will have its preposition head tagged as such, but the verb, noun, or adjective head of the complement of that preposition instead, whenever this is the element conveying the event. We mark up the head preposition only *in case the verb, noun, or adjective head within the PP does not denote the event itself.* The

following are examples where the element to be tagged as an event is the head of the preposition complement (boldface), and not the preposition (underlined). Example (37a) illustrates the case for verbs, (37b) for nouns, and (37c) for adjectives.

(37) a. He glared at Conroy [without **seeing** him] and charged back.

b. The programme began [with an **interview** with someone from that TV series].

c. He is often characterized [as **eccentric**].

Events denoted by OTHER ELEMENTS**.** Events can also be referred to by other elements, most typically locative adverbs such as *here* and *there*. They will be marked up only when functioning as a predicative complement.

(38) a. We're **there** to stay for a fairly lengthy period.

b. We are **here** because what happens on this island will also have an impact on the United States.

Complex event constructions. It is often the case that multiple events are mentioned in the same construction. In some cases, both of these are verbs, but it is also possible for NPs, APs, and PPs to be involved. We now discuss some of the most common of these constructions.

1. **Aspectual Constructions.** These consist of an aspectual verb (e.g., *begin, stop, end, keep*) or noun (*beginning, ending*), and an event-denoting complement, which can be expressed by either a VP (39a-b) or an NP (39c). BOTH the aspectual predicate and its complement will be tagged as independent events. In the sentences below, the aspectual predicate is in bold face, its complement head in italics, and the two elements to annotate are delimited by square brackets. The sentences in (39) illustrate cases in which the aspectual predicate is a verb, whereas the sentences in (40) exemplify cases involving aspectual nouns.

(39) a. US did not [**stop**] [*interfering*] in other countries' policies.

b. They probably would have [**began**] [*responding*] to President Reagan's 600 ships plan with new construction.

c. In 1939, Bohannon [**began**] the [*construction*] of Hillsdale.

(40) a. The banks must wait at least 30 days before [**closing**] the [*purchase*].

b. The [**outbreak**] of holy [*war*] could bring thousands of Americans home in coffins.

c. Mr. Bush and his aides were leaning toward a military [**conclusion**] of the [*crisis*].

2. **Inchoative Constructions.** Inchoative constructions in English express the coming to existence of a situation. They generally involve the presence of verbs like *become* and *get*, in addition to their complement, which denotes the resulting situation or process. BOTH the inchoative predicate (in bold face) and the complement expressing the resulting situation (in italics) will be annotated as events:

(41) a. They aren't being allowed to leave and could [**become**] [*hostages*].

b. The President Ilham Aliyev [**got**] [*acquainted*] with reconstruction works in Vahid garden and National Park.

c. The public clamor was so great that they [**got**] [*scared*] and a substitute was adopted appointing a committee to investigate the property.

3. **Causative Constructions.** Causal constructions involve one of the following causative predicates, or similar ones, in their causative senses: *cause, stem from, lead to, breed, engender, hatch, induce, occasion, produce, bring about, produce, secure.* Two different constructions can be distinguished here:

(a) **EVENT**$_{e_1}$ ***cause***$_{e_2}$ **EVENT**$_{e_3}$**.** The causal expression (e_2), its logical subject (e_1) and its event complement (e_3) are ALL tagged as independent events–indicated with square brackets in the example below.

(42) The [**rains**$_{e_1}$] [**caused**$_{e_2}$] the [**flooding**$_{e_3}$].

(b) **ENTITY** ***cause***$_{e_1}$ **EVENT**$_{e_2}$**.** BOTH the causal expression (e_1) and its event complement (e_2) are tagged as independent events.

(43) John [**caused**$_{e_1}$] the [**fire**$_{e_2}$].

4. **Light Verb Constructions.** These involve a verb of very light semantic content (e.g., *make, get, do, have, take, put, set, let*) and a nominal event acting as its selected complement. In these situations, BOTH the verbal and nominal elements are tagged as events. Below, the light verb is in bold face whereas the nominal is in italics.

(44) a. Several pro-Iraq [*demonstrations*] have [**taken**] place in the last week.

b. They will definitely [**take**] into [*consideration*] our readiness.

5. **Copulative Constructions.** Copulative constructions are VPs headed by verbs like *be* or *seem*, and which have an NP (45a), AP (45b), or PP (45c) as complement. In these constructions, BOTH the verbal predicate and the predicative complement will be marked up. All of the involved elements (verb, NPs, APs, or PPs) will be annotated according to the rules specified in the previous sections. In the examples above, the copulative predicate is in bold face, its complement head in italics, and the elements to annotate are delimited with square brackets.

(45) a. An eminent Indian origin woman [**is**] the new [*head*] of the British Medical Association.

b. If, in spite of everything, we will not [**be**] [*ready*], we will ask the United States to delay the operation.

c. Zarei [**was**] [*in*] charge of a program to clean cities from corruption.

The primary reason for annotating both the copula and its complement in TimeML is so that later processing of the document can assign a particular attribute or property to a particular entity. For example, the *woman* in (45a) is assigned the property of being the *head of the British Medical Association.* While TimeML itself says nothing about this connection, it is useful to have both events tagged for making this connection at a later time.

6. **Constructions with Functional Nouns.** Examples of functional nouns are: *temperature, size, weight, population, intensity*, etc. They take an individual as argument (denoting, e.g., a person, physical location, group of individuals, etc.) and return a specific value on an appropriate scale, which can be numeric or not (e.g., *high, low; big, small; hot, cold*; etc.). Functional nouns can appear in three different constructions. In all of them, the funtional noun will be marked up as event, together with the main verb of its main clause. Some examples are provided below for different types of constructions, where all the markable expressions are in square brackets. In addition, the functional noun is in bold face and the main verbal predicate of its clause, in italics.

   (a) **NOUN**$_{functional}$ ***is*** **X.**

   (46) a. The current USA [**population**] [*is*] above 300 million.
   b. An appraisal of the house indicated its market [**value**] [*is*] $150000.

   (b) **INDIVIDUAL *has* a NOUN**$_{functional}$ **of X.**

   (47) a. Catalonia [*has*] a [**population**] of around 7 million people.
   b. This noise originated from cosmic radiation and [*had*] a [**temperature**] of 3 K.

   (c) **NOUN**$_{functional}$ ***changes/raises/drops/increases/...*** **(from X) (to Y).**

   (48) In the nine months, [**net**] [*rose*] 4.3% to $525.8 million, from $504.2 million last year.

   As with copulative constructions, constructions with functional nouns have no additional TimeML annotation, but both elements are annotated to allow for easy annotation at a later stage of the functional noun to its given value.

3.1.2 Event Attributes

Since events are really the responsibility of TimeML, there are no additional attributes to annotate in ISO-Space. For this Pilot Annotation, simply capture the extent with the EVENT tag. This will generate an ID that can then be used to relate the event to other ISO-Space elements.

3.2 Motions

A MOTION is a special kind of EVENT that involves a change of location. Note that every MOTION tag will participate in a relation with whatever participates in the motion event. That is to say, in creating a MOTION tag you are also comitting to also creating at least one MOVELINK for that MOTION. MOTION events receive special attention in ISO-Space since they are inherently spatial and they come in three varieties.

1. Bare Manner of Motion:
   e.g., *John walked.*

2. Path Motion:
   e.g., *John left home.*

3. Compound Motion:
   e.g., *John left home running.* or *John walked home.*

These different types of motion are reflected in the attributes as described in Section 3.2.2.

3.2.1 Motion Extents

When identifying motion events, follow the same extent rules for any TimeML event. Annotate an EVENT as a MOTION only if it passes the EVENT tests and it involves a change of location in "real space" (or in the case of STAY class motions, involves a lack of change of location in "real space"). E.g., *followed* in *David followed the map* would not be annotated as a MOTION, but in *David followed the road* would it would be.

3.2.2 Motion Attributes

Table 5 shows the attributes for the MOTION tag. As usual, the `id` attribute is automatically generated, but the annotator should fill in values for the remaining attributes.

Attribute	**Value**
`id`	`m1`, `m2`, `m3`, ...
`motion_type`	MANNER, PATH, COMPOUND
`motion_class`	MOVE, MOVE_EXTERNAL, MOVE_INTERNAL, LEAVE, REACH, DETACH, HIT, FOLLOW, DEVIATE, CROSS, STAY
`motion_sense`	LITERAL, FICTIVE, INTRINSIC_CHANGE, SIMULATED
`countable`	TRUE or FALSE
`amount`	a quantificational constraint
`quant`	a generalized quantifier
`scopes`	an ID of a location/entity/event tag that is the *scopee* in a *scopes*(*scoper*, *scopee*) relation

Table 5: MOTION Tag Attributes

The `motion_type` attribute refers to the distinction mentioned earlier in this section. Bare manner of motion events (those with the value MANNER) are quite rare in the corpus. In order to receive this value, there can be no indication of the source (starting location) or goal (ending location) of the movement. PATH and COMPOUND motion events are far more likely to appear in the corpus.

MOTION tags of the PATH `motion_type` are those that have an explicit component of the path of motion evident in the text, but that have no indication of the manner in which the change of location takes place. The examples in (49) are all PATH motion events.

(49) a. John [**left**$_{m1}$] the room.

b. John [**arrived**$_{m2}$] at the party.

c. John [**left**$_{m3}$].

d. John [**arrived**$_{m4}$].

e. Danielle was [**headed**$_{m5}$] west-northwest at near 17 mph (28 kph).

f. Projections show Danielle [**nearing**$_{m6}$] the Bermuda area by Sunday morning.

Notice that event examples (49c) and (49d) are considered PATH motions, though there are no explicit locations given as the `source` or the `goal`. This is because certain predicates are always interpreted as PATH motion events even if the PATH information is implicit (e.g., LEAVE class motion events require a `source` which is PATH information). When the `source`, `goal`, `midPoints`, or `ground` locations are not made explicit, we naturally figure out what it should be using context. The same can be said for example (49b) with the `goal` location. You can tell when you are dealing with such a predicate if you find yourself looking for missing information. That is, if you read the sentence *John left*, it is natural to wonder *left where? Leave* and *arrive* will be common PATH motion events in the corpus, so you should consistently tag them as such, even when the `source`, `goal` etc. are not explicit.

MOTION tags of the MANNER `motion_type` capture what are known as "bare-manner" motion events, and they are a rarer type of motion event, at least in English. These are motion events where no explicit path of motion is evident, but the manner of motion is indicated. The following examples in (50) illustrate MOTION tags of the MANNER `motion_type`.

(50) a. John [**ran**$_{m1}$] five miles yesterday.

b. John [**bikes**$_{m2}$] seriously.

c. The arrow [**flew**$_{m3}$] straight and true.

d. John [**took**$_{m4}$] the bus.

Note the light verb construction in (50d). Light verbs can act as motions, and in this case, *took* expresses no manner information by itself. In this case, the presence of the motion ADJUNCT[10] *the bus*, provides the manner component of motion.

The most common value for the `motion_type` attribute is COMPOUND. A COMPOUND motion event has characteristics of both PATH and MANNER motions. Sometimes the MANNER of motion will be encoded in the verb itself while path information will appear as an ADJUNCT. However, some motion verbs conflate path and manner without any ADJUNCT. Bare-manner motion verbs can also coincide with an ADJUNCT that encodes path information. In still another case, multiple motion adjuncts may provide both path and manner information. The sentences in (51) provide examples of MOTION tags with the COMPOUND `motion_type`.

(51) a. John [**biked**$_{m1}$] from Virginia to Oregon.

b. John [**left**$_{m2}$] the concert on foot.

c. John [**went**$_{m3}$] through the tunnel on his bike.

d. John [**caught**$_{m4}$] a taxi home.

[10]Refer to Section 3.3 for further details regarding ADJUNCTS tags

The values for the `motion_class` attribute are each associated with a spatial event structure that specifies the spatial relations between the arguments of the motion at different phases of the event. For example, a REACH motion such as *arrive* involves a pre-state in which the mover is not at the `goal` location and a post-state in which the mover is at the `goal` location. Table 6 provides examples of the different `motion_class` values and illustrates the associated event structures. Although example motion verbs have been listed in Table 6, the class of motion is context-dependent, and annotators should not necessarily annotate instance of the same motion verb with the same `motion_class` value.

If a MOTION's `motion_class` is MOVE then the path of motion is underspecified. The MOVE class, as such, is a base-case, the event structures of all other classes are more specific. Annotating a MOTION with `motion_class` MOVE_EXTERNAL stipulates that at every phase of the event the `mover` and `ground` are disconnected (i.e., in terms of qualitative spatial relations (QSRs[11]) it holds that DC(`mover`, `ground`)). MOVE_INTERNAL stipulates that at every phase of the event it holds that IN(`mover`, `ground`). LEAVE stipulates that at the beginning of the event it holds that IN(`mover`, `source`), and at the end of the event it holds that DC(`mover`, `source`). REACH stipulates that at the beginning of the event it holds that DC(`mover`, `goal`), and at the end of the event it holds that IN(`mover`, `goal`). DETACH stipulates that at the beginning of the event it holds that EC(`mover`, `source`), and at the end of the event it holds that DC(`mover`, `source`). HIT stipulates that at the beginning of the event it holds that DC(`mover`, `goal`), and at the end of the event it holds that EC(`mover`, `goal`). FOLLOW requires that the identifier of the PATH traversed by the `mover` participant is filled for the `pathID` attribute. This is a shortcut for specifying that, essentially, the event-path for the motion is identical, or is a part of the PATH whose ID is filled in the `pathID` attribute. CROSS stipulates that at the beginning of the event it holds that IN(`mover`, `source`), after the beginning of the event it holds that IN(`mover`, `midPoints`), and at the end of the event it holds that IN(`mover`, `goal`). STAY stipulates that some qualitative spatial relation or orientation relation (or both) between the `mover` and `ground` continuously holds during the event. For all classes it holds during the middle of the event that IN(`mover`,`midIDs`).

