UMR Road Map Guidelines

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Contents

1 Introduction

UMR is a semantic annotation scheme, which means that it aims to annotate semantic information regardless of the morphosyntactic strategies used to express that information in any particular language. This means that UMR annotations may be different for the same grammatical construction, depending on the context in which it occurs. Nevertheless, certain types of grammatical constructions may serve as 'clues' to the appropriate UMR annotation.

UMR seeks to achieve both flexibility and comparability across a diverse range of languages. Languages differ from each other not only with regard to linguistic features, but also in terms of which types of computational resources have already been developed. The pieces of the UMR annotation scheme presented here make use of two types of solutions for these differences across languages: typologically-informed lattices, and the road map approach.

The lattice approach gives annotators the flexibility to select coarser-grained (or finer-grained) annotation values. The lattices are constructed based on typological generalizations and indicate which annotation values are comparable.

The road map approach defines different stages of UMR annotation, depending on the resources available in a given language. This allows languages without a large amount of pre-existing computational resources to be annotated with UMR. For certain annotation categories, earlier stages of the road map only annotate a subset of events/participants with the relevant value; but, importantly, the events/participants that are annotated receive comparable annotations to later stages in the road map. For participant roles, the earlier stages of the road map involve building the computational resources to enable Stage 2 annotation. Here, the computational resource (namely, frame files) will indicate the relationship between the Stage 1 and Stage 2 annotation values.

2 UMR relations

2.1 Participant roles

Every entity and event that is dependent on an event is annotated with a participant role label. The participant role annotation looks rather different at the different stages of the road map. The factor which determines where a language begins on the road map is whether there is an existing PropBank-style lexicon for the language. An English PropBank frame file is shown below:

Predicate: `give.01`
Roles:
`Arg0:` giver
`Arg1:` thing given
`Arg2:` entity given to

Following AMR, UMR uses PropBank frame files to annotate lexicalized participant roles. But, this only works for languages which have PropBank-style frame files. This is considered the 'Stage 2' participant role annotation (see §2.1.2). The Stage 1 annotation involves using a set of general participant roles, while building a lexicon of PropBank-style frame files in order to move towards Stage 2 annotation.

Some types of valency alternations (or, argument structure alternations) are indicated in the participant role annotation; other types of alternations are not annotated in UMR. Not all valency alternations have the same relationship between the basic construction and the non-basic construction. Givón (1994) distinguishes semantic and pragmatic valency alternations. In semantic alternations, the basic and non-basic constructions differ in terms of the semantic content that they express, i.e., they don't refer to the same "real-world" event. Reciprocals are an example of a semantic alternation, seen below in 1 from Torau (Parkinson 2018, 53).

(1) a. ta-di=lo daki-a tioni arimi ta besu
PFV-3PLS=go find-3SGO man feel.sorry 3SG.PFV be.hungry
'When they found him, the poor man was hungry.'

b. ta-di=lama ari da-daki uua=i
PFV-3PLS=TAM RECP RDP-find in.that.direction=LOC
'They had found each other.'

The event described in 1a is different than the event described in 1b. This is in contrast to valency alternations which reflect a pragmatic difference between the basic and non-basic construction. With pragmatic alternations, both constructions refer to the same "real-world" event, but they package that information differently, often in terms of the topicality (or, discourse salience) of participants. Passive constructions are an example of a pragmatic valency alternation, as seen in 2 from Balinese (Shibatani and Artawa 2013).

(2) a. Anake muani cenik ento ngajeng buahe ento.

anak=e muani cenik ento ngajeng buah=e ento
person=DEF male small that eat fruit=DEF that

'The boy ate the fruit.'

b. Buahe ento ajenga teken anake muani cenik ento.

buah=e ento ajeng=a teken anak=e muani cenik ento
fruit=DEF that eat=PASS by person=DEF male small that

'The fruit was eaten by the boy.'

Here, 2a and 2b could refer to the same event, with the main difference being the saliency or topicality of *anak=e muani cenik* 'the boy'.

Broadly, UMR indicates semantic valency alternations with the participant role annotation, while pragmatic alternations are not reflected in the UMR. This means that the participant role annotations for 1a and 1b would be different, where as the participant role annotation for 2a and 2b would be the same. The annotations for valency alternations also depend on the stage of the road map, so that will be detailed below.

2.1.1 Stage 1

At Stage 1, a set of general (i.e., non-lexicalized) semantic roles are used. These certainly will not map exactly to the grammatical marking of argument phrases in any language, but this set of roles was selected based on cross-linguistic patterns of argument marking. The set of participant role labels, a brief description for each label, and examples are shown below in Table 1.

UMR Annotation	Definition	Example
ACTOR	animate entity that initiates the action	**the doctor** laughed **the boy** ate a salad
UNDERGOER	entity (animate or inanimate) that is affected by the action	**the papers** burned he burned **the onions**
THEME	entity (animate or inanimate) that moves from one entity to another entity, either spatially or metaphorically	she put **the books** on the shelf she tore **a page** from the book he gave **a sandwich** to me she told him **a story**
RECIPIENT	animate entity that gains possession (or at least temporary control) of another entity	he gave a sandwich **to me** she told **him** a story
FORCE	inanimate entity that initiates the action	**the wind** knocked down the tree
CAUSER	animate entity that acts on another animate entity to initiate the action	**the mother** made her child eat the broccoli
EXPERIENCER	animate entity that cognitively or sensorily experiences a STIMULUS	**the dog** heard a sound
STIMULUS	entity (animate or inanimate) that is experienced by an EXPERIENCER	the dog heard **a sound**
INSTRUMENT	inanimate entity that is manipulated by an external causer in order to initiate the action	she hit him with **a broom**
COMPANION	animate entity that acts with the ACTOR to initiate the action	he cooked dinner with **his wife**
MATERIAL	entity (inanimate) that is transformed into a new entity	he made a roux with **flour and butter**
SOURCE	entity from which the THEME detaches	he plucked a flower from the **the bush**
PLACE	location at which the action takes place	he read a book in **the garden**
START	location at which a motion event begins	she biked from **her house**
GOAL	location at which the action ends, the end point at which the THEME arrives	she put the books on **the shelf**
AFFECTEE	animate entity which the action has a positive or negative influence on, i.e. beneficiary or maleficiary	he made a cake for **the dog** she stole a watch from **the CEO**
CAUSE	inanimate entity that causes the action to happen	he was late because of **the fire**
MANNER	manner in which the action takes place	she exercised by **lifting weights**
REASON	motivation for the ACTOR to initiate the action	they got married because **they are in love**
PURPOSE	intended event that results from the action	they dropped water in order to **fight the fires**
TEMPORAL	event that has a temporal relation with the action	she left after **dinner**
EXTENT	measurement phrase	he ran **seven miles**
OTHER	this role can be used when an annotator is unsure of which role is appropriate	

Table 1: UMR non-lexicalized roles

External Cause	Central Event	Circumstantial
ACTOR	(CHANGE OF) STATE:	AFFECTEE
COMPANION	MATERIAL, UNDERGOER	PLACE
INSTRUMENT	MOTION/LOCATION:	MANNER
FORCE	THEME, GOAL, START, SOURCE, PLACE	PURPOSE
CAUSER	TRANSFER:	REASON
	THEME, RECIPIENT	CAUSE
	EXPERIENTIAL:	TEMPORAL
	EXPERIENCER, STIMULUS	EXTENT

Table 2: Categorization of UMR non-lexicalized roles

These general semantic roles can be categorized based on the types of events with which they occur, shown in Table 2. Some participant roles express the external cause of an event; these can occur with many semantic classes of events. Similarly, the "circumstantial" type semantic roles can occur with a wide range of semantic event classes.

For the roles that characterize the central participant(s) in the event, the best way to decide which participant role label a given participant should receive is to consider the semantic class of the event. The UNDERGOER role only occurs with change-of-state events, construed broadly to include creation and contact events as well. The UNDERGOER role is used for the entity that undergoes the change-of-state, is the endpoint of force in a contact event, or is created in a creation event, as seen in 3. The MATERIAL role only occurs with creation events, as in 3c, and is used for the raw materials that are transformed into the created object.