Value	**Event Structure**
MOVE	$_{begin}[location\_of(\texttt{mover})] \not\sim {}_{end}[location\_of(\texttt{mover})]$
MOVE_EXTERNAL	$_{begin...end}[\{\text{DC},\text{EC}\}(\texttt{mover},\texttt{ground})]$
MOVE_INTERNAL	$_{begin...end}[\text{IN}(\texttt{mover},\texttt{ground})]$
LEAVE	$_{begin}[\text{IN}(\texttt{mover},\texttt{source})]$, $_{end}[\{\text{DC},\text{EC}\}(\texttt{mover},\texttt{source})]$
REACH	$_{begin}[\text{DC}(\texttt{mover},\texttt{goal})]$, $_{end}[\text{IN}(\texttt{mover},\texttt{goal})]$
DETACH	$_{begin}[\text{EC}(\texttt{mover},\texttt{source})]$, $_{end}[\text{DC}(\texttt{mover},\texttt{source})]$
HIT	$_{begin}[\text{DC}(\texttt{mover},\texttt{goal})]$, $_{end}[\text{EC}(\texttt{mover},\texttt{goal})]$
FOLLOW	$_{begin...end}[path\_of(\texttt{mover}) \sim \texttt{pathID}]$
DEVIATE	$_{begin}[path\_of(\texttt{mover}) \sim \texttt{pathID}]$, $_{end}[path\_of(\texttt{mover}) \not\sim \texttt{pathID}]$
CROSS	$_{begin}[\text{IN}(\texttt{mover},\texttt{source})]$, $_{mid}[\text{IN}(\texttt{mover},\texttt{midPoints})]$, $_{end}[\text{IN}(\texttt{mover},\texttt{goal})]$
STAY	$_{begin...end}[\{\{\text{RCC8}+\},\{\text{OLINK}\}\}(\texttt{mover},\texttt{ground})]$

Table 6: `motion_class` Event Structures

[11]Refer to Table 11 in Section 5.1 for further details regarding QSRs.

The `motion_sense` attribute distinguishes between different kinds of interpretations of motion events. The LITERAL sense covers motion verbs that describe temporal or dynamic changes of location. The FICTIVE sense covers motion verbs that describe atemporal or static paths. The INTRINSIC_CHANGE sense attribute covers motion verbs that describe a temporal or dynamic change in the intrinsic, spatial configuration or structure of an object. Table 7 lists some examples of each of the senses of motion.

Motion Sense Value	Examples
LITERAL	*John biked*, *the ball rolled*, *the balloon rose*
FICTIVE	*the river ran*, *the road climbed*, *the mountains rose*
INTRINSIC_CHANGE	*the shadow shrank*, *the glacier crept*, *the river rose*

Table 7: `motion_sense` Attribute Values

3.3 Motion Adjuncts

In the ISO-Space specification, a motion adjunct is a prepositional word or phrase, or other satellite that supplies additional path or manner information about a motion event.[12] The ADJUNCT tag captures these motion adjuncts by specifying path or manner of motion information. Motion adjuncts of type PATH contribute information about the path of motion, and include prepositions like *to* and *from*. Adjuncts of type MANNER supply manner of motion information (e.g., *by car*). The IDs of ADJUNCT tags are eventually used to fill the `adjunctID` attribute for MOVELINK tags. Note that prepositions which function as spatial signals in some contexts, may act as motion adjuncts in others (e.g., *in* acts as a PATH type ADJUNCT–not a SPATIAL_SIGNAL–in Example (54c)).

3.3.1 Adjunct Extents

When an ADJUNCT supplies PATH information, the extent of the tag should be limited to the preposition or satellite itself. Example (52) illustrates a sentence where the entire extent of the prepositional phrase *to the store* is not tagged–only *to*.

(52) John walked [**to**$_{a1}$] the store.

When a COMPOUND type MOTION appears as in example (53) where the ADJUNCT supplies MANNER information, the entire extent of the prepositional phrase is tagged as the ADJUNCT.

(53) John left the garage [**by car**$_{a2}$].

3.3.2 Adjunct Attributes

Adjuncts have only two relevant attributes:

Annotators must choose whether the `adjunct_type` is PATH or MANNER:

[12] The specification originally treated adjuncts as a type of SPATIAL_SIGNAL. For more information about SPATIAL_SIGNAL tags refer to Section 4.1.

Attribute	Value
id	a1, a2, a3, ...
adjunct_type	MANNER, PATH

Table 8: Attributes for ADJUNCT

1. MANNER: Used when the ADJUNCT supplies information about the MANNER of the MOTION it is associated with

2. PATH: Used when the ADJUNCT supplies information about the PATH of the MOTION it is associated with

Example (54) shows the attribute values for the above examples.

(54) a. John walked [**to**$_{a1}$] the store.
ADJUNCT(id=a1, adjunct_type=PATH)

b. John left the garage [**by car**$_{a2}$].
ADJUNCT(id=a2, adjunct_type=MANNER)

c. John arrived [**in**$_{a3}$] Boston.
ADJUNCT(id=a3, adjunct_type=PATH)

It may not always be obvious when a preposition is acting as an ADJUNCT or a SPATIAL_SIGNAL. Annotators should consider what semantic information the preposition is contributing. Note in Example (54c) that *in* is acting as a motion adjunct in this context. Although the preposition *in* may act as a SPATIAL_SIGNAL in other contexts, in this instance it is supplying path of motion information about a motion event–namely *arrived*. In the case of Example (54c), *in* is identifying the goal location–namely *Boston*. Adjuncts never contribute qualitative or quantitative relational information–this is the job of the SPATIAL_SIGNAL tag.

4 Spatial Signals and Measurements

4.1 Spatial Signals

A SPATIAL_SIGNAL is a word that supplies information to spatial link. For example, the spatial signals are highlighted in each of the sentences in (55).

(55) a. The cup is [**on**$_{s1}$] the table.

b. Boston is [**north of**$_{s2}$] New York.

c. Danielle was headed [**west-northwest**$_{s3}$] at near 17 mph (28 kph).

d. The new skyscraper [**at**$_{s4}$] 111 Huntington Avenue was completed in 2002, [**directly across**$_{s5}$] the street from The Colonnade Hotel.

In general, spatial signals are prepositions or prepopistional phrases that reveal the particular relationship between two ISO-Space elements, thereby helping the annotator decide what

kind of links should be used and what the values for attributes in those links should be. Recall that ADJUNCT tags and SPATIAL_SIGNAL tags have different functions in ISO-Space. `spatial_signal` tags always supply information about topological or qualitative spatial relations between other ISO-Space elements. ADJUNCT tags capture information specifically about the path or manner of a motion event.

4.1.1 Spatial Signal Extents

The extents for spatial signals are usually one word prepositions and are generally easy to spot. For more examples, see (55) above.

4.1.2 Spatial Signal Attributes

Spatial signals have three attributes associated with them, as shown in Table 9.

Attribute	Value
`id`	`s1`, `s2`, `s3`, ...
`cluster`	identifies the sense of the preposition
`semantic_type`	DIRECTIONAL, TOPOLOGICAL, DIR_TOP

Table 9: Attributes for SPATIAL_SIGNAL

Of these attributes, only `semantic_type` must be filled in by the annotator for this Pilot Annotation. The `semantic_type` refers to what kinds of ISO-Space links are introduced by the spatial signal. This attribute has three possible values as follows:

1. DIRECTIONAL: Introduces an OLINK (refer to Section 5.2)
2. TOPOLOGICAL: Introduces a QSLINK (refer to Section 5.1)
3. DIR_TOP: Introduces both a QSLINK and an OLINK

Example (56) shows the attribute values for the above examples.

(56) a. The cup is [**on**$_{s1}$] the table.
SPATIAL_SIGNAL(`id`=`s1`, `semantic_type`=DIR_TOP)

b. Boston is [**north of**$_{s2}$] New York.
SPATIAL_SIGNAL(`id`=`s2`, `semantic_type`=DIRECTIONAL)

c. Danielle was headed [**west-northwest**$_{s3}$] at near 17 mph (28 kph).
SPATIAL_SIGNAL(`id`=`s3`, `semantic_type`=DIRECTIONAL)

d. The new skyscraper at 111 Huntington Avenue was completed in 2002, [**directly across**$_{s4}$] the street from The Colonnade Hotel.
SPATIAL_SIGNAL(`id`=`s4`, `semantic_type`=DIR_TOP)

The remaining attribute, `cluster`, will not be used for this Pilot Annotation. This attribute refers to the sense of the spatial signal as it appears in a sense inventory. It is expected that the signal's sense will indicate what ISO-Space links are introduced by the signal. So, in the future, the annotator won't have to fill in the `semantic_type` attribute if he or she knows the sense number for the signal. For now, though, you should ignore this attribute.

4.2 Measures

A MEASURE is a special kind of specific kind of spatial signal that captures distances and dimensions and introduces a metric link (i.e. an MLINK[13]). MEASURE tags consist of a numerical component and a unit component as shown in the examples below.

4.2.1 Measure Extents

The extent for the MEASURE tag includes the numerical component and the unit component. The sentences in example (57) each contain a MEASURE tag.

(57) a. John walked for [**5 miles**$_{me1}$].

b. The field is [**100 yards**$_{me2}$] long.

c. Danielle's center was about [**710 miles**$_{me3}$] ([**1,145 kilometers**$_{me4}$]) east of the northern Leeward Islands.

d. At a mere [**25 stories**$_{me5}$], it is overshadowed by the other two.

4.2.2 Measure Attributes

The attributes for the MEASURE tag are fairly straightforward as shown in Table 10. The `value` attribute should have a numerical value for the numerical component of the MEASURE. The unit of measurement should be stored in the `unit` attribute, as shown in example (58).

Attribute	Value
`id`	`me1`, `me2`, `me3`, ...
`value`	number component
`unit`	measurement phrase component

Table 10: Attributes for MEASURE

(58) a. John walked for [**5 miles**$_{me1}$].
MEASURE (`id`=`me1`, `value`="5", `unit`="miles")

b. The field is [**100 yards**$_{me2}$] long.
MEASURE (`id`=`me2`, `value`="100", `unit`="yards")

c. Danielle's center was about [**710 miles**$_{me3}$] ([**1,145 kilometers**$_{me4}$]) east of the northern Leeward Islands.
MEASURE (`id`=`me3`, `value`="710", `unit`="miles")
MEASURE (`id`=`me4`, `value`="1145", `unit`="kilometers")

d. At a mere [**25 stories**$_{me5}$], it is overshadowed by the other two.
MEASURE (`id`=`me5`, `value`="25", `unit`="stories")

[13]Refer to Section 5.4 for more details regarding MLINK tags.

e. The city has sunk [**6 meters**$_{me6}$] over the past decade.
MEASURE (`id`=`me6`, `value`="6", `unit`="meters")

Note in example (58e) that the MEASURE tag `value` attribute is not negative. In such cases the directionality is contributed by the motion verb *sunk*, not the MEASURE tag. The MEASURE only specifyies a dimenion of the event-path which cannot be negative. Note, however that the `value` attribute for MEASURE tags may take a negative value when identifying elevations when specified as an offset on some scale (e.g., *500 ft below sea level* would necessitate a `value` of "-500"). Annotators should not fill separating commas (or other extraneous notation) in attributes which hold with numerical values. E.g., in (58c), the `value` for `me4` is "1145" not "1,145". For non-integer numerical values, use decimal notation, not fractions (e.g., "0.5" not "1/2").

5 Spatial Relationships

Thus far, all of the tags that have been discussed, with the exception of METALINK tags, have involved tagging some spatially relevant span of text. The remainder of the ISO-Space tags capture information about spatial relationships between those tagged elements. There are four ISO-Space link tags, not counting METALINK, which is not spatial in nature. The link tags are:

1. QSLINK – qualitative spatial links;
2. OLINK – orientation information;
3. MOVELINK – movement links;
4. MLINK – defining the dimensions of a location.

Each of these links captures unique information about the relationships shared between spatial objects. Note that ISO-Space links have no extents themselves. Links typically hold the IDs of two spatial objects, the IDs of any other tags that supply further information to the link, and some additional attributes for describing the nature of the relationship between the objects mentioned in the link. In a way, the tags discussed in previous sections in this document can be thought of as "ingredients" for creating these links.

The remainder of this section describes each of the four ISO-Space links in detail. In addition, the examples in this section are more complete so they should provide additional information for the ISO-Space extent tags as well.

5.1 Qualitative Spatial Links

A qualitative spatial link captures the topological relationship between two spatial objects. For this reason, they are triggered by SPATIAL_SIGNAL tags with a `semantic_type` of either TOPOLOGICAL or DIR_TOP. Topological information primarily refers to containment and connection relations between two regions. The possible relationships come from a field of research called Qualitative Spatial Reasoning (QSR), which primarily deals with how abstract objects relate. Since most of the spatial objects that are mentioned in natural language text are not abstract, however, QSR is generally insufficient for fully capturing the intended relationship between the

objects. For that reason, both QSLINK and OLINK tags may be required to fully capture spatial relationships.

For example, consider the sentence: *The cup is on the table.* The SPATIAL_SIGNAL *on* in this sentence tells us that the cup is in direct contact with the table. This is **topological** information. However, a simple "direct contact" relationship does not say whether the cup is sitting on top of the table (the likely intended relationship) or if it is somehow clinging to the side of or hanging from beneath the table (not likely, but possible). To capture this aspect of the relationship, an OLINK is required. This is discussed in Section 5.2. For now, though, let us focus on qualitative spatial relation (QSR) based relationships.

ISO-Space uses the Region Connection Calculus (RCC) as the basis for its qualitative spatial relationships. RCC is concerned with how regions (spatial objects) are *connected* to each other. RCC8, a variant of RCC that consists of 8 basic relations, is used as a basis for the possible relationships between ISO-Space objects. The RCC8 along with `in` will be referred to as RCC8+. Table 11 defines the different relationships that RCC8+ captures and Figure 1 shows an abstract example of the RCC8 relations.

Value	Description
DC	disconnected
EC	externally connected
PO	partial overlap
EQ	equal
TPP	tangential proper part
TPPi	tangential proper part inverse
NTPP	non-tangential proper part
NTPPi	non-tangential proper part inverse
IN	disjunction of TTP and NTTP

Table 11: RCC8+ Relations

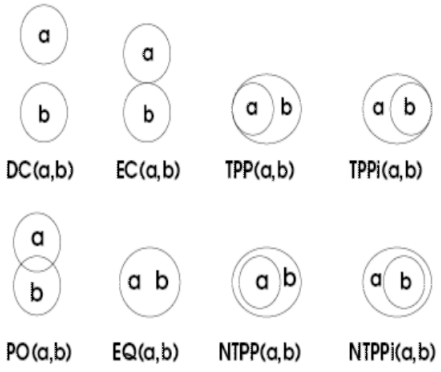


Figure 1: RCC8 Relations

The objects participating in a spatial relation with one another are typically referred to as either the `figure` or `ground`. The `figure` is the object *being related* to the `ground` while the `ground` is what the `figure` is *being related to*. It is not a universal rule, but, often, the `figure`

is a movable object while the `ground` tends to be more static. In the cup and table example above, the cup is the `figure` while the table is the `ground`. The next section includes several examples that should help clarify this distinction.

5.1.1 Qualitative Spatial Link Attributes

Table 12 shows the attributes for the QSLINK tag. As usual, the `id` attribute is assigned automatically, but the annotator must fill in the `figure`, `ground`, `trigger`, and `relType` values.

Attribute	Value
`id`	`qsl1`, `qsl2`, `qsl3`, ...
`relType`	DC, EC, PO, EQ, TPP, TPPi, NTPP, NTPPi, IN
`figure`	ID of location/entity/event tag that is being related
`ground`	ID of the location/entity/event tag that is being related to
`trigger`	ID of the spatial signal that triggered the link

Table 12: Attributes for QSLINK

Both `figure` and `ground` can hold the ID of an ISO-Space PLACE, PATH, SPATIAL_NE, EVENT or MOTION tag. When an entity that is not a location tag participates in a QSLINK, it is actually being coerced into behaving like a location. That is, rather than saying that a spatial named entity is in some relationship to another ISO-Space object in a QSLINK, you are really saying that the location that the spatial named entity occupies is in relation to the location of the other ISO-Space object. Remember that the `figure` is the object *being related* and the `ground` is the object that the figure is *being related to*.

The `trigger` value takes the ID of SPATIAL_SIGNAL with a `semantic_type` of TOPOLOGICAL or DIR_TOP. Keep in mind that signals of this type always introduce a QSLINK, but the `trigger` attribute is optional because it is possible to have a QSLINK that is not associated with any particular SPATIAL_SIGNAL in the text.

The `relType` attribute is used to specify the type of qualitative spatial relationship that exists between the `figure` and the `ground`. The `relType` attribute takes as its value any of the RCC8 relations as well as the additional value IN, which is the disjunction of TPP and NTPP. A `relType` of IN should be used when it is not clear whether the TPP or NTPP is the correct `relType`, but one of those two values must apply. The value EQ is special in that it is used to say that two spatial objects occupy the same space, or are actually the same object. Table 13 displays the possible `relType` values with some natural language examples with `figure` objects marked as $[figure_f]$ and ground objects as $[ground_g]$.

The sentences in (59) provide some examples of QSLINK tags. For additional examples, refer to Section 8.

(59) a. [**The book**$_{sne1}$] is [**on**$_{s1}$] [**the table**$_{sne2}$].
SPATIAL_SIGNAL(`id=s1`, cluster=‘ 1”, `semantic_type`=DIR_TOP)
QSLINK(`id=qsl1`, `figure=sne1`, GROUND=`sne2`, `trigger=s1`, `relType`=EC)

b. [**The light switch**$_{sne3}$] is [**on**$_{s2}$] [**the wall**$_{sne4}$].
SPATIAL_SIGNAL(`id=s1`, cluster=“on-2”, `semantic_type`=DIR_TOP)

Value	Example
DC	$the[grill_f]\ outside\ of\ the\ [house_g]$
EC	$the[cup_f]onthe[table_g]$
PO	$[Russia_{f/g}]and[Asia_{f/g}]$
EQ	$[boston_{f/g}]andthe[capital_{f/g}]ofMassachusetts$
TPP	$the[shore_f]of[Delaware_g]$
TPPi	
NTPP	*[Austin], [Texas]*
NTPPi	
IN	*the [bookcase] in the [room]*

Table 13: QSLINK `relType` values

QSLINK(`id`=`qsl2`, `figure`=`sne3`, GROUND=`sne4`, `trigger`=`s2`, `relType`=PO)

c. A thick green [**rainforest**$_{pl2}$] grew up [**around**$_{s4}$] the [**road**$_{p1}$].
SPATIAL_SIGNAL(`id`=`s4`, `semantic_type`=TOPOLOGICAL)
QSLINK(`id`=`qsl4`, `figure`=`p1`, GROUND=`pl2`, `trigger`=`s4`, `relType`=IN)

Notice that while the same spatial signal is used in both of these examples, the `relType` value for each differs. This is because the signal *on* is being used in a slightly different sense in each of the examples. It is also noteworthy here that the `semantic_type` for these examples dictates that an OLINK be supplied in addition to these QSLINK tags. OLINK tags are described in Section 5.2.

5.2 Orientation Link

The OLINK tag covers those relationships that occur between two locations that are non-topological in nature. Orientation links essentially fill in the spatial relations that QSLINK tags cannot capture. This includes three different types of information based on the three frames of reference as follows:

1. **Absolute**: This frame of reference can be considered the "bird's eye" view.
2. **Intrinsic**: This frame of reference is used when some part of a spatial object has an intrinsic orientation such as a TV, which has an intrinsic front.
3. **Relative**: This frame of reference is used when the relationship being described depends on a particular entity's point of view.

Once the frame of reference for the OLINK has been identified, the annotator must also supply a reference point. For ABSOLUTE OLINK tags, the `referencePt` attribute value must match the `relType` value which must be a cardinal direction. For INTRINSIC OLINK tags, the `referencePt` takes the ID filled for the `ground` attribute. For RELATIVE OLINK tags, the `referencePt` is either the ID of a named entity from whose viewpoint the relation is described, or the special value "VIEWER", which is used to indicate that the author did not explicitly declare who is viewing the relationship, but it is still a relative frame of reference (e.g., *the table on David's left* vs. *the table on the left*).

OLINK tags also capture projective information. Consider the sentences in example (60).

(60) a. The [**helicopter**$_{sne1}$] is [**above**$_{s1}$] the [**town**$_{pl1}$].

b. The [**hill**$_{pl2}$] is [**above**$_{s2}$] the [**town**$_{pl3}$].

Each of these sentences introduces an OLINK and they both use the same SPATIAL_SIGNAL, *above*. However, in Example (60a), the likely interpretation is that helicopter is located directly above the town. This is not the most salient interpretation for (60b); hills usually do not fly or hover above towns in the same way that the helicopters do. To distinguish between these two interpretations, we say that the OLINK in (60b) has a projective interpretation in which we imagine that the region associated with the town projects outwards beyond its normal limits. It is this projected region associated with the town that the hill is actually located above. So both of these sentences will have nearly identical OLINK tags associated with them, except that the `projective` attribute value for the link for (60b) would be flagged as TRUE. Example (61) includes annotations that illustrate this distinction in detail.

5.2.1 Orientation Link Attributes

Table 14 shows the attributes for the OLINK tag.

Attribute	Value
`id`	`ol1`, `ol2`, `ol3`, ...
`relType`	ABOVE, BEHIND, NEXT TO, NORTH OF, ...
`figure`	ID of the location/entity/event tag that is being related
`ground`	ID of the location/entity/event tag that is being related to
`trigger`	ID of the spatial signal that triggered the link
`frame_type`	ABSOLUTE, INTRINSIC, RELATIVE
`referencePt`	cardinal direction, ground entity, viewer entity
`projective`	TRUE, FALSE

Table 14: Attributes for OLINK

As with QSLINK, the `figure` and `ground` attributes can hold the ID of any location/entity/event tag. The `trigger`, which is optional, must be a SPATIAL_SIGNAL with a `semantic_type` of either DIRECTIONAL or DIR_TOP. The `projective` attribute can have a value of either TRUE for projective interpretations or FALSE for non-projective cases. The `relType` attribute currently has an open set of values, some of which are named in Table 14. Annotators should try to stick to this set of values, but may annotate additional values if none of those are appropriate.

Perhaps more so than any other ISO-Space element, the attributes of OLINK are dependent on each other. The value for the `frame_type` attribute determines what the `referencePt` value should be, thus the `frame_type` should be filled first. Table 15 shows the consequences for each `frame_type` value.

Example 61 shows several different kinds of OLINK tags. Once again, only the tag in question is shown in these annotations though many of them also have accompanying QSLINK tags.

(61) a. [**Boston**$_{pl1}$] is [**north of**$_{s1}$] [**New York City**$_{pl2}$].
OLINK (`id`=`ol1`, `figure`=`pl1`, GROUND=`pl2`, `trigger`=`s1`, `relType`="NORTH", `frame_type`=ABSOLUTE, `referencePt`=NORTH, `projective`=TRUE)

Frame Type Value	Effect
ABSOLUTE	`referencePt`=value of `relType`
INTRINSIC	`referencePt`=value of `ground`
RELATIVE	`referencePt`=VIEWER or tag ID specifying the viewpoint

Table 15: Impact of `frame_type` Values on `referencePt`

b. [**The dog**$_{sne1}$] is [**in front of**$_{s2}$] the [**couch**$_{sne2}$].
OLINK (`id`=`ol2`, `figure`=`sne1`, `ground`=`sne2`, `trigger`=`s2`, `relType`="FRONT", `frame_type`=INTRINSIC, `referencePt`=`sne2`, `projective`=FALSE)

c. [**The dog**$_{sne3}$] is [**next to**$_{s3}$] the [**tree**$_{sne4}$].
OLINK (`id`=`ol3`, `figure`=`sne3`, `ground`=`sne4`, `trigger`=`s3`, `relType`="NEXT TO", `frame_type`=RELATIVE, `referencePt`=VIEWER, `projective`=FALSE)

d. [**The hill**$_{pl3}$] is [**above**$_{s4}$] the [**town**$_{pl4}$].
OLINK (`id`=`ol4`, `figure`=`pl3`, `ground`=`pl4`, `trigger`=`s4`, `relType`="ABOVE", `frame_type`=INTRINSIC, `referencePt`=`pl4`, `projective`=TRUE)

e. [**The helicopter**$_{sne5}$] is [**above**$_{s5}$] the [**town**$_{pl6}$].
OLINK (`id`=`ol5`, `figure`=`sne5`, `ground`=`pl6`, `trigger`=`s5`, `relType`="ABOVE", `frame_type`=INTRINSIC, `referencePt`=`pl6`, `projective`=FALSE)

f. [**The book**$_{sne1}$] is [**on**$_{s1}$] the [**table**$_{sne2}$].
OLINK (`id`=`ol1`, `figure`=`sne1`, `ground`=`sne2`, `trigger`=s1, `relType`="ABOVE", `frame_type`=INTRINSIC, `referencePt`=`sne2`, `projective`=FALSE)

g. [**The gum**$_{sne1}$] is [**on**$_{s1}$] the [**table**$_{sne2}$].
OLINK (`id`=`ol1`, `figure`=`sne1`, `ground`=`sne2`, `trigger`=`s1`, `relType`="BELOW", `frame_type`=INTRINSIC, `referencePt`=`sne2`, `projective`=FALSE)

h. The new tropical [**depression**$_{sne8}$] was about 430 miles (690 kilometers) [**west**$_{s4}$] of the southernmost [**Cape VerdeIslands**$_{pl8}$]
OLINK (`id`=`ol8`, `figure`=`sne8`, `ground`=`pl8`, `trigger`=`s4`, `relType`="WEST", `frame_type`=ABSOLUTE, `referencePt`="WEST", projective=TRUE)

5.3 Movement Links

The MOVELINK tag connects motion events with their mover participants. The other attributes of the MOVELINK tag are then used to specify any evident event-path components and motion adjuncts.

MOVELINK tags are always introduced by a triggering MOTION tag. Therefore, whenever an annotator tags an extent with the MOTION tag, they are committing to also creating a corresponding MOVELINK. The annotation for the MOVELINK depends on the `motion_type` of the MOTION (i.e., MANNER, PATH, or COMPOUND). A bare-manner motion verb (e.g., *David cycles seriously*) still triggers a MOVELINK, though most of the attributes will be underspecified since there is no evident event-path information. At the other extereme, it's possible for PATH or COMPOUND type motions to make use of the full range of MOVELINK attributes.

5.3.1 Movement Link Attributes

Table 16 shows the attributes for the MOVELINK tag.

Attribute	Value
id	mvl1, mvl2, mvl3, ...
trigger	ID of a MOTION that triggered the link
source	ID of a location/entity/event tag at the beginning of the event-path
goal	ID of a location/entity/event tag at the end of the event-path
midPoint	ID(s) of event-path midpoint location/entity/event tags
mover	ID of the locatin/entity/event tag whose location changes
ground	ID of a location/entity/event tag that the mover participant's motion is relative to
goal_reached	TRUE, FALSE, UNCERTAIN
pathID	ID of a PATH tag that is identical to the event-path of the trigger MOTION
adjunctID	ID(s) of (an) ADJUNCT tag(s) that contributes path or manner information to the trigger MOTION

Table 16: MOVELINK Tag Attributes.

The trigger value of a MOVELINK is filled by the MOTION tag ID of the motion which is being linked to the mover participant.

The source, goal, midPoint, and ground attributes are used when the trigger is a PATH or COMPOUND type MOTION. Motions of these types always include some information about the path traversed by the mover (i.e., the event-path). This information is stored in the MOVELINK's source, goal, midPoint, and ground attributes. The values for these attributes may be filled by any ISO-Space location tag or any tag which can be coerced to act as a location including PLACE, PATH, SPATIAL_NE, EVENT, and MOTION tags, though they will most often be filled with IDs of PLACE or PATH tags. When creating MOVELINK tags, don't look across sentence boundaries to find source, goal, ground or other event-path information (allow post-processing to fill in that kind of information).

The mover attribute specifies the tag element which participates in the MOTION event by changing location. The mover attribute usually takes an ID of a SPATIAL_NE, though it may also be filled by a location tag or event tag coerced to a location.

The goal_reached attribute, which can have a value of TRUE, FALSE, or UNCERTAIN, is used for those cases when it is not clear from the text whether the identified goal location was reached. If there is no goal location associated with the event then this attribute will be left unspecified. For example, in *John left for Boston*, *Boston* appears to be the goal of the MOTION, but the reader does not know if *John* ever really got there. In such a case, the goal_reached attribute should be set to UNCERTAIN. Marking goal_reached as UNCERTAIN stipulates that the annotator is unsure of *John*'s location within the narrative after the *left* MOTION event has occurred. In *John did not make it to Boston*, goal_reached would be set to FALSE since *Boston* was never reached. In *John arrived in Boston*, contrastively, goal_reached would be filled as TRUE. If there is no goal attribute filled in the MOVELINK, then the goal_reached attribute will not be filled.

The `adjunctID` attribute takes the ID of an ADJUNCT, though it is optional because not all motion verbs are accompanied by motion adjuncts. For example, in *John traveled by car*, the phrase *by car* is a motion AJDUNCT, but for *John traveled for three days*, there is no motion AJDUNCT.

Depending on the `motion_class` of the MOTION triggering a MOVELINK, certain attributes that define the event-path will be requisite. E.g., in example (62e), below, the `motion_class` for the MOTION *jump* is MOVE_EXTERNAL. This `motion_class` requires that the `ground` is filled by the identifier of the PATH tag for *fence* to capture the fact that the location of the *fence* is what *John jumped* relative to. The only `motion_class` that may remain totally underspecified is the MOVE class, although it is not obligated to be underspecified. I.e., a MOVE class motion may have a `source`, `goal`, `midPoint` or other attributes specified, but only if the motion event structure does not fit any of the more specific classes. Table 17 lists which MOVELINK attributes are requisite for each of the different classes of MOTION.

MOVELINK tags triggered by FOLLOW class MOTION tags require the `pathID` attribute to be filled, such as in Example (62c). In such a case, the `pathID` attribute for MOVELINK is used to link the PATH that is traversed by the `mover` to the MOTION to specify an explicit event-path. Essentially this specifies that the PATH *Massachusetts Turnpike* is identical to the event-path for the *drove* MOTION. Note, however, that there may also be information about the event-path supplied by way of the `source`, `midPoint`, and `goal` or `ground` attributes (in this instance, the GOAL happens to be *Worcester*).