(3) a. The ice cube melted.

```
(m / melt
    :UNDERGOER (i / ice cube))
```

b. The enemy sank the ship.

```
(s1 / sink
    :ACTOR (e / enemy)
    :UNDERGOER (s2 / ship))
```

c. She built a house out of wood.

```
(b / build
    :ACTOR (s / she)
    :UNDERGOER (h / house)
    :SOURCE (w / wood))
```

d. He hit the stick against the fence. / He hit the fence with the stick.

```
(h1 / hit
    :ACTOR (h2 / he)
    :INSTRUMENT (s / stick)
    :UNDERGOER (f / fence))
```

The EXPERIENCER and STIMULUS roles always occur with experiential events, as seen in 4. The EXPERIENCER role is used for the mental-level entity which attends to, reacts to, or passively experiences the STIMULUS role.

(4) a. The audience listened to the concerto.

```
(l / listen
    :EXPERIENCER (a / audience)
    :STIMULUS (c / concerto))
```

b. The cat startled me.

```
(s / startle
    :EXPERIENCER (m / me)
    :STIMULUS (c / cat))
```

The START, GOAL, and SOURCE roles only occur with motion events; PLACE has two different uses, one with Motion/Location events and one with other event classes. START, GOAL, and PLACE are used for locations – START is the location from which motion originates, as in 5b, GOAL is the location in which motion ends, as in 5a and 5c, and PLACE is used for static locations, as in 5d. The SOURCE role is in the removal subclass of motion events; it is used for the entity from which the THEME is removed, as in 5e. With motion events, the THEME role is used for the entity that moves (unless the motion is volitional), as in 5b.

(5) a. The leaf fell to the ground.

```
(f / fall
    :THEME (l / leaf)
    :GOAL (g / ground))
```

b. She walked home from the store.

```
(w / walk
    :ACTOR (s1 / she)
    :GOAL (h / home)
    :START (s2 / store))
```

c. He put the books in a box.

```
(p / put
    :ACTOR (h / he)
    :THEME (b1 / books)
    :GOAL (b2 / box))
```

d. She is sitting on the couch.

```
(s1 / sit
    :ACTOR (s2 / she)
    :PLACE (c / couch))
```

e. He picked some berries from the bush.

```
(p / pick
    :ACTOR (h / he)
    :THEME (b1 / berries)
    :SOURCE (b2 / bush))
```

The RECIPIENT role only occurs with transfer events, or metaphorical transfer events like communication. With these events, the initiator of the transfer is an ACTOR, the entity that is transferred is the THEME and the entity that the THEME is transferred to is labelled as the RECIPIENT. For transfer of possession events that express the original possessor of the THEME, the original possessor is annotated as AFFECTEE, as in 6d.

(6) a. He gave the cat some wet food.

```
(g / give
    :ACTOR (h / he)
    :THEME (w / wet food)
    :RECIPIENT (c / cat))
```

b. I showed the pictures to her.

```
(s / show
    :ACTOR (i / I)
    :THEME (p / picture)
    :RECIPIENT (h / her))
```

c. She told me that they they're attending.

```
(t1 / tell
    :ACTOR (s / she)
    :RECIPIENT (m / me)
    :THEME (a / attend
        :ACTOR (t2 / they)))
```

d. She stole the information from a competitor.

```
(s1 / steal
    :ACTOR (s2 / she)
    :THEME (i / information)
    :SOURCE (c / competitor))
```

The other participant roles can occur pretty much freely with any semantic class of event. The external cause roles are used to annotate entities that bring about the central event. The ACTOR role is used for "active" single-participant events, in which the single participant acts volitionally to bring about the event, as in 7. This contrasts with "inactive" single-participant events, in which the single participant undergoes a change outside of its control, as in 3a above. See Appendix B for examples of single-participant verbs and their participant role annotation. The ACTOR role is also used for animate entities that initiate an action, as in 3b above.

The COMPANION role is used for the entity that helps the ACTOR bring about the action, as in 8a.[1] Note that this role is only annotated when the COMPANION participant is expressed separately from the ACTOR. Plural participants and conjoined participants, as in 8b and 8c, are annotated with a single ACTOR role. In some languages, a marker may be ambiguous between a comitative marker and a conjunction. When the two participants are expressed separately in the clause, they should be treated as separate participants, annotated with ACTOR and COMPANION. When they are expressed together, they are treated as a single ACTOR participant.

The INSTRUMENT role is used for an entity that is manipulated by one of the other external cause roles, often an ACTOR, in order to initiate the action. The entity which manipulates the INSTRUMENT may or may not be present in the clause; see 9a and 9b.

The FORCE role is used for physical entities which initiate an action, or cause another entity to undergo a change, as in 9c. Finally, the CAUSER role is used for the external initiator in some causative constructions, see 2.1.1.

(7) He winked.

```
(w / wink
    :ACTOR (h / he))
```

1. This means that all events annotated with a COMPANION role will also have a participant annotated with an ACTOR role.

(8) a. Jane wrote the paper with Chris.

```
(w / write
   :ACTOR (J / Jane)
   :COMPANION (C / Chris)
   :UNDERGOER (p / paper))
```

b. They wrote the paper.

```
(w / write
   :ACTOR (t / they)
   :UNDERGOER (p / paper))
```

c. Jane and Chris wrote the paper.

```
(w / write
   :ACTOR (J / Jane and Chris)
   :UNDERGOER (p / paper))
```

(9) a. She sliced the bread with a knife.

```
(s / slice
   :ACTOR (s / she)
   :INSTRUMENT (k / knife)
   :UNDERGOER (b / bread))
```

b. The knife sliced through the bread.

```
(s / slice
   :INSTRUMENT (k / knife)
   :UNDERGOER (b / bread))
```

c. The storm damaged the power lines.

```
(d / damage
   :FORCE (s / storm)
   :UNDERGOER (p / power lines))
```

See Table 1 for examples of the circumstantial roles. In addition, there is an OTHER placeholder role that can be used when annotators are unsure of which participant role annotation is accurate for a particular participant. Also see Appendix B for a list of verbs and how their microroles are annotated.

At Stage 1, participant roles that aren't explicitly expressed in the clause do not have to be annotated, even if they are implied by the context. If the annotator is certain about them, however, they can be annotated. For example, in 10, the GOAL is left implicit; at Stage 1, this role may be left out of the annotation.

(10) They loaded the boxes.

```
(l / load
   :ACTOR (t / they)
   :THEME (b / boxes))
```

Nonverbal clauses There is a small set of predicates that use lexicalized roles at all stages of the road map; therefore, frame files for these predicates are created at Stage 1 annotation. These are the nonverbal clause predicates shown above in Table **??**.

Each nonverbal clause predicate has an `ARG0` and an `ARG1`; these map to the semantic roles as shown in Table 3. The argument that can be predicativized in some languages is always `Arg1`. Examples 11-17 show how nonverbal clauses are annotated with participant roles. Note that these annotations will be the same at every stage of the road map.

Clause type	**UMR Predicate**	**ARG0**	**ARG1**
thetic/presentational possession	have-03	*possessor*	*possession*
predicative possession	belong-01	*possession*	*possessor*
thetic/presentational location	exist-91	*location*	*theme*
predicative location	have-location-91	*theme*	*location*
property predication	have-mod-91	*theme*	*property*
object predication	have-role-91	*theme*	*object category*
equational	identity-91	*theme*	*equated referent*

Table 3: Nonverbal clause predicates

(11) Thetic/presentational Possession - Kukama

Mijiri-tin ɨara-yara
Miguel-CER canoe-owner

'Miguel does have a canoe.' (Lit. 'Miguel is a canoe-owner')

```
(e / ɨara-yara 'has canoe'
:ARG0 (m / Mijiri 'Miguel')
:ARG1 (i / ɨara 'canoe'))
```

(12) Predicative Possession - English

The dog belongs to the teacher.

```
(b / belong-01
:ARG0 (d / dog)
:ARG1 (t / teacher))
```

(13) Thetic/presentational Location - English

On the rock was a symbol.

```
(e / exist-91
:ARG0 (r / rock)
:ARG1 (s / symbol))
```

(14) Predicative Location - Yabem (Dempwolff 1939)