Motion Class	**Required Attributes**
MOVE	None
MOVE_EXTERNAL	`ground`
MOVE_INTERNAL	`ground`
LEAVE	`source`
REACH	`goal`
DETACH	`source`
HIT	`goal`
FOLLOW	`pathID`
DEVIATE	`source`
CROSS	`source`,`midPoint`,`goal`
STAY	`ground`

Table 17: MOVELINK Attributes Required by Classes of Motion

Example (62) illustrates how to annotate MOVELINK tags. Since the MOTION tag that triggers a movement link informs the MOVELINK tag's attributes, the MOTION tags are also included in the example annotations.

(62) a. [**John**$_{sne1}$] [**walked**$_{m1}$] [**from**$_{a1}$] [**Boston**$_{pl1}$] [**to**$_{a2}$] [**Cambridge**$_{pl2}$].
MOTION (`id`=`m1`, `motion_type`=COMPOUND, `motion_class`=MOVE, motion_sense=LITERAL)
MOVELINK (`id`=`mvl1`, `trigger`=`m1`, `mover`=`sne1`, `source`=`pl1`, `goal`=`pl2`, `goal_reached`=TRUE, `adjunctID`=`a1`,`a2`)

b. [**John**$_{sne2}$] [**traveled**$_{m2}$] [**by car**$_{a3}$].

MOTION (id=m2, motion_type=MANNER, motion_class=MOVE, motion_sense=LITERAL)
MOVELINK (id=mvl2, trigger=m2, mover=sne2, adjunctID=a3)

c. [**John**$_{sne3}$] [**drove**$_{m3}$] [**to**$_{a4}$] [**Worcester**$_{pl3}$] [**on**$_{s1}$] the [**Massachusetts Turnpike**$_{p1}$].
MOTION (id=m3, motion_type=COMPOUND, motion_class=FOLLOW, motion_sense=LITERAL)
MOVELINK (id=mvl3, trigger=m3, mover=sne3, goal=pl3, goal_reached=TRUE, adjunctID=a4, pathID=p1)

d. [**John**$_{sne4}$] [**left**$_{m4}$] [**for**$_{a5}$] [**Boston**$_{pl3}$].
MOTION (id=m4, motion_type=PATH, motion_class=LEAVE, motion_sense=LITERAL)
MOVELINK (id=mvl4, trigger=m4, mover=sne4, goal=pl3, goal_reached=UNCERTAIN, adjunctID=a5)

e. [**John**$_{sne5}$] [**jumped**$_{m5}$] [**over**$_{a6}$] the [**fence**$_{p2}$].
MOTION (id=m5, motion_type=COMPOUND, motion_class=MOVE_EXTERNAL, motion_sense=LITERAL)
MOVELINK (id=mvl5, trigger=m5, mover=sne5, ground=p2, ajdunctID=a6)

f. [**John**$_{sne6}$] [**walked**$_{m6}$] [**off**$_{a7}$] the [**path**$_{pl4}$].
MOTION (id=m6, motion_type=COMPOUND, motion_type=DEVIATE, motion_sense=LITERAL)
MOVELINK (id=mvl6, trigger=m6, source=p4, mover=sne6, adjunctID=a7)

g. The [**brook**$_{p3}$] [**runs**$_{m7}$] [**along**$_{a8}$] the [**road**$_{p4}$].
MOTION (id=m7, motion_type=PATH, motion_class=FOLLOW, motion_sense=FICTIVE)
MOVELINK (id=mvl7, trigger=m7, goal=p4, adjunctID=a8)

h. The [**glacier**$_{p5}$] [**crept**$_{m8}$] [**down**$_{s1}$] the [**valley**$_{p6}$].
MOTION (id=m8, motion_type=MANNER, motion_class=MOVE, motion_sense=INTRINSIC_CHANGE)
MOVELINK (id=mvl8, trigger=m8, mover=p5)

i. The [**clouds**$_{sne7}$] [**spread**$_{m9}$] [**over**$_{s2}$] the Peruvian [**coast**$_{p7}$].
MOTION (id=m9, motion_type=MANNER, motion_class=MOVE, motion_sense=INTRINSIC_CHANGE)
MOVELINK (id=mvl8, trigger=m8, mover=sne7)

Pay special attention to examples (62h) and (62i). INTRINSIC_CHANGE MOTION tags will always have a motion_type of MANNER and a motion_class of MOVE. This is due to the fact that the location of an entity is an extrinsic property. The location of the mover entities participating in INTRINSIC_CHANGE motion events is not undergoing any change.

5.3.2 Special Section: Ergative Motion Verbs

Be extra careful when annotating MOVELINK tags triggered by ergative motion verbs. Ergative verbs act differently depending on whether they are used transitively or intransitively. Note the

sentences in Example (63) where the `mover` entities have been marked in **boldface**. Note that when *flew* is used ditransitively as in Example (63c), it is the object 'being flown' that fulfills the role of the `mover`, but when used intransitively, as in Example (63a), it is the 'flyer' that is the `mover`. That is, in (63c), it is not the case that ***John*** *flew over the harbor*. Depending on the context, it may be entailed that both the subject and direct object of a ditransitive, ergative, motion verb happen to undergo the same change of location. This is the case in Example (63f). In those cases it is appropriate to list multiple `mover` entities in the comment field as discussed in Section 10 or create a separate MOVELINK for each `mover` participant.

(63) a. **John** flew over the harbor.

b. The remote-controlled **plane** flew over the harbor.

c. John flew the remote-controlled **plane** over the harbor.

d. **John** drove to the airport.

e. The **taxi** drove to the airport.

f. The **taxi** drove **John** to the airport.

5.3.3 Special Section: Underspecified Mover Participants

When creating MOVELINK tags it is necessary to link from a MOTION tag to some other `mover` element.[14] In some cases there may not be an explicit `mover` participant to link to. Two situations where this problem arises are nominalized motion events and motion events that fall under certain grammatical or narrative moods (e.g., imperative, simulated etc.). In such cases where the `mover` is not evident or underspecified, for the pilot annotation, it is acceptable to link from the MOTION tag to itself since the `mover` will not be associated with any extent tag that would normally be linked to. When performing a link from a MOTION tag to itself, leave the `mover` attribute unspecified (i.e., blank). You should then write a short comment describing the `mover` participant. Example (64) demonstrates how to create MOVELINK tags for underspecfied `mover` participants and what helpful comments might look like.

(64) a. There was some incredible night [**biking**$_{m1}$] [**in**$_{a1}$] the [**Atacama Desert**$_{pl1}$].
MOTION (`id`=`m1`, `motion_type`=COMPOUND, `motion_class`=MOVE_INTERNAL, `motion_sense`=LITERAL)
MOVELINK (`id`=`mvl1`, `fromText`="biking", `toText`="biking", `trigger`=`m1`, `mover`=∅[15], `ground`=`pl1`, `adjunctID`=`a1`, `comment`="The author is describing biking which they themself (possibly among others) participated in as a mover.")

b. [**Take**$_{m1}$] the [**stairs**$_{p1}$] [**to**$_{a1}$] the [**roof**$_{pl1}$].
MOTION (`id`=`m1`, `motion_type`=PATH, `motion_class`=FOLLOW, `motion_sense`=LITERAL)
MOVELINK (`id`=`mvl1`, `fromText`="take", `toText`="take", `trigger`=`m1`, `mover`=∅, `goal`=`pl1`, `pathID`=`p1`, `adjunctID`=`a1`, `commend`="This is an imperative construction where the mover participant would be anyone that follows the direction.")

[14] Refer to Section 10 for details on link creation in MAE.
[15] The ∅ symbol is used here to indicate an underspecified attribute value that would be left blank.

5.4 Measure Links

The MLINK tag serves two purposes in ISO-Space. First, it can be used to capture the distance between two locations as in *The bone is two feet from the dog.* Such relationships are commonly accompanied by a MEASURE extent, but this is not a requirement. For example, the phrase *the hot dog stand near Macy's* also introduces an MLINK since *near* is interpreted on a scale.

In addition to relating two spatial objects, measure links can also be used to describe the dimensions of a single object. Locations, spatial named entities, and even events possess spatial dimensions that may be captured by an MLINK tag. A typical case where the MLINK tag is used is when the length dimension of a location is described as in *The football field is 100 yards long.* Note, however, that the MLINK tag can also capture dimensions of motion events as in *I rode 30 miles* (refer to examples (65b) and (65c) below). In such a case the MLINK is actually specifying a dimension of the event-path associated with the motion.

5.4.1 Measure Link Attributes

The attributes for the MLINK tag are presented in Table 18.

Attribute	**Value**
`id`	`ml1`, `ml2`, `ml3`, ...
`figure`	ID of a location/entity/event tag
`ground`	ID of the related location/entity/event tag
`relType`	DISTANCE, LENGTH, WIDTH, HEIGHT, or GENERAL_DIMENSION
`val`	NEAR, FAR, TALLER, SHORTER, or ID of a MEASURE tag
`endPoint1`	ID of a location/entity/event tag at one end of a stative-path
`endPoint2`	ID of a location/entity/event tag at the other end of a stative-path

Table 18: Attributes for MLINK

When the MLINK tag is used to describe the relationship between two spatial objects, their IDs are given in the `figure` and `ground` attributes. In the other MLINK usage, in which only one spatial object is described, its ID should be given in the `figure` attribute and either repeated as the `ground` or the `ground` attribute should be left unspecified.

The `relType` attribute describes what dimension is being measured with the MLINK. The possible values are DISTANCE, LENGTH, WIDTH, HEIGHT, or GENERAL_DIMENSION. Table 19 describes how to choose the appropriate `relType` value depending on the dimension being measured.

`relType` **Value**	**Description**
DISTANCE	distance between two spatial objects
LENGTH	intrinsic length of a single spatial object
WIDTH	intrinsic width of a single spatial object
HEIGHT	intrinsic height of a single spatial object
GENERAL_DIMENSION	the dimension being measured is not clear

Table 19: MLINK `relType` Values

The `val` attribute describes the actual measurement. Its value can be the ID for a MEASURE

tag or one of the following: "NEAR", "FAR", "TALLER", or "SHORTER". For now, both `relType` and `val` have a closed set of possible values, but this may change as the pilot annotation proceeds. If the annotator believes an MLINK is appropriate but is not satisfied with the possible values for the link attributes, he or she should comment on this in the MLINK's annotation.

When a static path is used to describe the dimensions of an object, any endpoints that bound the object should appear in the `endPoint1` and `endPoint2` attributes. As usual, the values for these attributes can be the ID of any ISO-Space object (i.e., places, paths, events, etc.). The examples in (65) provide the annotations for several MLINK tags.

(65) a. The new [**tropical depression**$_{sne1}$] was about [**430 miles**$_{me1}$] ([**690 kilometers**$_{me2}$]) west of the [**southernmost Cape Verde Island**$_{pl1}$], forecasters said.
MLINK (`id`=`ml1`, `relType`=DISTANCE, `figure`=`sne1`, GROUND=`pl1`, val=`me1`)
MLINK (`id`=`ml2`, `relType`=DISTANCE, `figure`=`sne1`, GROUND=`pl1`, val=`me2`)

b. [**The football field**$_{sne2}$] is [**100 yards**$_{me2}$] long.
MLINK (`id`=`ml3`, `relType`=LENGTH, `figure`=`sne2`, GROUND=`sne2`, val=`me2`)

c. I [**rode**$_{m1}$] [**30 miles**$_{me4}$] yesterday.
MLINK (`id`=`ml4`, `relType`=GENERAL_DIMENSION, `figure`=`m1`, GROUND=`m1`, val=`me4`)

d. [**The office**$_{pl3}$] stretches for [**25 feet**$_{me3}$] from [**the bookcase**$_{sne3}$] to [**the white board**$_{sne4}$].
MLINK(`id`=`ml6`, `relType`=GENERAL_DIMENSION, `figure`=`pl3`, GROUND=`pl3`, val=`me3`, `endPoint1`=`sne3`, `endPoint2`=`sne4`)

e. [**The hot dog stand**$_{sne5}$] near [**Macy's**$_{sne6}$].
MLINK(`id`=`ml7`, `relType`=DISTANCE, `figure`=`sne5`, GROUND=`sne6`, val=NEAR)

6 Special Section: Quantification

This section is intended to cover a number of attributes which handle quantification over spatial elements in ISO-Space. These attributes, namely `quant`, `countable`, `amount`, and `scopes`, are common to many different tag types so they have been consolidated here. The tag types which share these attributes include location tags, namely PLACE and PATH tags, as well as any tags that may be coerced to act like a location including SPATIAL_NE, EVENT and MOTION tags. Table 20 reiterates the attributes for handling quantification.

Attribute	Value
COUNTABLE	TRUE or FALSE
AMOUNT	a quantificational constraint
QUANT	a generalized quantifier
SCOPES	an ID of a location/entity/event tag that is the *scopee* in a *scopes*(*scoper*, *scopee*) relation

Table 20: Quantification Attributes

A value of TRUE is usually filled for the `countable` attribute for nouns that are individually countable such as *trees*, *lakes*, or *trips*. A value of FALSE might be used for *water*, *countryside*,

or *employment*. Recall that languages such as English possess mechanisms for coercing mass-terms to act like count-terms (e.g., in English, *There are three waters in the fridge*) and vice versa (e.g., *Together, the trees surrounded the building*).

The `amount` attribute specifies a constraint on the quantification. The value for this attribute may be informed by a determiner, the grammatical number of the noun, or simply be implicit. The `amount` attribute is optional since quantification is not always constrained (in fact, it is quite rare for `amount` information to be specified under universal quantification).

The `quant` attribute takes a generalized quantifier. Generalized quantifiers are generally introduced by determiner phrases, though they may be implicit as well. Determiners participate within constituency grammars analogously to the way that generalized quantifiers participate in logical formulae. Determiners may introduce universal or existential quantification depending whether they are definite or indefinite (e.g., the indefinite article *a(n)* may introduce universal or existential quantification depending on the context; the same is the case for *some* and *any*). There are also many determiners in English that may conflate quantification and quantity: *some, several, many, few, most, both, every, each, all* as well as counting numerals (*half, one, two, a hundred*,...).

The `scopes` attribute specifies a scoping relation between the *scoper*, which is the tag element whose `scopes` attribute is being filled, and the *scopee*, which is the tag element whose ID is filled as the value. That is, if the `scopes` attribute for a `spatial_ne` tag `sne1` were filled with the value `pl1`, we can represent this relation in terms of a $scopes(scoper, scopee)$ function such that $scopes(\texttt{sne1}, \texttt{pl1})$ meaning that the quantifier for `sne1` has scope over the quantifier for `pl1`.