àndu kê-kô malac
house 3SG-be.at village

'The house is in the village.'

```
(h / have-location-91
:ARG0 (a / àndu 'house')
:ARG1 (m / malac 'village'))
```

(15) Property Predication - English

The cat is black.

```
(h / have-mod-91
:ARG0 (c / cat)
:ARG1 (b / black))
```

(16) Object Predication - Kukama

ajan kunumi tsumi
this young.man shaman

'This young man is a shaman.'

```
(h / have-role-91
:ARG0 (k / kunumi 'young man')
:ARG1 (t / tsumi 'shaman'))
```

(17) Object Equational - English

She is the winner.

```
(h / identity-91
:ARG0 (s / s)
:ARG1 (w / winner))
```

Valency alternations As discussed in 2.1, certain types of semantic valency alternations are reflected in the participant role annotation. At Stage 1, these alternations influence the choice of general participant role labels. For information-packaging alternations, such as passives, antipassives, or valency-rearranging applicatives, participants are annotated in the same way as in the basic construction in the language. If a participant is omitted, for example the agent in a passive construction as in 18 from Berber (Guerssel 1986, 52), then it simply isn't annotated at Stage 1.[2]

(18) a. Y-usy wrba tafirast.
3MS-pick.up boy:CST pear
'The boy picked up the pear.'

(u / usy 'pick up'
:ACTOR (w / wrba 'boy')
:UNDERGOER (t / tafirast 'pear'))

b. T-ttw-asy tfirast.
3FS-DETR-pick.up pear
'The pear was picked up.'

(t / ttw-asy 'pick up'
:UNDERGOER (t / tafirast 'pear'))

Causatives. There are a few different types of causatives that require different annotation solutions. For most causatives of transitives, the causer is annotated as CAUSER, the causee as ACTOR, and the rest of the participants receive the same annotation labels that they would in a a non-causative construction. In 19 from Kukama, *nai* 'grandmother' is annotated as CAUSER, the causee *churan* 'kid' is annotated as ACTOR, and *uni* 'water' as UNDERGOER.

(19) nai kurata-ta churan=ui
grandmother drink-CAU kid=PST
uni=pu
water=INS
'Grandmother made the kid drink the water.'

(k / kuratata 'make drink'
:CAUSER (n / nai 'grandmother')
:ACTOR (c / churan 'kid')
:UNDERGOER (u / uni 'water'))

There are certain causatives of transitives which do not use the CAUSER role. These are constructions which express transfer events, including mental/cognitive transfer. Some languages express these types of events with monomorphemic verbs, like English, but other languages use causatives of transitive verbs. Languages may differ in terms of which types of causative constructions are construed as transfer; in order to annotate the same semantic events in the same way across languages, the ACTOR, THEME, RECIPIENT roles are used for transfer of possession (giving), sending, and mental transfer, which includes showing and communication. Bezhta in 20b (Comrie, Khalilov, and Khalilova 2015, 560) uses the causative of *b-egā-yo* 'see' as equivalent to English *show*.

(20) a. hogco-l raład b-egā-yo
he.OBL-LAT sea(III) III-see-PST
'He saw the sea.'

(b / b-egā 'see'
:EXPERIENCER (h / hogco 'he')
:STIMULUS (r / raład 'sea'))

b. hogco kibba-l raład
he.OBL(ERG) girl.OBL-LAT sea(III)
b-ega-l-lo
III-see-CAUS-PST
'He showed the sea to the girl.'

(b / b-ega-l 'show'
:ACTOR (h / hogco 'he')
:THEME (r / raład 'sea')
:RECIPIENT (k / kibba 'girl'))

For causatives of ditransitives, the causer receives the CAUSER role, the causee the ACTOR role, and the other participants receive the same annotation as in a non-causative construction. This can

2. This means that agentless passives and anticausatives will have the same participant role annotation at Stage 1.

be seen in 21 from Shipibo-Konibo (Valenzuela 2003, 612). If 'the man' was expressed in the clause, that participant would be annotated as RECIPIENT.

(21) Ja-tian ja xontako
that-TEMP that unmarried.girl:ABS
jawen tita-n
POS3 mother-ERG
xoi meni-ma-[a]i
roasted.meat/fish:ABS give-CAUS-INC
keen-yama-[a]i-bi...
want-NEG-SDS-EM
'Then her mother makes the unmarried girl give roasted meat/fish (to the man who had asked her in matrimony) even though she doesn't want to...'

(m / meni-ma 'make give'
:CAUSER (t / tita 'mother')
:ACTOR (x1 / xontako 'unmarried girl')
:THEME (x2 / xoi 'roasted meat'))

There are two types of causatives of intransitives, based on the two types of intransitives. For intransitives whose single participant corresponds to an UNDERGOER role, such as change-of-state verbs in many languages, the causer is annotated as ACTOR and the single participant retains its UNDERGOER label. This can be seen in 22 from Falam Chin (King 2011, 195) below.

(22) a. Ka kedam hri a
1SG shoe STRING 3SG.NOM
cat.
broken.1
'My shoelace is broken/broke.'

(c / cat 'broken'
:UNDERGOER (k / kedam hri 'shoelace'))

(c / cat-ter 'break'
:ACTOR (t / Thangte)
:UNDERGOER (k / kedam hri 'shoelace'))

b. Thangte in ka kedam hri
Thangte ERG 1SG shoe STRING
a cat-ter.
3SG.NOM broken.1-CAUS
'Thangte broke my shoelace.'

Regardless of whether the causative or anticausative verb is derived (or, neither is derived), the anticausative/intransitive meaning is annotated with a single UNDERGOER participant and the causative/transitive meaning is annotated with an ACTOR and an UNDERGOER participant.

When the single participant of the intransitive corresponds to the ACTOR role, then the causer receives the CAUSER annotation and the single participant retains its ACTOR label. This can be seen in 23 from Falam Chin King 2011, 195 below.

(23) a. Cinte a hni.
Cinte 3SG.NOM laugh.1
'Cinte laughed.'

(h / hni 'laugh'
:ACTOR (C / Cinte))

b. Parte in Cinte a
Parte ERG Cinte 3SG.NOM
hni-ter.
laugh.1-CAUS
'Parte made Cinte laugh.'

(h / hni-ter 'make laugh'
:CAUSER (P / Parte)
:ACTOR (C / Cinte))

Applicatives. Peterson (2007) distinguishes between "valency-increasing" applicatives and "valency-rearranging" applicatives. In valency-rearranging applicatives, a participant is expressed as an oblique in the basic construction and expressed as a core argument in the applicative construction; they are generally associated with the increased saliency or topicality of the oblique participant. Therefore, these fit into the category of pragmatic valency alternations, and both the basic and applicative construction receive the same participant role annotation. This can be seen in 24 from Falam Chin (King 2011, 240).

(24) a. Parte in Thangte hrang=ah hmeh
Parte ERG Thangte for=LOC curry
a suang.
3SG.NOM cook.1
'Parte cooked some curry for Thangte.'

(s / suang 'cook'
:ACTOR (P / Parte)
:UNDERGOER (h / hmeh 'curry')
:AFFECTEE (T / Thangte))

b. Parte in Thangte hmeh a
Parte ERG Thangte curry 3SG.NOM
suan-sak
cook.2-BEN
'Parte cooked Thangte some curry.'

(s / suang-sak 'cook for'
:ACTOR (P / Parte)
:UNDERGOER (h / hmeh 'curry')
:AFFECTEE (T / Thangte))

Whether the beneficiary, *Thangte*, is expressed as an oblique or a core argument, it is annotated as AFFECTEE. Valency-increasing applicatives involve the addition of a participant, compared to the basic construction. Here, the added participant is simply annotated with the appropriate semantic role.

Reflexives & Reciprocals For reflexive and reciprocal constructions, the single participant is annotated with both of the semantic role labels which it is fulfilling in the construction. This can be in 25 and 26 from Supyire (Carlson 1994, 416-7).

(25) U a ù-yé bánì
he PERF he-REFL wound
'He has wounded himself.'

(b / bánì 'wound'
:ACTOR (u / u 'he')
:UNDERGOER (u))

(26) Pi a pì-yé kánù
they PERF they-REFL love
'They loved each other.'

(k / kánù 'love'
:ACTOR (p / pi 'they')
:UNDERGOER (p))

2.1.2 Stage 2

The Stage 2 participant role annotation requires access to PropBank-style frame files in the language for a large number of predicates. At this stage, each predicate identified as an event is linked to its corresponding frame file. The participants dependent on that event are annotated with the lexicalized roles, as determined by the frame file. This can be seen in 27 below.

predicate: `tease.02`
arguments:
`ARG0`: teaser
`ARG1`: teased
`ARG2`: about what

(27) He teased the boy about his hat.

(h / tease.02
    :ARG0 (h / he)
    :ARG1 (b / boy)
    :ARG2 (h / hat))

Since the nonverbal clause functions require the use of lexicalized predicates at Stage 1, these are annotated in the same way at Stage 2 (see 2.1.1). Unlike Stage 1, implicit participants are annotated for their semantic role at Stage 2. This is shown in 28 below.

(28) She parked the truck in the driveway. They loaded the boxes.

(h / park.01
    :ARG0 (s / she)
    :ARG1 (t / truck)
    :ARG2 (d / driveway))

(h / load.01
    :ARG0 (t2 / they)
    :ARG1 (t)
    :ARG2 (b / boxes))

The second sentence in 28 does not include explicit mention of the truck, but it is understood from the context that the truck is the goal participant of the loading event. Therefore, at Stage 2, these implicit roles receive participant role annotation.

Valency alternations The approach to valency alternations at Stage 2 is largely the same as that detailed for Stage 1 in 2.1.1. However, at Stage 2, predicates with valency-changing morphology should have their own frame files with lexicalized arguments. Therefore, the annotation of participant roles for valency alternations is the same as that for other types of predicates. The predicate is matched with its frame files and the participants are annotated accordingly.

3 UMR Attributes

3.1 Aspect

3.1.1 Event Identification

Only words identified as events in the UMR annotation receive an aspectual value. Identifying events is not based on parts of speech or word classes, since these vary greatly across languages. Instead, event identification is based on a combination of semantic type and information packaging (Croft 2001). Semantic type refers to the difference between entities (or, objects), states (or, properties), and processes; this can be thought of as a categorization of things in the real world. Information packaging (also called discourse function or information structure), on the other hand, characterizes how a particular linguistic expression "packages" the semantic content. There are three fundamental information packaging functions: reference, modification, and predication. Croft (in preparation) defines them as:

reference: what the speaker is talking about
modification: additional information provided about the referent
predication: what the speaker is asserting about the referents in a particular utterance

The three semantic types can occur with any of the three fundamental information packaging functions, as shown in Table 4 from Croft (in preparation).

Cross-linguistically, certain types of morphosyntactic constructions tend to express specific combinations of semantic type and information packaging; these are shown in Table 5, modified from Croft (2001). Prototypical combinations of semantic type and information packaging are indicated with small caps. These correspond to well-known part-of-speech classes across languages: entities

	Reference	Modification	Predication
Entities	the sharp **thorns**	the **bush's** thorns	It **is a thorn.**
States	**sharpness**	the **sharp** thorns	Those thorns **are sharp.**
Processes	I said [**that** the thorns **scratched** me]. the [**scratching** of the thorns]	the thorns **that** [**scratched** me] the thorns [**scratching** me]	The sharp thorns **scratched** me.

Table 4: English examples of semantic type and information packaging (Croft, in preparation)

	Reference	Modification	**Predication**
Entities	UNMARKED NOUNS	relative clauses, PPs on nouns	**predicate nominals, complements**
States	deadjectival nouns	UNMARKED ADJECTIVES	**predicate adjectives, complements**
Processes	**event nominals, complements, infinitives, gerunds**	**participles, relative clauses**	**UNMARKED VERBS**

Table 5: Constructions associated with semantic type and information packaging (Croft 2001)

in reference correspond to nouns, states in modification to adjectives, and processes in predication to verbs.

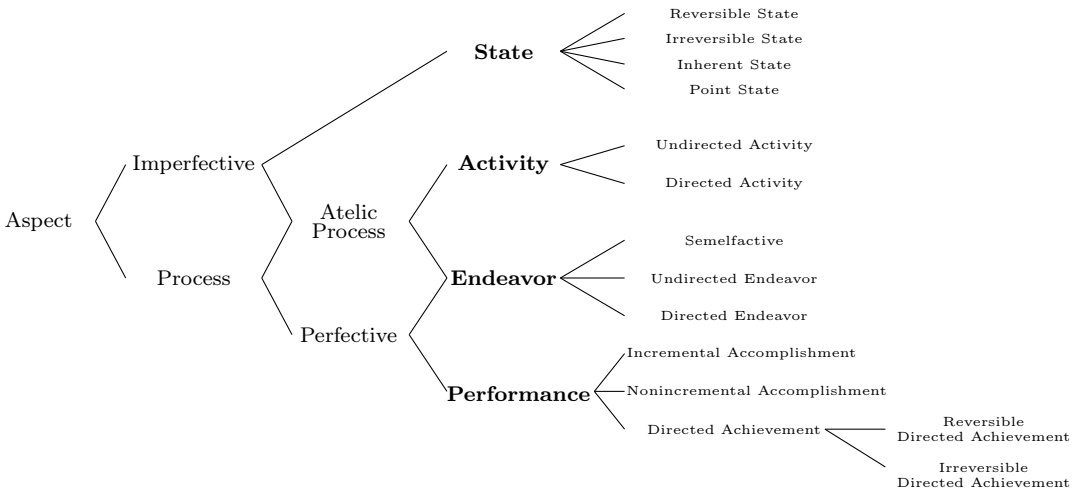
The most prototypical expression for an event is a process in predication, therefore we identify a word/phrase as an event if it has either the semantic type of the prototype (process) or the prototypical information packaging (predication). The categories which are identified as events in UMR are shown in bold in Table 5.

3.1.2 Aspectual values

The aspect annotation consists of a single value that is annotated for every event identified in 3.1.1. The aspect annotation doesn't have distinct annotation stages, unlike modality and participant roles. Instead it relies on a typological lattice which ranges from very coarse-grained to very fine-grained aspectual values. It's expected that languages at an earlier stage of semantic analysis or annotation will tend to use more coarse-grained values, and languages at later stages of annotation will tend to use more fine-grained values.