The following examples in (66) are aimed to help illustrate how to capture scoping relations with the `scopes` attribute:

(66) a. A [**computer**$_{sne1}$] [**on**$_{s1}$] every [**desk**$_{sne2}$].
SPATIAL_NE (`id`=`sne1`, `text`="computer", `form`=NOM, `countable`=TRUE, `amount`=1, `quant`="a", `scopes`=∅[16])
SPATIAL_NE (`id`=`sne2`, `text`="desk", `form`=NOM, `countable`=TRUE, `amount`=∅, `quant`="every", `scopes`=`sne1`)
SIGNAL (`id`=`s1`, `semantic_type`=DIR_TOP)
QSLINK (`id`=`qsl1`, `relType`=EC, `figure`=`sne1`, `ground`=`sne2`, `trigger`=`s1`)
OLINK (`id`=`ol1`, `relType`="above", `figure`=`sne1`, `ground`=`sne2`, `trigger`=`s1`, `frame_type`=INTRINSIC, `referencePt`=`sne2`, `projective`=FALSE)
$\forall sne_2\ \exists sne_1\ [sne_2 \in \text{DESKS} \wedge sne_1 \in \text{COMPUTERS} \rightarrow \text{EC}(sne_2, sne_1) \wedge \text{ABOVE}(sne_2, sne_1)]$

b. [**I**$_{sne1}$] [**rode**$_{m1}$] [**along**$_{a1}$] some steep [**roads**$_{p1}$].
SPATIAL_NE (`id`=`sne1`, `text`="I", `form`=nom, `countable`=true, `amount`=1, `quant`="existential", `scopes`=`p1`)
PATH (`id`=`p1`, `text`="roads", `form`=NOM, `countable`=TRUE, `amount`="some", `quant`="existential", `scopes`=`m1`)
MOTION (`id`=`m1`, `text`="rode", `motion_type`=COMPOUND, `motion_class`=FOLLOW, `motion_sense`=LITERAL, `countable`=TRUE, `amount`=∅, `quant`="existential", `scopes`=∅)

[16]The symbol ∅ is used here to indicate an unspecified attribute value.

ADJUNCT (id=a1, adjunct_type=path)
MOVELINK (id=mvl1, trigger=m1, mover=sne1, pathID=p1, adjunctID=a1)
$\exists_1 sne_1\ \exists_{some} p_1\ \exists m_1\ [sne_1 \in \text{INDIVIDUALS} \wedge p_1 \in \{\text{STEEP} \wedge \text{ROADS}\} \wedge m_1 \in \text{RIDINGS} \wedge \text{FOLLOW}(m_1, p_1) \wedge mover\_of(m_1, sne_1)]$

c. ...every [**car**$_{sne2}$] that [**passed**$_{m1}$] [**me**$_{sne1}$] had at least 3 or more [**people**$_{sne3}$] [**inside**$_{s1}$].
SPATIAL_NE (id=sne2, text="car", form=NOM, countable=TRUE, amount=∅, quant="every", scopes=m1)
SPATIAL_NE (id=sne1, text="me", form=NOM, countable=TRUE, amount=1, quant=EXISTENTIAL, scopes=sne2)
SPATIAL_NE (id=sne3, text="people", form=NOM, countable=TRUE, amount=gte3, quant=EXISTENTIAL, scopes=∅)
SPATIAL_SIGNAL (id=s1, text="inside", semantic_type=TOPOLOGICAL)
MOTION (id=m1, text="passed", motion_type=PATH, motion_class=MOVE_EXTERNAL, motion_sense=LITERAL, scopes=sne3)
MOVELINK (id=mvl1, trigger=m1, mover=sne2, ground=sne1)
QSLINK (id=qsl1, relType=IN, figure=sne3, ground=sne2)
$\exists_1 sne_1\ \forall sne_2\ \exists m_1\ \exists_{\geq 3} sne_3\ [sne_1 \in \text{INDIVIDUALS} \wedge sne_2 \in \text{CARS} \wedge m_1 \in \text{PASSINGS} \wedge sne_3 \in \text{PEOPLE} \wedge \text{MOVE\_EXTERNAL}(m_1, sne_1) \wedge mover\_of(m_1, sne_2) \rightarrow \text{IN}(sne_2, sne_3)]$

The annotations in Example (66) may be difficult to follow so a partial logical translation has been provided following each annotation. Note that any time multiple quantified variables are introduced there exists a possibility for scoping ambiguities. Like any lexical or syntactic ambiguity, not all quantificational scoping ambiguities will necessarily resolve to a single plausible interpretation. Part of the annotator's responsiblity is to assume an interpretation which they find most appropriate and ensure that their annotation is consistent with that interpretation.

The interpretation assumed for the annotation in Example (66a) is one under which for every sne_2 there exists some sne_1 such that if sne_2 is a *desk* and sne_1 is a *computer* then sne_1 is *on* sne_2. The other possible interpretation is the one under which it holds that there exists some *computer* for every *desk* such that that particular *computer* is *on* every *desk*. This second interpretation was discarded in this case since it seems unlikely, at least pragmatically, that one particular computer would be on every desk. Provided an appropriate context, however, that interpration might be plausible. E.g., given a universe of discourse where the set of desks is small–say 2–and those desks are arranged in such a way that their surfaces are contiguous, a particular computer could be on every desk. Under this "particular computer" interpretation, though, the `scopes` attribute values for the SPATIAL_NE tags for *computer* and *desk* would need to reflect that scoping relation such that $scopes(sne_1, sne_2)$. The "particular computer" interpreation is not reflected in the annotation provided where the scoping relation is such that $scopes(sne_2, sne_1)$.

The annotation in Example (66b) corresponds to an indvidual interpretation (as opposed to a collective interpretation) where there is a distinct *riding* motion event for each *steep road*. A collective interpretation would require that the `countable` attribute for the PATH tag for *roads* (`p1`) be set to FALSE. Such a collective interpretation would be one for which a single *riding* event occurred and the *steep roads* were collectively followed. Pragmatically, for this to

be plausible, one would have to imagine that the roads be configured in a parallel series. Under the individual interpretation, corresponding to the annotation, it holds that there exists an entity sne_1 for some paths p_1, and for p_1 there exists a motion event m_1 such that the sne_1 is an individual (referenced by I) and m_1 is a *riding* and p_1 are *steep roads* and those m_1 follows p_1 and the mover participant in m_1 is the individual sne_1.

The interpretation that has been annotated in Example (66c) is another individual interpretation where the `countable` attributes for each entity have been annotated as TRUE. The `quant` attribute for `sne2` takes the value "every" due to the determiner *every* while `sne1` and `sne3` are quantified existentially. The `amount` attribute for `sne2` is underspecified because it is universally quantified, however for `sne1` there is an explicit, definite determiner (*3 or more*), and for `sne3` the `amount` is implicitly 1 due to *me* being a singular pronoun. Under this interpretation it holds that there exists an individual entity sne_1 for every entity sne_2 and for every sne_2 there exists a motion event m_1 and for m_1 there exists ≥ 3 entities sne_3 such that if sne_1 is an individual (referenced by *me*) and sne_2 is a *car* m_1 is a *passing* and sne_3 are *people* and m_1 is a *passing by* of sne_1 and the mover participant of m_1 is sne_2 then sne_3 are *inside* sne_2.

Pay special attention to the `scopes` attribute. If there are n quantified variables, then there will be $n-1$ scoping relations. For (66a) there is one scoping relation which can be represented in terms of a $scopes(scoper, scopee)$ funciton where $scopes(sne_2, sne_1)$. For (66b) there are two scoping relations: $scopes(sne_1, p_1)$ and $scopes(p_1, m_1)$. In (66c) there are three scoping relations: $scopes(sne_1, sne_2) \wedge scopes(sne_2, m_1) \wedge scopes(m_1, sne_3)$. Note how the ordering of the quantifiers in the logical forms, after applying quantifier raising (QR), reflect these scoping relations in the annotations.

7 Phased Approach for the Pilot Annotation

This section outlines a phased approach for conducting the annotation. In this approach there will be four annotation phases—two for extent tags and two for link tags. In Phase 1, annotators will tag PLACE, PATH, SPATIAL_NE, EVENT, and ADJUNCT extents, and create any non-consuming PLACE and PATH tags. In Phase 2, annotators will tag EVENT, MEASURE, and SPATIAL_SIGNAL extents. Then a round of adjudication for the extent tags will be performed. Subsequently, in Phase 3, annotators will create all MOVELINK tags triggered by the MOTION tags tagged in Phase 1. In Phase 4, annotators will create the remaining OLINK, QSLINK, and MLINK tags. A final round of adjudication will then be performed for the link tags.

7.1 Outline of Phases

- Extents Annotation
  - Phase 1
    1. Adjuncts
    2. Motions
    3. Paths
    4. Places
    5. Spatial Named Entities
  - Phase 2

1. Events
2. Measures
3. Spatial Signals

- Extents Adjudication
- Links Annotation
  - Phase 3
    1. Movement Links
  - Phase 4
    1. Measure Links
    2. Orientation Links
    3. Qualitative Spatial Links
    4. Meta Links
- Links Adjudication

This phased approach is intended to divide the annotation into sub-tasks. Due to interdependencies in the sub-tasks, Phase 2 must be built on top of Phase 1 and Phases 3 and 4 each depend on Phase 2. This division of the annotation and adjudication task anticipates multiple annotators and adjudicators working on the phases independently, but also, importantly, is intended to ensure that annotators will never be creating links between unadjudicated extent tags. That is to say, Links Annotation Phases 3 and 4 depend on the adjudication of the Extents Annotation Phases 1 and 2.

While the phases are somewhat independent, there are a few dependency caveats. The following list provides recommendations and exceptions to the order as outlined previously.

- All Phase 2 annotations must be built on top of Phase 1. After a Phase 2 annotation is complete, the resulting annotation ought to have all extent tags including those from Phases 1 and 2.
- Phase 3 annotations must be built on top of an adjudicated set of extent tags and Phase 4 should be built on top of Phase 3. After a Phase 4 annotation is complete, the resulting annotation will be complete, pending adjudication of the link tags.
- If a MEASURE tag would be used to fill an `elevation` attribute for a Phase 1 tag then it recommended that annotators create the `measure` tag at that time so that the `elevation` may be filled immediately.
- Non-consuming PLACE and PATH tags[17] should be created as necessary. In the event that an annotator creates a MOTION tag in Phase 1, and a non-consuming PLACE or PATH tag would ultimately participate in the MOVELINK triggered by that MOTION–as is often the case with the CROSS `motion_class`, for example–then the non-consuming tag should be created at the same time as the MOTION tag.

[17]For further details regarding non-consuming tags refer to Section 2.5.

- This applies similarly to spatial signals (e.g., *across*). If a SPATIAL_SIGNAL tag annotated in Phase 2 would trigger an OLINK or QSLINK in which a non-consuming location tag would participate then that non-consuming tag should be created at the same time as the SPATIAL_SIGNAL if it was not already created in Phase 1.

- Finally, if a non-consuming tag would ultimately participate in an MLINK then the non-consuming tag should be created at the same time as the MEASURE tag which would trigger the MLINK.

8 Annotation Examples

In this section, we present several examples from real, natural language text that were annotated during the Pilot Annotation. The examples are presented using the usual predicate-argument form. There is also a short explanation of the annotator's choices for each example.

(67) a. ...two palm [**trees**$_{sne1}$] [**in front of**$_{s1}$] the [**house**$_{pl1}$] ...
SPATIAL_NE (id=sne1, extent="trees", form=NOM, countable=TRUE)
PLACE(id=pl1, extent="house", form=NOM)
SPATIAL_SIGNAL (id=s1, extent="in front of", semantic_type=DIR_TOP)
QSLINK (id=qsl1, relType=DC, figure=sne1, GROUND=pl1, trigger=s1)
OLINK (id=ol1, relType=FRONT, figure=sne1, GROUND=pl1, trigger=s1, frame_type=INTRINSIC, referencePt=PL1, projective=FALSE)

This example is relatively straightforward. Note that *trees* is tagged with the SPATIAL_NE tag instead of the PLACE tag. This may seem confusing, and in some cases it might seem plausible to annotate *trees* with the PLACE tag, but in general *trees* are not the kind of thing that one can *be at* or *take*, though it may be possible in specific circumstances. Note also that it may be unnecessary to have a QSLINK for *in front of*, since this spatial signal deals mostly with orientation and not necessarily a topological relationship. It is plausible that a number of RCC8+ types could be used depending on the annotator's chosen interpretation. This annotation assumes that the trees are disconnected from the house, thus the DC relType was supplied for the QSLINK. When in doubt, it is better to err on the side of underspecifation so as to avoid specifying something that is false.

b. a [**woman**$_{sne2}$] and a [**child**$_{sne3}$] are [**walking**$_{m1}$] [**over**$_{s2}$] the [**square**$_{pl2}$]
SPATIAL_NE (id=sne2, extent="woman", form=NOM, mod=∅, countable=TRUE)
SPATIAL_NE (id=sne3, extent="child", form=NOM, mod=∅, dcl=FALSE, countable=TRUE)
PLACE (id=pl2, extent="square", form=NOM, mod=∅, dcl=FALSE, countable=TRUE)
MOTION (id=m1, extent="walking", motion_type=COMPOUND, motion_class=MOVE)
SPATIAL_SIGNAL (id=s2, semantic_type=ADJUNCT)
MOVELINK (id=mvl1, trigger=m1, source=∅, goal=∅, midPoint=pl2, mover=sne2, goal_reached=FALSE, adjunctID=s2)
MOVELINK (id=mvl1, trigger=m1, source=∅, goal=∅, midPoint=pl2, mover=sne3, goal_reached=FALSE, adjunctID=s2)

The tricky part here can be how to handle the motion of two entities. Creating two entities and a MOVELINK for each one leads to the suggestion that the entities are not walking over the square together even though this is likely the case, as lone children are usually accompanied by an adult. However, it could simply be the case that an observer is describing everyone crossing the square; perhaps the woman and the child are not even walking next to each other. To prevent introducing false information into the annotation, it is preferable to underspecify the relationship between the *woman* and the *child*. For clarity purposes, the `source` and `goal` for the MOVELINK were included as blank, since neither are known, and only that the square is some mid point from where the woman and child may be going.

c. The [**Prudential Center**$_{pl3}$], situated [**on**$_{s2}$] [**23 acres**$_{me1}$] ([**93,000 m2**$_{me2}$]), is [**in**$_{s3}$] the [**Back Bay neighborhood**$_{pl4}$] [**at**$_{s4}$] [**800 Boylston Street**$_{pl8}$] and [**houses**$_{s5}$] a [**495,229-square-foot**$_{me3}$] ([**46,008.3 m2**$_{me4}$]) shopping [**mall**$_{pl6}$], the [**Shops at Prudential Center**$_{pl7}$], [**in**$_{s6}$] the [**base**$_{pl9}$]. [$\varnothing_{pl10}$]
PLACE (`id`=`pl3`, `extent`="Prudential Center", `form`=NAM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl4`, `extent`="neighborhood", `form`=NAM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl6`, `extent`="mall", `form`=NOM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl7`, `extent`="Shops at Prudential Center", `form`=NAM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl8`, `extent`="800 Boylston Street", `form`=NAM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl9`, `extent`="base", `form`=NOM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl10`, `extent`=∅, `form`=NOM, `mod`=∅, `dcl`=FALSE, `countable`=TRUE)
SPATIAL_SIGNAL (`id`=`s2`, `extent`="on", `semantic_type`=TOPOLOGICAL)
SPATIAL_SIGNAL (`id`=`s3`, `extent`="in", `semantic_type`=TOPOLOGICAL)
SPATIAL_SIGNAL (`id`=`s4`, `extent`="at", `semantic_type`=TOPOLOGICAL)
SPATIAL_SIGNAL (`id`=`s5`, `semantic_type`=TOPOLOGICAL, `extent`="houses")
SPATIAL_SIGNAL (`id`=`s6`, `semantic_type`=TOPOLOGICAL, `extent`="in")
MEASURE (`id`=`me1`, `value`="23", `unit`="acres", `extent`="23 acres")
MEASURE (`id`=`me2`, `value`="93000", `unit`="square meters", `extent`="93,000 m2")
MEASURE (`id`=`me3`, `value`="495229", `unit`="square feet", `extent`="495,229-square-foot")
MEASURE (`id`=`me4`, `value`="46008.3", `unit`="square meters", `extent`="46,008.3 m2")
MLINK (`id`=`ml1`, `figure`=`pl10`, `relType`=GENERAL_DIMENSION, `val`=`me1`)
MLINK (`id`=`ml2`, `figure`=`pl10`, `relType`=GENERAL_DIMENSION, val=`me2`)
MLINK (`id`=`ml3`, `figure`=`pl6`, `relType`=GENERAL_DIMENSION, `val`=`me3`)
MLINK (`id`=`ml4`, `figure`=`pl6`, `relType`=GENERAL_DIMENSION, `val`=`me4`)
QSLINK (`id`=`qsl2`, `relType`=EQ, `figure`=`pl3`, GROUND=`pl10`, `trigger`=`s2`)
QSLINK (`id`=`qsl3`, `relType`=IN, `figure`=`pl3`, GROUND=`pl4`, `trigger`=`s3`)
QSLINK (`id`=`qsl4`, `relType`=EQ, `figure`=`pl3`, GROUND=`pl8`, `trigger`=`s4`)
QSLINK (`id`=`qsl5`, `relType`=IN, `figure`=`pl6`, `ground`=`pl3`, `trigger`=`s5`)
QSLINK (`id`=`qsl6`, `relType`=IN, `figure`=`pl7`, `ground`=`pl9`, `trigger`=`s6`)
QSLINK (`id`=`qsl7`, `relType`=TPP, `figure`=`pl9`, `ground`=`pl3`, `trigger`=∅)
OLINK (`id`=`ol1`, `relType`="BOTTOM", `figure`=`pl9`, `ground`=`pl3`, `trigger`=∅, `frame_type`=INTRINSIC, `referencePt`=`pl3`, `projective`=FALSE)

This sentence does not feature any motion events, however there are still many static, spatial relations which need to be accounted for. Note that there are some multiword extent tags in this example. These multiword extents are locations with proper names and each name is captured with a single tag. There is also another non-consuming PLACE tag, `pl10`, which was introduced by the MEASURE tag `me1`. The location identified by `pl10` happens to be identical to *Prudential Center* (`pl3`), so they were linked together with an EQ `relType` QSLINK. One other item of note is the PLACE tag for *base*. Although there is no SPATIAL_SIGNAL tag to indicate the relation of the *base* to any other tag, the word *base* itself presumes a topological and directional relation to whatever it is a *base of*. Thus, a QSLINK and OLINK (`qsl7` and `ol1`) were created to capture the fact that the *base* is a tangential-proper-part of and intrinsically, at the bottom of the *Prudential Center*. The `trigger` attributes for these link tags were left unspecified.

d. The tallest of these [**peaks**$_{pl11}$] have been [**covered**$_{s7}$] in [**snow**$_{sne4}$] and [**ice**$_{sne5}$] ...
SPATIAL_NE (`id`=`sne4`, `extent`="snow", `form`=NOM, `dcl`=FALSE, `countable`=FALSE)
SPATIAL_NE (`id`=`sne5`, `extent`="ice", `form`=NOM, `dcl`=FALSE, `countable`=FALSE)
PLACE (`id`=`pl11`, `extent`="peaks", `form`=NOM, `mod`="tallest", `dcl`=FALSE, `countable`=TRUE)
SPATIAL_SIGNAL (`id`=`s7`, `extent`="covered", `semantic_type`=DIR_TOP)
QSLINK (`id`=`qsl6`, `relType`=EC, `figure`=`sne4`, GROUND=`pl11`, `trigger`=`s7`)
OLINK (`id`=`ol4`, `relType`="ABOVE", `figure`=`sne4`, GROUND=`pl11`, `trigger`=`s7`, `frame_type`=INTRINSIC, `referencePt`=`pl11`, projective=FALSE)
QSLINK (`id`=`qsl7`, `relType`=EC, `figure`=`sne5`, GROUND=`pl11`, `trigger`=`s7`)
OLINK (`id`=`ol4`, `relType`="ABOVE", `figure`=`sne4`, GROUND=`pl11`, `trigger`=`s7`, `frame_type`=INTRINSIC, `referencePt`=`pl11`, projective=FALSE)

This sentence demonstrates a QSLINK triggered by the verb *covered* which is acting as a SPATIAL_SIGNAL. This SPATIAL_SIGNAL tag triggers two QSLINK tags and two OLINK tags, one each for *snow* and *ice*. Note that there may be a temporal interpretation of the sentence under which the area *covered* by the *snow* and *ice* increased over time, in which case *covered* would be annotated as a MOTION with a `motion_sense` value of INTRINSIC_CHANGE. For this annotation, however, the interpretation under which the *covering* is being described statically, or atemporally. Without additional context to inform an annotator's decision, this would be the best option.

e. [**Departing**$_{m2}$] [**Copala**$_{pl11}$], the [**road**$_{p1}$] [**climbs**$_{m3}$] [**to**$_{a1}$] [**over 6,000 feet**$_{me5}$] in [**30 miles**$_{me6}$], and then continues to [**climb**$_{m4}$] while [**hugging**$_{s8}$] an impressive cliff-lined [**ridgeline**$_{p2}$] literally called 'the spine of the devil.' [$\varnothing_{pl12}$]

PLACE (`id`=`pl11`, `extent`="Copala", `form`=NAM, `elevation`=$\varnothing$, `mod`=$\varnothing$, `dcl`=FALSE, `countable`=TRUE)
PLACE (`id`=`pl12`, `extent`=$\varnothing$, `elevation`=`me5`, `mod`=$\varnothing$, `dcl`=FALSE, `countable`=TRUE)
PATH (`id`=`p1`, `extent`="road", `beginID`=$\varnothing$, `endID`=$\varnothing$, `midIDs`=`pl11`,`pl12`, `form`=NOM, `elevation`=$\varnothing$, `mod`=$\varnothing$)

PATH (id=p2, extent="ridgeline", beginID=∅, endID=∅, midIDs=∅, form=NOM, elevation=∅, mod=∅, countable=TRUE)
MEASURE (id=me5, extent="over 6,000 feet", value="gt6000", unit="feet")
MEASURE (id=me6, extent="30 miles", value="30", unit="miles")
MLINK (id=ml5, figure=m3, ground=m3, relType=GENERAL_DIMENSION, val=m6, endPoint1=pl11, endPoint2=pl12)
MOTION (id=m2, extent="Departing", motion_type=PATH, motion_class=LEAVE, motion_sense=FICTIVE)
MOVELINK (id=mvl2, trigger=m2, source=pl11, goal=∅, midPoint=∅, mover=p1, goal_reached=∅, pathID=p1, adjunctID=∅)
MOTION (id=m3, extent="climbs", motion_class=MOVE, motion_sense=FICTIVE)
ADJUNCT (id=a1, extent="to", adjunct_type=PATH)
MOVELINK (id=mvl3, trigger=m3, source=pl11, goal=pl12, midPoint=∅, mover=p1, goal_reached=TRUE, pathID=p1, ajdunctID=a1)
MOTION (id=m4, extent="climb", motion_class=MOVE, motion_sense=FICTIVE)
MOVELINK (id=mvl4, trigger=m4, source=pl12, goal=∅, midPoint=∅, mover=p1, goal_reached=∅, pathID=p1, ajdunctID=∅)
SPATIAL_SIGNAL (id=s8, extent="hugging", semantic_type=TOPOLOGICAL)
QSLINK (id=qsl8, relType=EC, figure=p1, GROUND=p2, trigger=s8)

This sentence is rather dense in terms of spatially relevant information, and it is made even trickier due to the figurative language that is employed. The first item of note is the non-consuming place tag, pl12 that has been created. Note, in this case, that the MEASURE ID of *over 6,000 feet* fills the elevation attribute of pl12. This non-consuming PLACE tag is then used later for the goal for the MOVELINK mvl3 triggered by the first *climb* MOTION tag, m3.

The second thing to note is that the motion_sense attribute values for all the MOTION tags are FICTIVE. This is because the *road* is fulfilling the role of mover in the figurative, atemporal interpretations of the *Departing*, *climbs*, and *climb* motion events.

9 Tips, Tricks, and Strategies for the Pilot Annotation

In this section, we list several useful ideas that have come up over the course of the Pilot Annotation. Some of these are also included in the earlier sections of this document. It is expected that the next version of these Guidelines will incorporate all of these ideas.

1. ISO-Space is not especially concerned with the specific syntax or grammatical structure of the language which is left for other tasks. Your annotations should not omit conditional contexts, subordinate clauses, passive constructions, etc. Tense, aspect, and mood (TAM) should not influence your decision whether to create a tag or not, though it may influence the value of certain tag attributes such as the motion_sense or goal_reached attributes.

2. Most tagged extents will subsequently participate in an ISO-Space link of some kind. If an extent doesn't participate in a link, its ID will probably be filled as an attribute for

another tag. If you find that you end up with a "dangling" spatial object (i.e., something that was tagged as a PLACE, PATH, SPATIAL_NE, SPATIAL_SIGNAL, MEASURE, EVENT, MOTION, or ADJUNCT but that does not show up in a QSLINK, OLINK, MOVELINK, MLINK or fill an attribute for another tag), go back and reevaluate that tag. It may be that it should not have been annotated in the first place, or it may be that you have missed a link or other tag somewhere along the way. There are exceptions here, but not many. PLACE and PATH tags for locations with proper names should always be created even if they do not participate in any links. Also, if a spatial object participates in a METALINK but no other link, that is OK as long as the object it is related to by the METALINK does itself participate in a link.

3. Triggers should only be included in links if they both introduce the link and tell you something about the nature of that link. Not every link needs a trigger, but every MOTION and SPATIAL_SIGNAL triggers a link, and every MEASURE either fills an `elevation` attribute or triggers an MLINK.

4. For light verbs that involve motion, such as *catch a boat*, tag the verb *catch* as a MOTION and the entire extent of the NP, *a boat*, as an adjunct with `adjunct_type` of MANNER. We will also want to tag just the extent for *boat* as a SPATIAL_NE so it can be filled as a `mover` in the MOVELINK triggered by the *catch* MOTION.

5. If you're trying to figure out if a preposition like *by* is part of a manner adjunct, or is simply an auxiliary verb in a passive voice construction, try unpassive-izing the phrase and it should become clear.

6. In examples like *sunk 6 meters* or *fell 2 feet*, the MEASURE tag `value` attribute should not be filled as negative. In such cases the directionality is contributed by the motion verbs *sunk* and *fell* themselves. The `value` attribute for MEASURE tags may be given a negative value, however, when identifying elevations (e.g., *500 ft below sea level*). Additionally, don't fill separating commas (or other extraneous notation) in attributes filled with numerical values attributes (e.g., "6000" not "6,000"). For non-integer values, use decimal notation, not fractions (e.g., "0.5" not "1/2").

10 Using MAE for ISO-Space Annotation

The following pages include directions for using MAE for ISO-Space annotation. In addition, the following guidelines should be followed for this Pilot Annotation.

1. For now, you should manually fill in the values for all link attributes, including those that come from MAE's `fromID` and `toID` attributes.

2. For those times when you need to provide a list of IDs (e.g, for the `midIDs` attribute in PATH), do so by separating the IDs with commas (e.g., "pl1, pl2").

3. If there is more than one comment in the comment field, separate them by semi-colons.

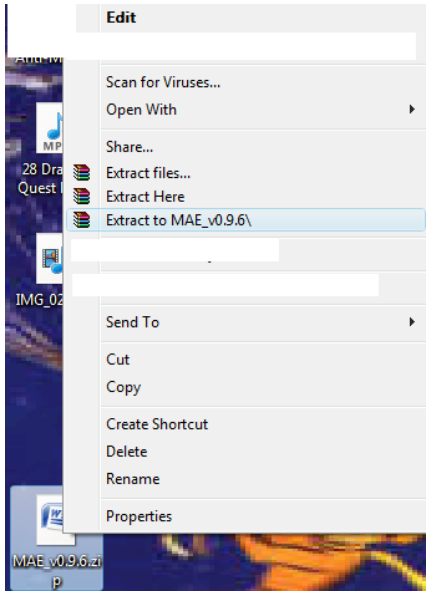
4. At this time, the specification only allows for single movers, so for multiple movers, list their IDs as a comma-separated list ending with a semicolon in the comment field for the MOVELINK (e.g "MOVERS: sne0, sne1, sne3;").

Techniques in ISO-Space Annotation

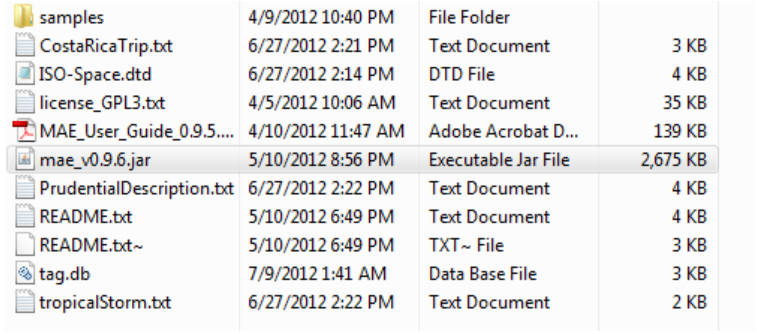
by Seth Dworman

I. Getting Started

All annotation for ISO-Space will be done with MAE (Multi-purpose annotation environment), an annotation tool written by Amber Stubbs. The tool may be downloaded at Amber's homepage (http://pages.cs.brandeis.edu/~astubbs/) and found in the section labeled "MAE." Following this leads to additional link (http://code.google.com/p/mae-annotation/) which has the file needed for download. Head to the section labeled "Downloads," which will display the zip file "MAE_v0.9.6.zip." Download it and save it to your computer (recommended to desktop). Now simply extract the files from the zip (see image below), ideally to a folder with the same name. If you do not have software to do the extraction you can easily google it, e.g. WinRAR.