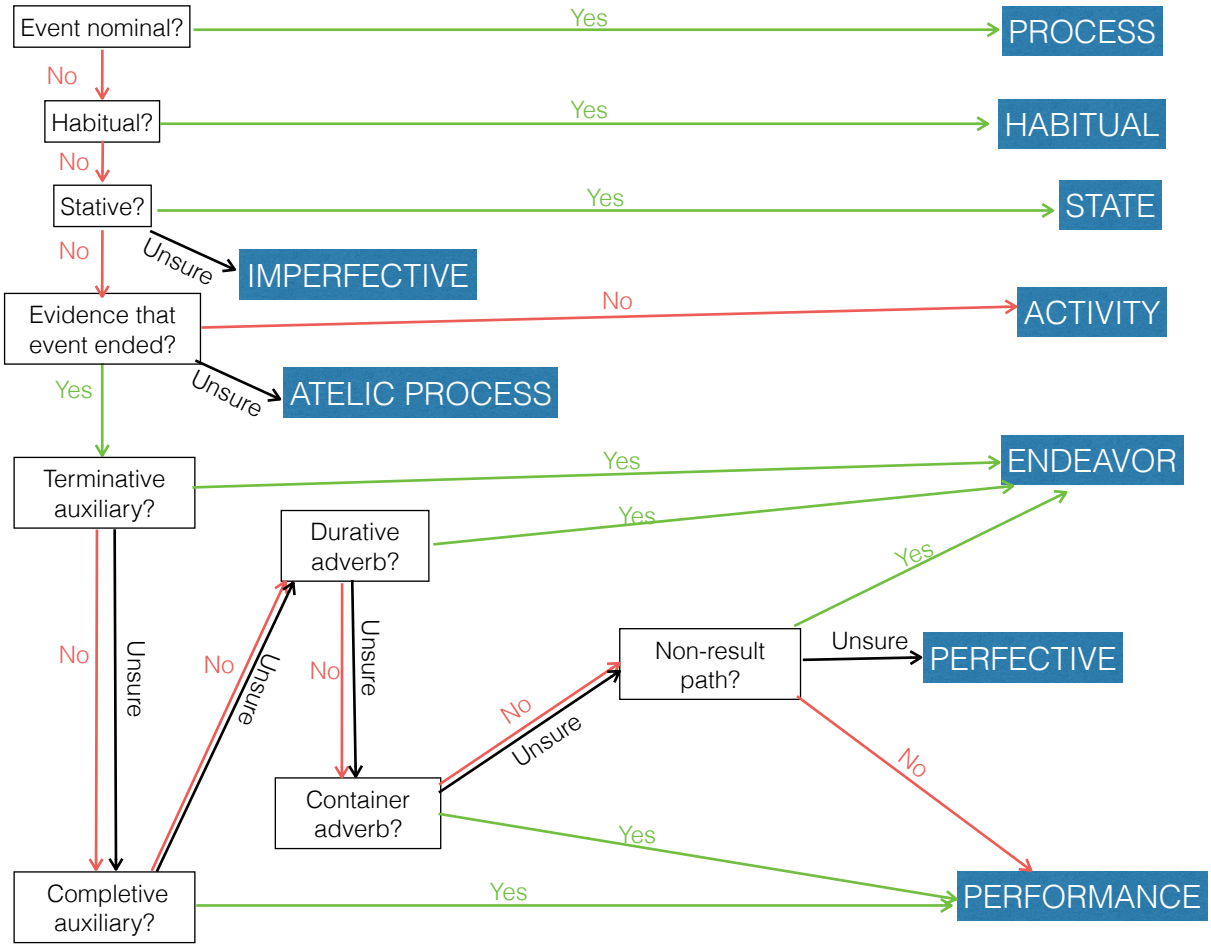
This is also heavily dependent on the aspectual distinctions that are grammaticalized and/or obligatory in the language. For example, although English has a long history of semantic analysis and many computational resources, it has very little overt aspectual marking in its grammar and therefore the most fine-grained aspect distinctions are very difficult to judge in annotation. This aspect lattice is shown below. Below are the aspect values with a brief definition.

HABITUAL: occurs/occurred usually or habitually
IMPERFECTIVE: ambiguous between state and process
PROCESS: unspecified type of process
ATELIC PROCESS: process that does not reach a result state
PERFECTIVE: process that comes to an end



STATE: unspecified type of state
REVERSIBLE STATE: acquired state that is not permanent
IRREVERSIBLE STATE: acquired state that is permanent
INHERENT STATE: state that is not acquired and permanent
POINT STATE: state that is acquired and reversed at a single point in time
ACTIVITY: process that does not end
UNDIRECTED ACTIVITY: process that does not end and does not progress linearly along a scale
DIRECTED ACTIVITY: process that does not end and does progress linearly along a scale
ENDEAVOR: process that ends without reaching a result state
SEMELFACTIVE: process that ends without reaching a result state and happens at a single point in time
UNDIRECTED ENDEAVOR: process that ends without reaching a result state and does not progress linearly along a scale
DIRECTED ENDEAVOR: process that ends without reaching a result state and progresses linearly along a scale
PERFORMANCE: process that ends and reaches a result state
INCREMENTAL ACCOMPLISHMENT: process that ends and reaches a result state, and progresses linearly along a scale
NONINCREMENTAL ACCOMPLISHMENT: process that ends and reaches a result state, and does not progress linearly along a scale
DIRECTED ACHIEVEMENT: process that ends and reaches a result state within a single point in time, and progresses linearly along a scale
REVERSIBLE DIRECTED ACHIEVEMENT: process that ends and reaches a result state, which is not permanent, within a single point in time, and progresses linearly along a scale
IRREVERSIBLE DIRECTED ACHIEVEMENT: process that ends and reaches a result state, which is permanent, within a single point in time, and progresses linearly along a scale

In order to select the appropriate annotation value for each event, annotators proceed through a series of decisions, summarized in the decision tree below.



3.1.3 Event Nominals

The first decision concerns the morphosyntactic expression of the event. Events expressed as nominals often lack any grammatical clues as to their aspectual structure. This makes determining an aspectual annotation value difficult. We do, however, know that these events are processes, and not states, since nominals expressing states are not identified as events. On the lattice, PROCESS is the aspectual value that includes all types of processes. Therefore, events expressed as event nominals, as in 29, are annotated as PROCESS.

(29) a. He presented his research at **the meeting** yesterday.
(m / meeting
ASPECT: PROCESS)

b. After **the game**, she went home.
(g / game
ASPECT: PROCESS)

c. He had **the operation** on Tuesday.
(o / operation
ASPECT: PROCESS)

Any event packaged in a referring expression is considered an event nominal and annotated with PROCECSS. This includes underived nominals, nominalizations, and gerunds, as in 30.

(30) a. **The second training** was cancelled yesterday.
(t / training
ASPECT: PROCESS)

b. The dog interrupted the meeting with **his barking**.
(b / barking
ASPECT: PROCESS)

Note that *-ing* forms in English can occur in a variety of constructions; they should only be treated as event nominals when they are used in referring expressions (as in 30a and 30b above). When they occur in other types of constructions, as in 31, they should not receive an aspect annotation at this point and annotators should continue on to the next step.

(31) The dog stopped **barking** for a few seconds.

Event nominals that occur in predicate nominal constructions, as in 32, are also not annotated at this point; these are treated like other predicate nominal constructions.

(32) It was **an earthquake**.

3.1.4 Habitual

The next step concerns the application of the HABITUAL aspect value. This value should be applied to all events that are presented as occurring usually or habitually, as in 33.

(33) a. He **bakes** pies.
(b / bake
ASPECT: HABITUAL)

b. She **rides** her bike to work.
(r / ride
ASPECT: HABITUAL)

c. They **vacation** in Taos every winter.
(v / vacation
ASPECT: HABITUAL)

d. They **used to vacation** in Taos every winter.
(v / vacation
ASPECT: HABITUAL)

In English, present habitual events are signalled by the Simple Present construction; past tense habitual events are expressed with the *used to* construction. Note that the HABITUAL annotation is not used for ability modals (e.g., *he can bake apple pie*); these events should continue on to the next step.

3.1.5 State

The next step assesses whether the event is a STATE. The distinction between states and processes is necessary for event identification (as states are only identified as events when predicated). According to Vendler (1967), states are those events which are stative—that is, no change takes place over the course of the event. There are various ways to express states in predication, shown in 34; note that all of the nonverbal clause types identified in 3.1.1 and annotated with UMR predicates are annotated as STATE.

(34) a. My cat **loves** tuna. (l / love ASPECT: STATE)

b. The doctor **is tall**. (h / have-mod-91 ASPECT: STATE)

c. The book **is on the table**. (h / have-location-91 ASPECT: STATE)

d. She **is an architect**. (h / have-role-91 ASPECT: STATE)

e. Your glass **is in the kitchen**. (h / have-location-91 ASPECT: STATE)

Modal verbs, as in 35, and events under the scope of ability modals, as in 36, are also annotated as STATE.

(35) a. He **wants** to travel to Albuquerque. (w / want ASPECT: STATE)

b. The cat **needs** to be fed. (n / need ASPECT: STATE)

c. He**'s dreading** their decision. (d / dread ASPECT: STATE)

(36) a. She <u>is able to</u> **sing** that aria. (s / sing ASPECT: STATE)

b. This car <u>can</u> **go** up to 150 mph. (g / go ASPECT: STATE)

In this analysis, ability modals refer to a static state of affairs, i.e. an entity possesses the relevant ability. For examples like 36a, ability modals may look more like event quantification. That is, there are probably multiple singing events that this example is generalizing over. Examples like 36b, however, show how ability modals are more like states. It is possible that the car has never actually gone as fast as 150 mph; the car just has the parts and (theoretical) ability to do so. Therefore, all types of ability modals, both 36a and 36b, are analyzed as states and annotated as such.