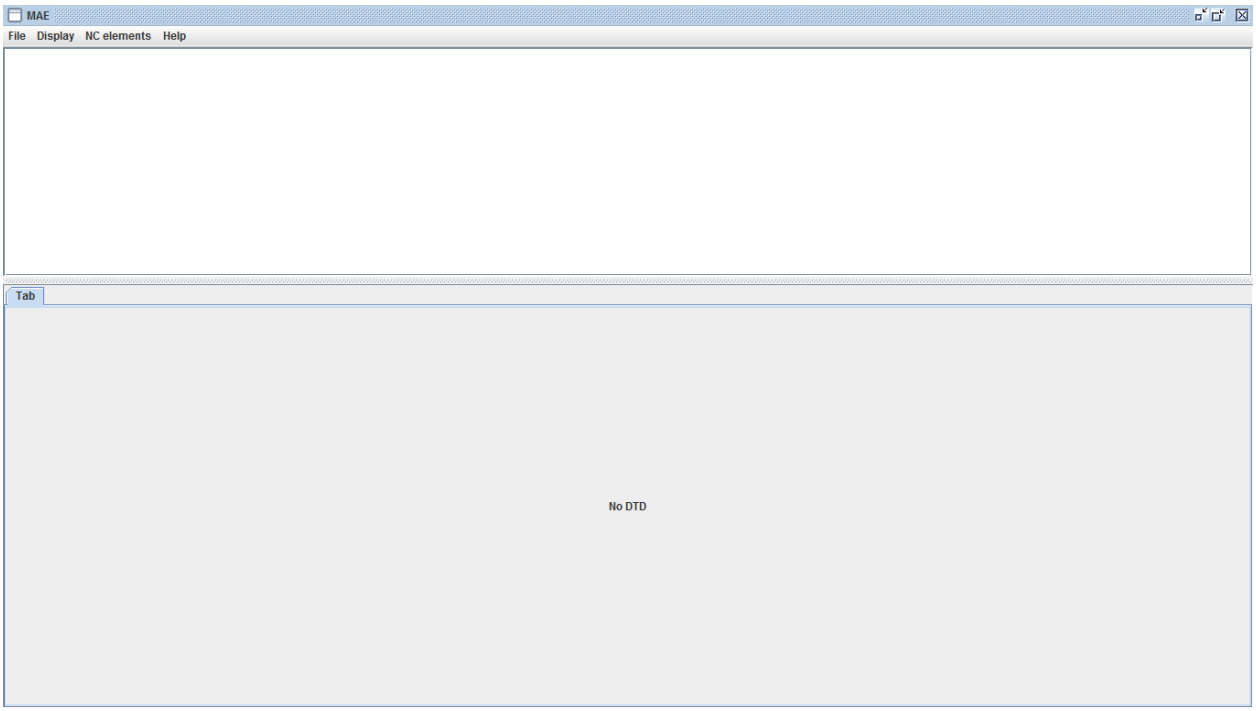


After extracting the files, you will end up with a folder containing said files. Open the folder and in the list of files there should be a "mae_v0.9.6.jar" file. This is the executable for the program—simply double click it to start up MAE (see image below).

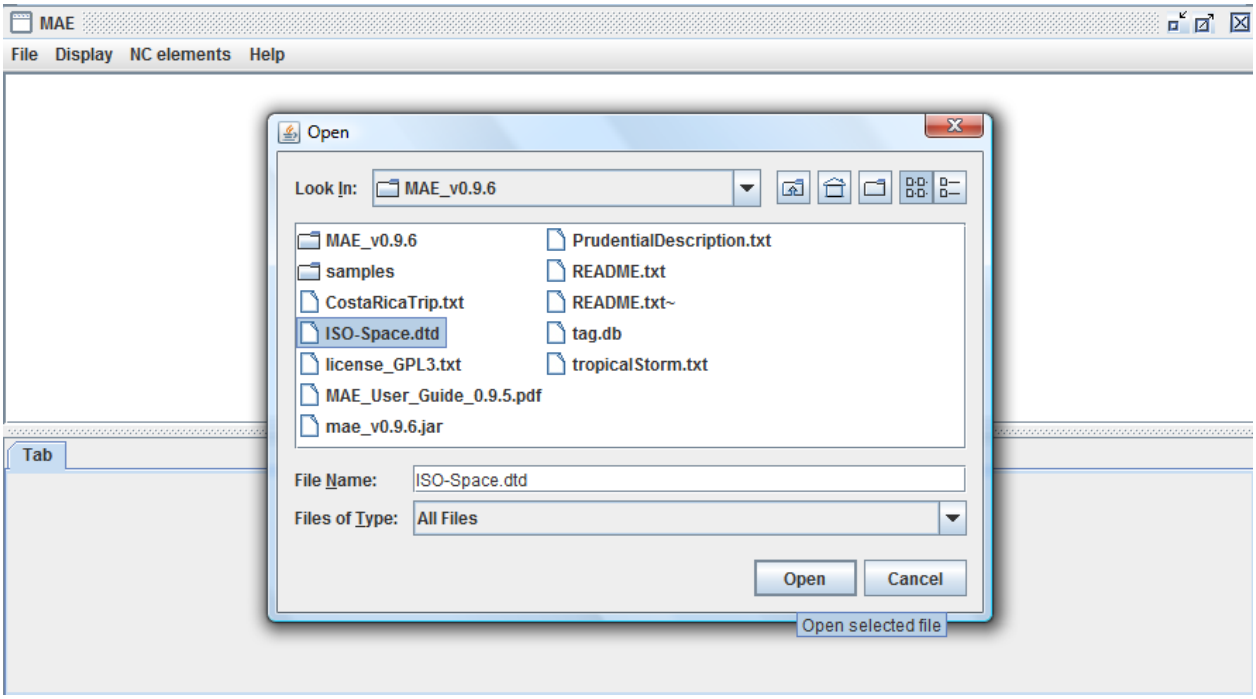


samples	4/9/2012 10:40 PM	File Folder	
CostaRicaTrip.txt	6/27/2012 2:21 PM	Text Document	3 KB
ISO-Space.dtd	6/27/2012 2:14 PM	DTD File	4 KB
license_GPL3.txt	4/5/2012 10:06 AM	Text Document	35 KB
MAE_User_Guide_0.9.5....	4/10/2012 11:47 AM	Adobe Acrobat D...	139 KB
mae_v0.9.6.jar	5/10/2012 8:56 PM	Executable Jar File	2,675 KB
PrudentialDescription.txt	6/27/2012 2:22 PM	Text Document	4 KB
README.txt	5/10/2012 6:49 PM	Text Document	4 KB
README.txt~	5/10/2012 6:49 PM	TXT~ File	3 KB
tag.db	7/9/2012 1:41 AM	Data Base File	3 KB
tropicalStorm.txt	6/27/2012 2:22 PM	Text Document	2 KB

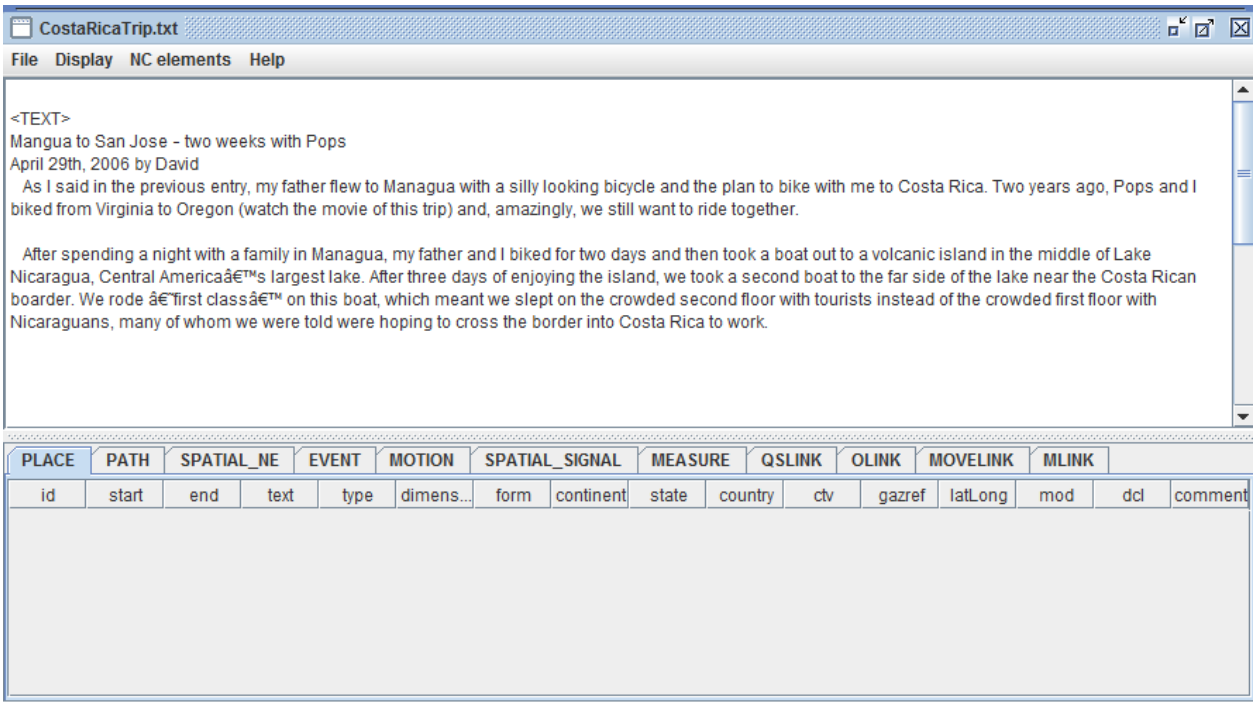
You should finally end up with some kind of window like below:



From here text/documents that are to annotated will be opened, but before any such annotation can be done, it is necessary to load the ISO-Space DTD, which contains all the information about the ISO-Space tags and links. You will have received the ISO-Space DTD at some point from Jessica Moszkowicz, at which point now you can simply head to File>Load DTD>ISO-Space.dtd (see image below). (Note the ISO-Space.dtd may not necessarily be in the same folder, but wherever you happened to save it.)

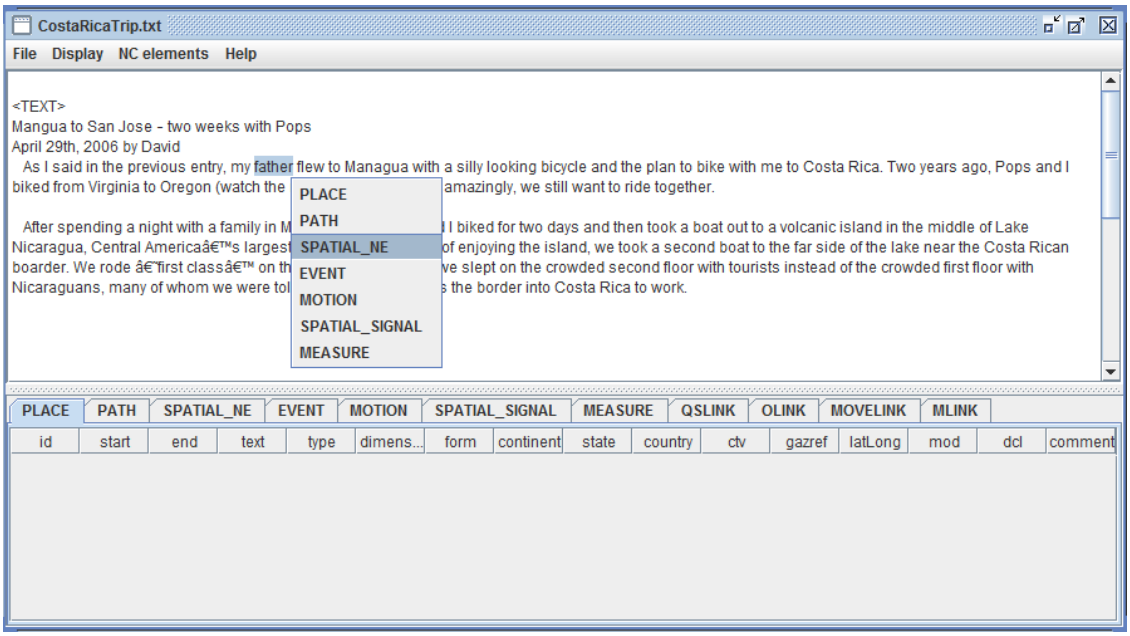


Finally, after loading the ISO-Space DTD, you will almost be ready to annotate! Now, simply head to File>Load File and choose any text/document that you wish to annotate. You should have something similar to below, which means you've correctly set-up MAE for ISO-Space.