There is a type of event, called "inactive actions" by Croft (2012), which is semantically intermediate between states and processes. In many languages, they can be construed either way. For example, English *lie* can occur in the Progressive (*Bill **is lying** on the bed*) or the Simple Present (*The Sandias **lie** to the east of Albuquerque*). And across languages there is variation as to the default construal of inactive actions. The most frequent inactive actions are posture verbs (*sit, stand, lie, hang*), perception verbs (*see/look at, watch, hear/listen to, feel*), some sensation verbs (*ache*), mental activity verbs (*think, understand*), and verbs of operation/function (*work* in *This washing machine **works/is working***). For the UMR annotation, inactive actions in all constructions are annotated as STATE. If it is unclear whether an event refers to a STATE or an ATELIC PROCESS, then the IMPERFECTIVE annotation value is used.

There are different types of states, shown in 37, which can optionally be distinguished in the aspect annotation.

(37) a. My cat **is black and white**.
(h / have-mod-91
ASPECT: INHERENT STATE)

b. My cat **is hungry**.
(h / have-mod-91
ASPECT: REVERSIBLE STATE)

c. The wine glass **is shattered**.
(h / have-mod-91
ASPECT: IRREVERSIBLE STATE)

d. It **is 2:30pm**.
(h / have-mod-91
ASPECT: POINT STATE)

Events that are annotated as INHERENT STATE, as in 37a, refer to states that are an inherent property of the entity, i.e. they did not 'start' at any particular point in the entity's history and are not changeable in the future. Events annotated as REVERSIBLE STATE, as in 37b, refer to properties of entities that are not inherent, meaning they have come into existence at some point during the entity's history; these states are reversible, meaning the entity likely will revert back to its base state in the future. Events annotated as IRREVERSIBLE STATE, as in 37c, refer to properties of entities that are not inherent, but cannot be reversed in the future; once acquired, these states are permanent. Finally, events that are annotated as POINT STATE, as in 37d, refer to states that come into and out of existence over a single point in time (what is considered a 'point' is open to construal); these states necessarily do not persist into the future.

Events that are not annotated as a type of STATE move on to the next step.

3.1.6 Activity

The ACTIVITY label applies to processes when there is no evidence that the event has come to an end, as in 38.

(38) a. He is still **writing** his paper.
(w / write
ASPECT: ACTIVITY)

b. He was **writing** his paper yesterday.
(w / write
ASPECT: ACTIVITY)

This covers cases where it is clear that the process is still ongoing at document creation time, as in 38a, but also cases where it is ambiguous whether or not the process continues, as in 38b.

This step is largely dependent on context and real world knowledge, however there are some grammatical cues that can help. Events in the present tense, as in 39, are annotated as ACTIVITY.

(39) He **is playing** the violin.
(p / play
ASPECT: ACTIVITY)

Inceptive and continuative aspectual marking, as in 40, also do not imply that an event has (necessarily) ended.

(40) a. He started **playing** the violin. (p / play
ASPECT: ACTIVITY)

b. He kept on **playing** the violin. (p / play
ASPECT: ACTIVITY)

If an annotator is unsure about whether the text indicates that an event has ended or not, the ATELIC PROCESS label can be used.

There are two finer-grained ACTIVITY categories which can optionally be distinguished. Certain type of activities describe directed change, as in 41a, whereas other activities describe undirected change, as in 41b; these are annotated as DIRECTED ACTIVITY and UNDIRECTED ACTIVITY respectively.

(41) a. The soup was **cooling** on the counter. (c / cool
ASPECT: DIRECTED ACTIVITY)

b. The cat was **meowing** outside the door. (m / meow
ASPECT: UNDIRECTED ACTIVITY)

Events annotated as DIRECTED ACTIVITY refer to change that occurs gradually along a qualitative scale. In 41a, the temperature of the soup continues to decrease in a linear fashion. Events annotated as UNDIRECTED ACTIVITY refer to change that does not progress incrementally along a scale; in 41b, there is no scale or gradual change.

Events that have ended prior to document creation time and have not yet received an annotation move on to the next step.

3.1.7 Endeavor and Performance

At this point, only PERFECTIVE events are left: ENDEAVOR and PERFORMANCE. Both the ENDEAVOR and PERFORMANCE aspectual types entail that the process has come to an end; they are distinguished by the boundedness of the event in terms of qualitative state. The PERFORMANCE value is used when the event reaches a result state distinct from the base (start) state, that is, a specific "natural" endpoint. The ENDEAVOR value is used when the events ends, but does not reach a distinct result state. The PERFORMANCE value can be seen as the 'default' value for events at this step; the ENDEAVOR value is only annotated in the presence of explicit marking, which may come in several forms detailed below. If it's not clear which category an event fits into, it can be annotated as PERFECTIVE.

The explicit aspectual markings which suggest an ENDEAVOR annotation are terminative aspect marking, durative adverbials, and non-result paths. These are illustrated for English below.

(42) a. Mary stopped **mowing** the lawn.

b. Mary **mowed** the lawn for thirty minutes.

c. *Mary finished **mowing** the lawn for thirty minutes.

d. They **walked** along the river.

e. They finished **walking** along the river.

f. They **walked** along the river in 3 hours.

(m / mow
    ASPECT: ENDEAVOR)

(m / mow
    ASPECT: ENDEAVOR)

(w / walk
    ASPECT: ENDEAVOR)

(w / walk
    ASPECT: PERFORMANCE)

(w / walk
    ASPECT: PERFORMANCE)

Terminative aspectual marking, such as *stop* in English, is the strongest evidence that an event has ended without reaching a result state and should therefore be annotated as ENDEAVOR. Durative adverbials, such as in 42b, are the second strongest evidence for an ENDEAVOR annotation: they indicate that the event took place for a defined period of time and then ended, likely without completion. At least in English, durative adverbials cannot co-occur with completive aspectual marking; see 42c. A non-result path is the weakest evidence for an ENDEAVOR annotation; in the absence of other aspectual indicators, a non-result path requires an ENDEAVOR annotation, as in 42d. But, if there is a completive aspectual marker, as in 42e, or a container adverbial, as in 42f, both indicators that an event has reached a distinct result state, then the event is annotated as PERFORMANCE.

In the absence of any of the aspectual indicators listed above, events that have made it to this point in the decision tree are annotated as PERFORMANCE.

Both ENDEAVOR and PERFORMANCE have more fine-grained aspectual distinctions which may optionally be annotated. Endeavors may be specified with UNDIRECTED ENDEAVOR, DIRECTED ENDEAVOR, and SEMELFACTIVE. The UNDIRECTED ENDEAVOR and DIRECTED ENDEAVOR values correspond to UNDIRECTED ACTIVITY and DIRECTED ACTIVITY; they differ in that the event has come to an end. Semelfactives refer to punctual events that happen once before reverting back to the base state (these are similar to POINT STATE, but refer to a process), as in 43c.

(43) a. The cat **meowed** for two hours until I woke up.

(m / meow
    ASPECT: UNDIRECTED ENDEAVOR)

b. The soup **cooled** for an hour before we ate it.

(c / cool
    ASPECT: DIRECTED ENDEAVOR)

c. The cat **meowed** (once).

(m / meow
    ASPECT: SEMELFACTIVE)

The finer-grained annotations for PERFORMANCE distinguish between punctual events (DIRECT ACHIEVEMENT) and durative events (INCREMENTAL ACCOMPLISHMENT, NONINCREMENTAL ACCOMPLISHMENT), with even finer-grained categories based on the type of change.

Achievements are punctual events, meaning that are conceptualized as occurring at a single point in time (like POINT STATE and SEMELFACTIVE). Unlike POINT STATE and SEMELFACTIVE, achievements don't revert back to the base state, which is why they're considered a finer-grained type of PERFORMANCE. The DIRECTED ACHIEVEMENT annotation can be further specified based on whether the change is reversible or irreversible. In 44a, the change that the door undergoes can be reversed in that the door can be closed; therefore this is annotated as REVERSIBLE DIRECTED ACHIEVEMENT. In 44b, the change that the window undergoes cannot be reversed; therefore this is annotated as IRREVERSIBLE DIRECTED ACHIEVEMENT.

Accomplishments are durative events that can be categorized based on whether the change occurs incrementally or nonincrementally; this is similar to the difference between directed and undirected

activities and endeavors. With INCREMENTAL ACCOMPLISHMENT, the change occurs incrementally along the qualitative dimension; in 44c, the pancake is eaten piece-by-piece and each subsequent bite brings the event closer to completion. With NONINCREMENTAL ACCOMPLISHMENT, the change ends up at a distinct result state (as with all types of Performances), but it may not get there in a linear/incremental fashion. In 44d, the computer does not necessarily get progressively more repaired with each action. Harry may try one tactic unsuccessfully to fix the computer; he may even make the problem worse at some point, but eventually succeeds in repairing the computer.

(44) a. The door **opened**.

(o / open
ASPECT: REVERSIBLE DIRECTED ACHIEVEMENT)

b. The window **shattered**.

(s / shatter
ASPECT: IRREVERSIBLE DIRECTED ACHIEVEMENT)

c. I **ate** an apple pancake.

(a / ate
ASPECT: INCREMENTAL ACCOMPLISHMENT)

d. Harry **repaired** the computer.

(r / repair
ASPECT: NONINCREMENTAL ACCOMPLISHMENT)

3.2 Ref

As opposed to AMR, which uses an English-based lexical treatment of pronominal reference, UMR approaches pronominal reference and person/number marking in a cross-linguistically based way. It annotates person and number through two attributes - :ref-person, for grammatical person information, and :ref-number for grammatical number marking. These attributes can apply to any entity concept. If an explicit nominal is marked for plural or dual number, for instance, the node for this entity concept can take the relevant attribute value label, as in 45.

(45) a. Bill saw rare birds today.

(s / see-01
:ARG0 (p/ person
:name (n/ name :op1 “Bill”))
:ARG1 (b/ bird
:mod (r/ rare)
:ref-number Plural))

b. áine ŋara-di-a-ru.
woman that-3PL-EP-DU

(w/ woman
:ref-number Dual
:mod (a/ ŋara))

’Those two women’

For arguments expressed only through verbal cross-referencing, or arguments that are implicit, both :ref-person and :ref-number can be used to represent their pronominal features. In such cases where there is no overt nominal expression to attach those values to, UMR "hallucinates" a concept (e.g., person, thing) to attach the attribute labels to in order to facilitate cross-lingual compatibility, as in 46. In the context preceding this one-word sentence, the speaker talks about how upon first

contact between the Sanapaná and Latinoparaguayans, the Paraguayans gifted the Sanapaná food and clothes. Here, the speaker describes the reaction of his ancestors to these gifts. From the prefixal indexation on the verb (2nd/3rd person masculine + distributive) and the preceding context (talking about the Sanapaná ancestors), we know that the :Actor argument of the eat-verb is third person plural. Therefore, we annotate this argument with a (p/ person) concept, which in turn takes :ref-person and :ref-number attributes with the relevant values. The :Undergoer of this predicate is not explicitly expressed at all, but from previous context we know it is the food that they were offered by the Paraguayans. We therefore annotate it with a (t/ thing) concept which takes a :ref-number Singular attribute. No :ref-person attribute is needed here, since the Thing concept implies third person rather than a speech act participant.

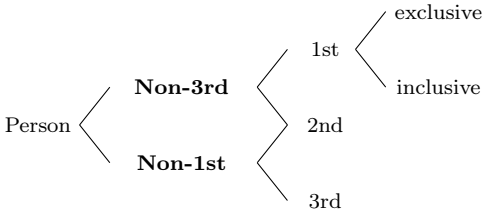
(46)

m-e-hl-t-om-o=hlta
NEG-2/3M.IRR-DSTR-eat-PST/HAB-SBJ=PHOD

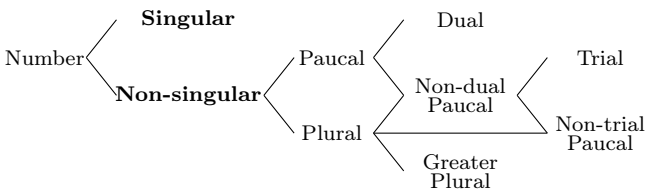
'They did not eat it.'

```
(e/ entoma-00 'eat'
   :Actor (p/ person
      :ref-person 3rd
      :ref-number Plural)
   :Undergoer (t/ thing
      :ref-number Singular)
   :polarity -)
```

The possible values for the :refer-person attribute are based on Cysouw's (2003) cross-linguistic study of person-marking system in the languages of the world. They are organized in a lattice as seen below. The default level of categories contains the well-known and familiar first, second, and third person values. Some languages have more fine-grained person systems, distinguishing a first person exclusive from a first person inclusive value in non-singular numbers (depending on whether the interlocutor is included in the group that is being referred to). Other languages have more coarse-grained systems, making no distinction between first and second person, or between second and third person (like Sanapaná above).



The possible number values for the :refer-number attribute are based on Corbett (2000). The default level here consists simply of singular vs. non-singular. Languages with more fine-grained categories in their system may have Duals, Trials, and Paucals, and Greater Plurals, which fit together as shown in the figure below.



3.3 Polarity

UMR mainly treats propositional negation at the document-level in the modal dependency annotation. However, the AMR attribute :polarity is also maintained in the UMR sentence-level annotation. It is used to flag any morphosyntactic indicators of negation that are present in the clause, as in 47. These do not necessarily signal semantic negation. This is the case, for example, for some instances of derivational negation of adjectives in English.

(47) a. Most of the time , economic policy and economic theory are not aimed at individuals.

```
(a / aim-02
    :polarity -
    :aspect State
    :ARG1 (a2 / and
        :op1 (p / policy-01)
        :op2 (t / theory)
        :mod (e / economy))
    :ARG2 (i / individual)
    :frequency (t2 / time
        :quant (m / most)))
```

b. Unhealthy food.

```
(t / thing
    :ARG1-of (e/ eat-01)
    :mod (h/ healthy
        :polarity -))
```

A Annotation Quick Reference

This "cheat sheet" summarizes the key points for aspect and participant roles, and gathers the most helpful tables and figures in one place.

Annotation target ID

Identify as an event if:

– the semantic type is process/action OR

– the information-packaging type is predication.

Identify as a participant if:

– it is dependent on an event.

Note that the same thing can (and often will be) identified as both an event and a participant.

Label the annotation target with:

– Nonverbal clause UMR predicate, if applicable (see Table 7 repeated below), ELSE

– Frame file sense, if available, ELSE

– Lemmatized form of the word

Clause type	**UMR Predicate**	**ARG0**	**ARG1**
thetic/presentational possession	have-03	*possessor*	*possession*
predicative possession	belong-01	*possession*	*possessor*
thetic/presentational location	exist-91	*location*	*theme*
predicative location	have-location-91	*theme*	*location*
property predication	have-mod-91	*theme*	*property*
object predication	have-role-91	*theme*	*object category*
equational	identity-91	*theme*	*equated referent*

Participant role annotation

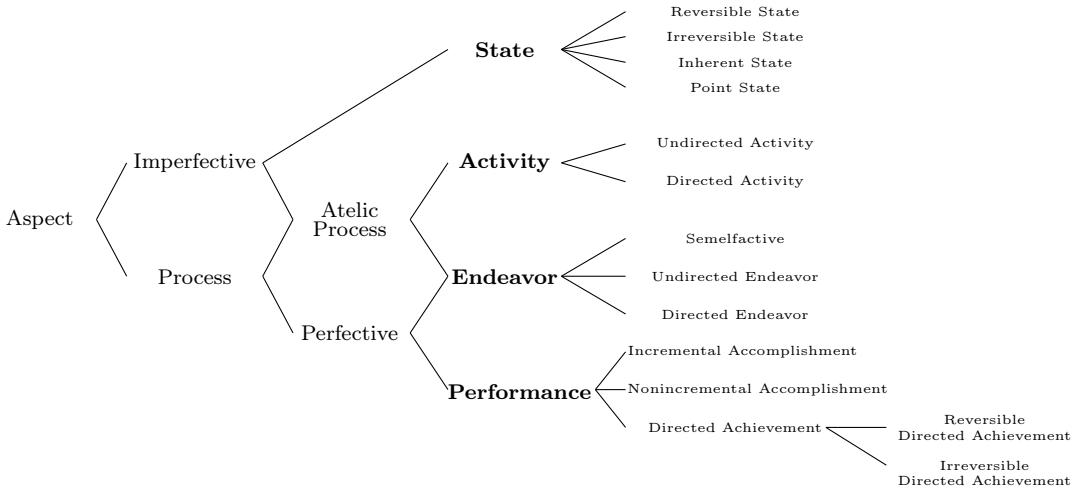
Each participant is linked to an event with a participant role label. The definition of each label is repeated below, along with the table which categorizes the roles.