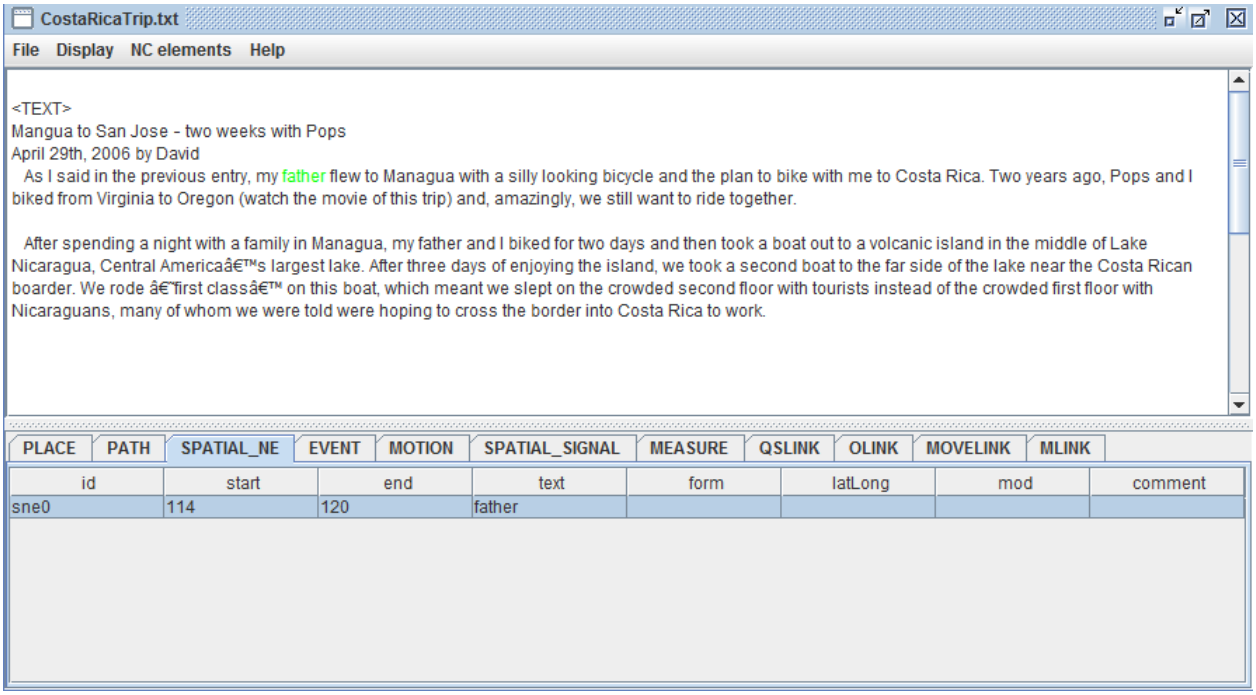


II. Using MAE

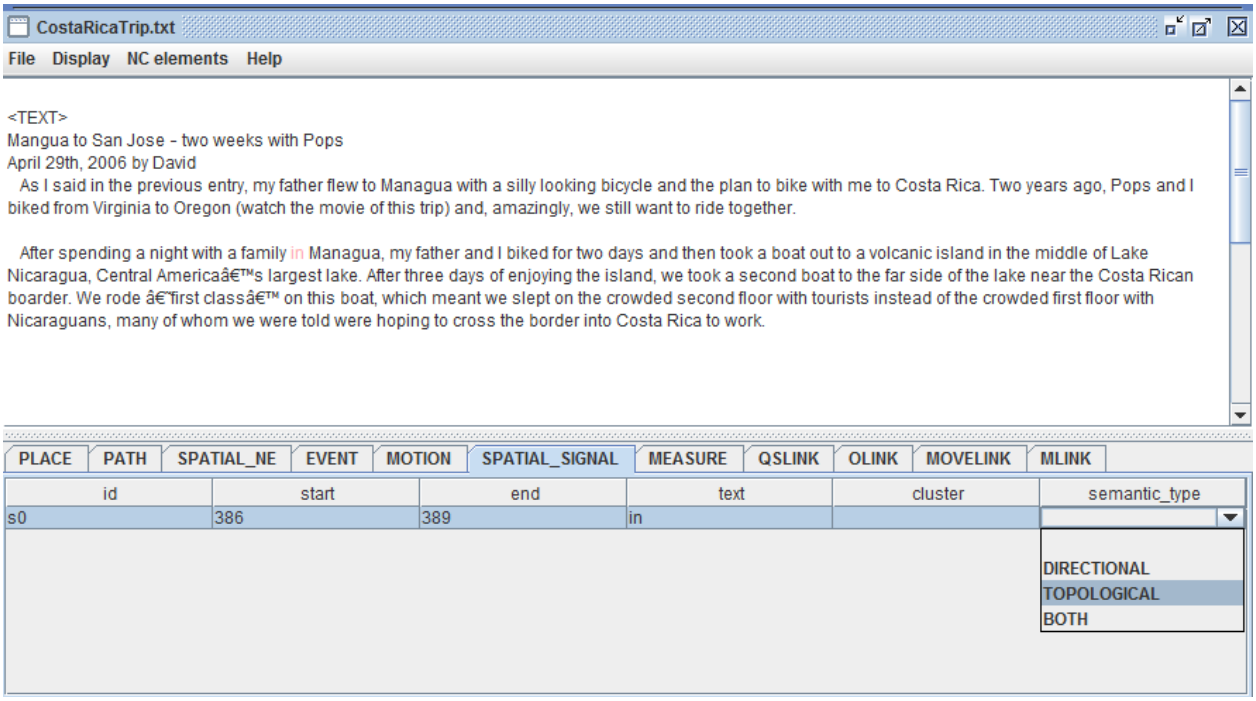
Whatever strategy may best suit you, the easiest part of the annotation is selecting what word(s) are places, paths, motions, spatial signals, etc. To tag a phrase, simply highlight the extent you wish to label and then right click on it. A dropdown menu should show up, listing all the possibilities. Simply select the one that is most logical with the extent (remember paths and spatial named entities can be coerced into being places).



You will know if the extent was correctly labeled if both it appears in one of the tables below (under the respective tag) and the color of the extent in the text has also changed to reflect the tag.

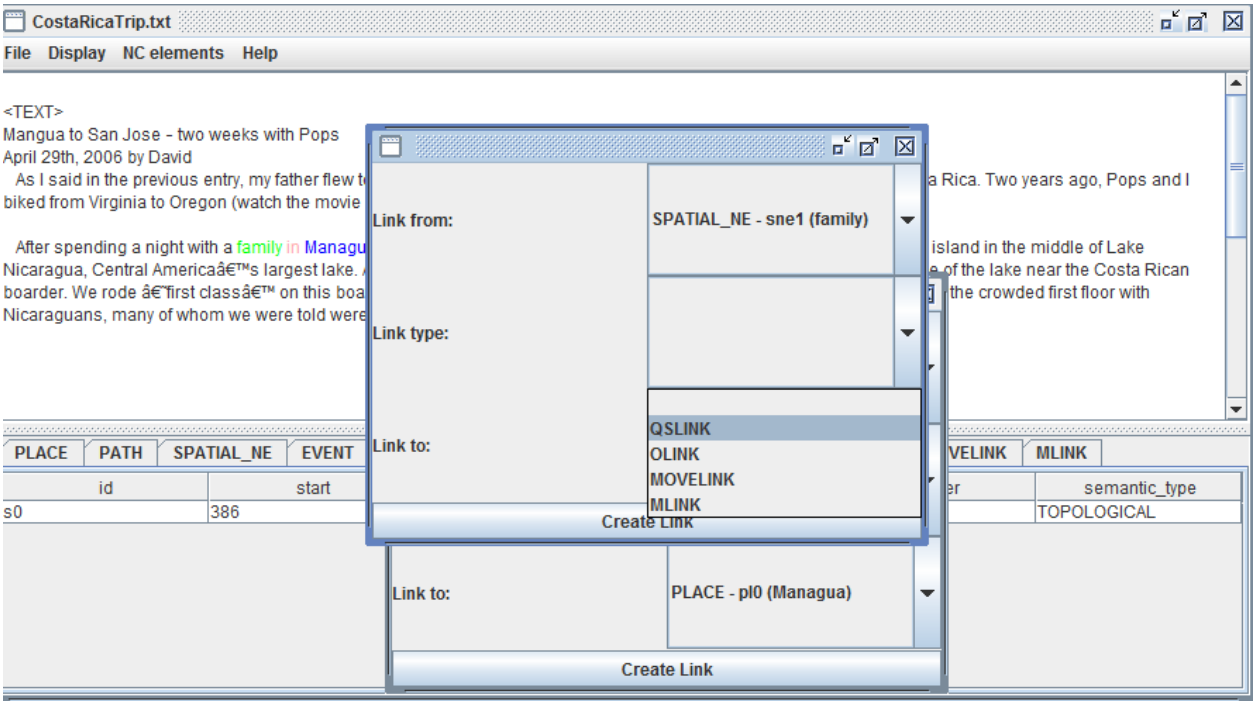


The “id” is used to index each of the different tags, starting with the type (“sne” for spatial named entity) and then the index (starting at 0). All tags and links are automatically indexed for you. However, if you decide to delete an entry in the table (done by right clicking anywhere on the entry and selecting “Remove selected...rows”) the indexing will not reflect the change. Additionally, you will need to use the “id” to reference the extent in links that it may participate in. Finally, note that not all of the attributes for the tag are filled in—if you are required to, you may have to manually fill in such attributes (more relevant for places, paths, spatial_signals, and motions) before moving onto the next extent. To do so, simply click on the empty entry below the attribute column, and either select a possible value or manually enter one in. The same can be done to entries that are already filled/completed (in case you felt there was a mistake).

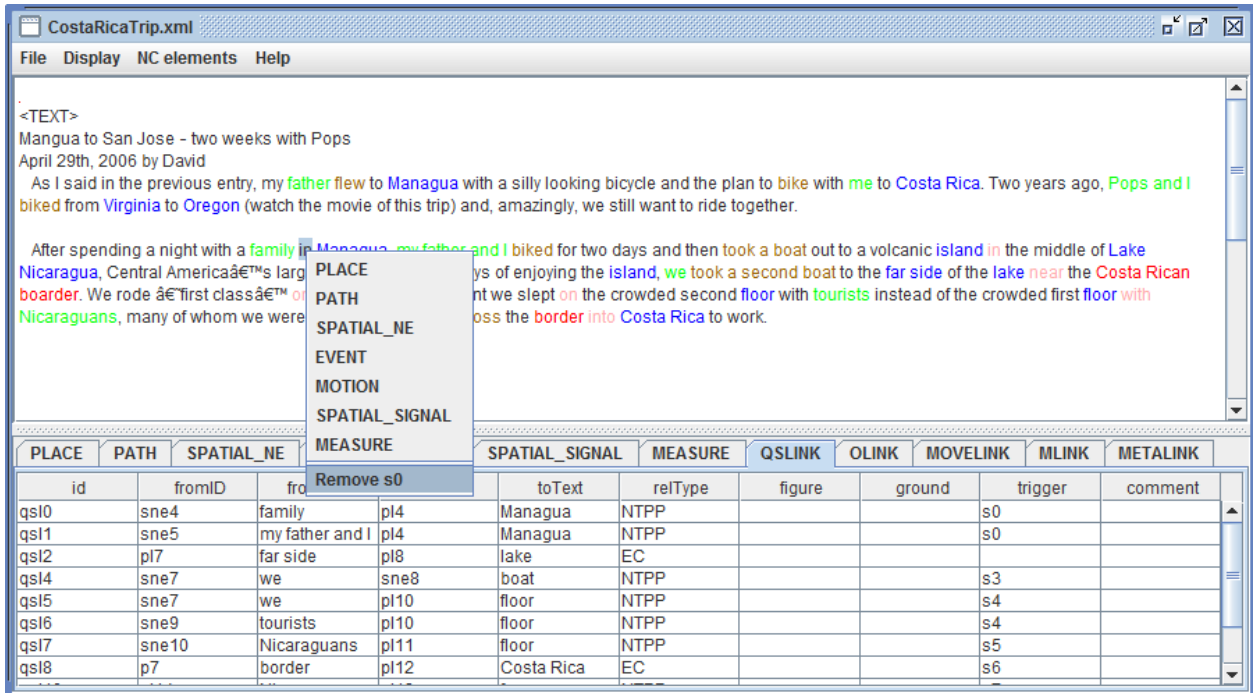


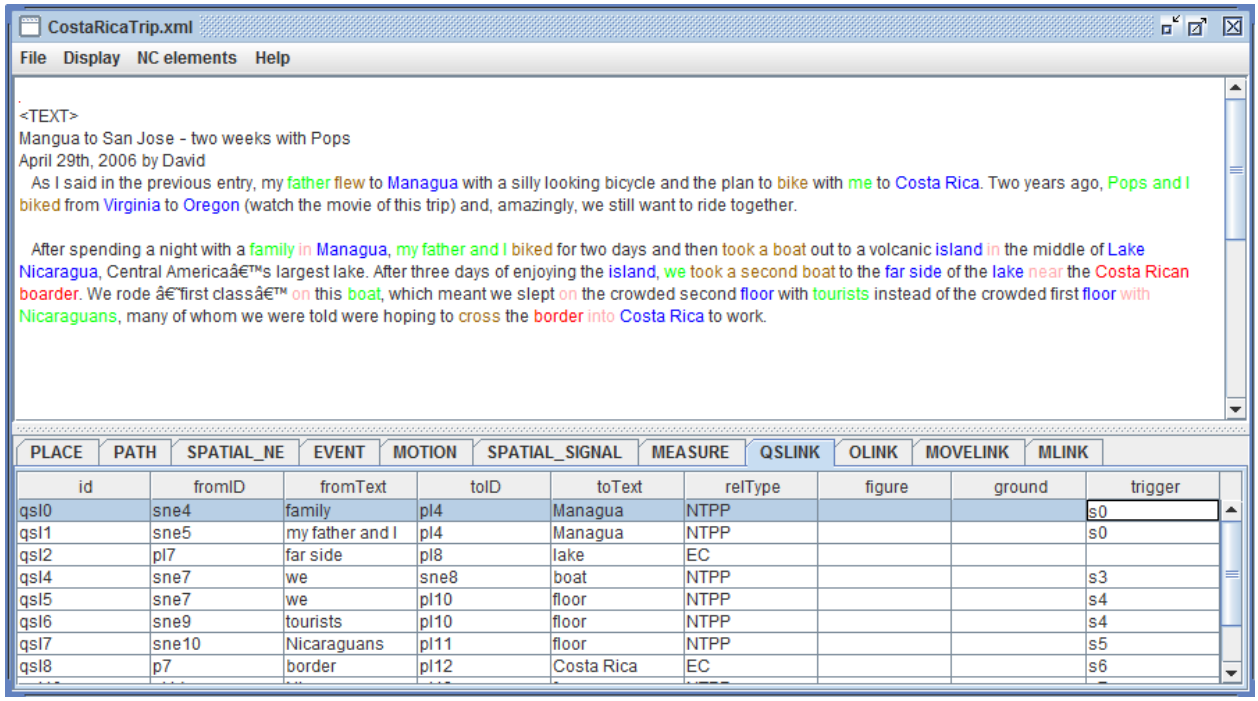
The most important task of the annotation, however, is how the various spatial relationships between the places, paths, motions, etc. are captured. This is done through various links, namely: QSLINK, OLINK, MOVELINK, MLINK, and METALINK. A link essentially will relate several (already annotated) extents to each other in some way. To begin a link, use CTRL+Left Click on the first and second extents you wish to associate in a link.

For QSLINK, OLINK, and MLINK, the first extent you click will be the figure (currently labeled as fromID) and the second extent will be the ground (currently labeled as toID). If an MLINK does not have a ground (e.g. simply a measurement of something), simply click the same extent twice. For MOVELINK, the first extent is the trigger/motion event (again labeled as fromID) and the second extent is the mover (here toID).



As you may have noticed, where the extents end up in the table for each link is not usually what the function that extent is; however, as long as the tagging is consistent this will not matter, as labels are simply labels. To finish the link, simply head to its entry and fill in the missing information. For most links you will likely need to provide more information about other attributes not provided by the first two extents (trigger, relType, etc.). Some of these attributes require the input of other tags (e.g. a trigger usually needs a spatial signal). Rather than go back through each of the tables of tags and track down each id, there is a way to find the id of the extent by simply highlighted the already tagged extent and right clicking on it. The pop-up menu should display the id of the tag preceded by "remove" (you do not need to remove the tag, just to find its id) as seen below. You will still need to manually enter in the id however.





...And that's it! You are now ready to tag extents and set up links, which covers all the annotation work needed for ISO-Space.