External Cause	**Central Event**	**Circumstantial**
ACTOR	(CHANGE OF) STATE:	AFFECTEE
COMPANION	MATERIAL, UNDERGOER	PLACE
INSTRUMENT	MOTION/LOCATION:	MANNER
FORCE	THEME, GOAL, START, SOURCE, PLACE	PURPOSE
CAUSER	TRANSFER:	REASON
	THEME, RECIPIENT	CAUSE
	EXPERIENTIAL:	TEMPORAL
	EXPERIENCER, STIMULUS	EXTENT

UMR Annotation	Definition	Example
ACTOR	animate entity that initiates the action	**the doctor** laughed **the boy** ate a salad
UNDERGOER	entity (animate or inanimate) that is affected by the action	**the papers** burned he burned **the onions**
THEME	entity (animate or inanimate) that moves from one entity to another entity, either spatially or metaphorically	she put **the books** on the shelf she tore **a page** from the book he gave **a sandwich** to me she told him **a story**
RECIPIENT	animate entity that gains possession (or at least temporary control) of another entity	he gave a sandwich **to me** she told **him** a story
FORCE	inanimate entity that initiates the action	**the wind** knocked down the tree
CAUSER	animate entity that acts on another animate entity to initiate the action	**the mother** made her child eat the broccoli
EXPERIENCER	animate entity that cognitively or sensorily experiences a STIMULUS	**the dog** heard a sound
STIMULUS	entity (animate or inanimate) that is experienced by an EXPERIENCER	the dog heard **a sound**
INSTRUMENT	inanimate entity that is manipulated by an external causer in order to initiate the action	she hit him with **a broom**
COMPANION	animate entity that acts with the ACTOR to initiate the action	he cooked dinner with **his wife**
MATERIAL	entity (inanimate) that is transformed into a new entity	he made a roux with **flour and butter**
SOURCE	entity from which the THEME detaches	he plucked a flower from the **the bush**
PLACE	location at which the action takes place	he read a book in **the garden**
START	location at which a motion event begins	she biked from **her house**
GOAL	location at which the action ends, the end point at which the THEME arrives	she put the books on **the shelf**
AFFECTEE	animate entity which the action has a positive or negative influence on, i.e. beneficiary or maleficiary	he made a cake for **the dog** she stole a watch from **the CEO**
CAUSE	inanimate entity that causes the action to happen	he was late because of **the fire**
MANNER	manner in which the action takes place	she exercised by **lifting weights**
REASON	motivation for the ACTOR to initiate the action	they got married because **they are in love**
PURPOSE	intended event that results from the action	they dropped water in order to **fight the fires**
TEMPORAL	event that has a temporal relation with the action	she left after **dinner**
EXTENT	measurement phrase	he ran **seven miles**
OTHER	this role can be used when an annotator is unsure of which role is appropriate	

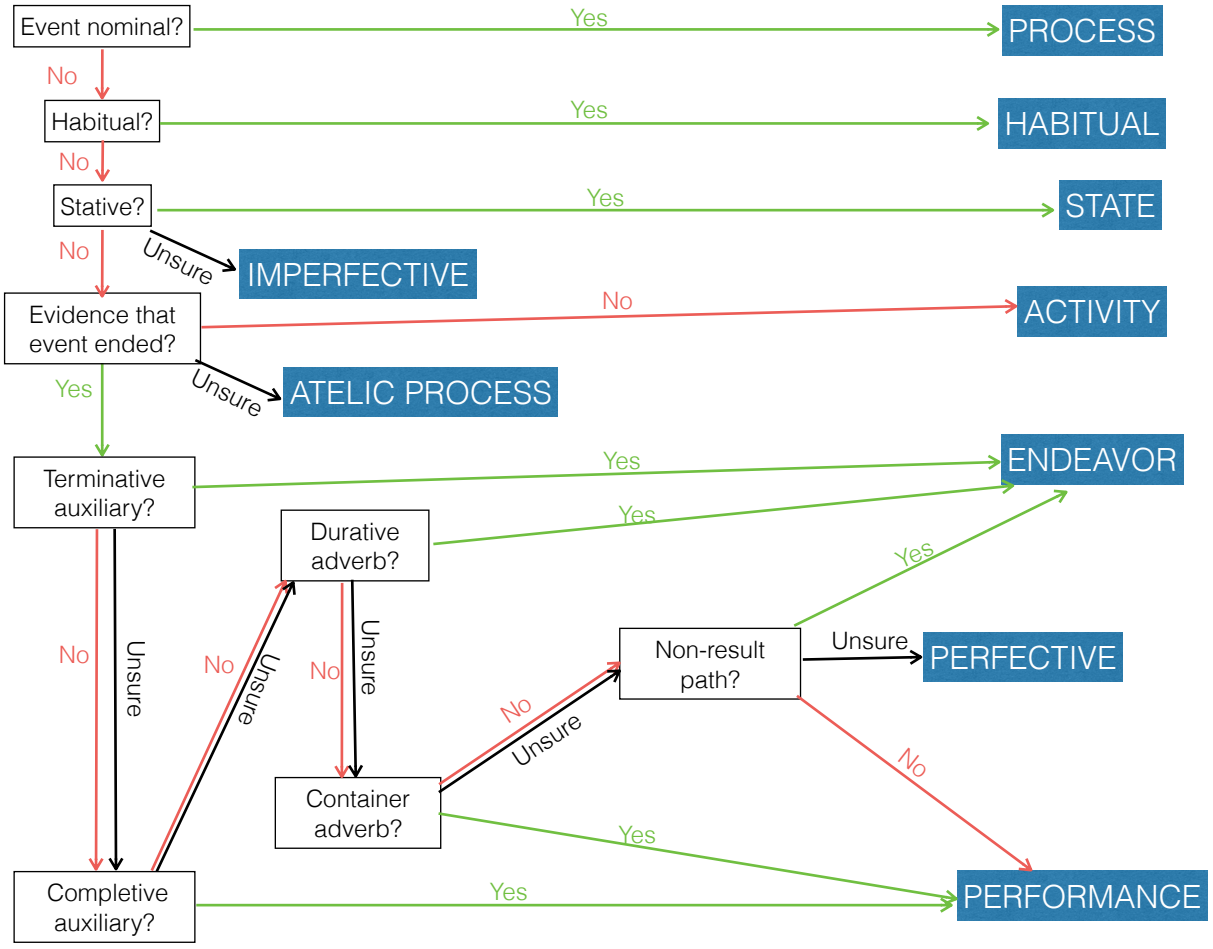
Aspect annotation

Each event receives an aspect value. The lattice, definitions of the values, and decision tree is repeated below.



HABITUAL: occurs/occurred usually or habitually
IMPERFECTIVE: ambiguous between state and process
PROCESS: unspecified type of process
ATELIC PROCESS: process that does not reach a result state
PERFECTIVE: process that comes to an end
STATE: unspecified type of state
REVERSIBLE STATE: acquired state that is not permanent
IRREVERSIBLE STATE: acquired state that is permanent
INHERENT STATE: state that is not acquired and permanent
POINT STATE: state that is acquired and reversed at a single point in time
ACTIVITY: process that does not end
UNDIRECTED ACTIVITY: process that does not end and does not progress linearly along a scale
DIRECTED ACTIVITY: process that does not end and does progress linearly along a scale
ENDEAVOR: process that ends without reaching a result state
SEMELFACTIVE: process that ends without reaching a result state and happens at a single point in time
UNDIRECTED ENDEAVOR: process that ends without reaching a result state and does not progress linearly along a scale
DIRECTED ENDEAVOR: process that ends without reaching a result state and progresses linearly along a scale
PERFORMANCE: process that ends and reaches a result state
INCREMENTAL ACCOMPLISHMENT: process that ends and reaches a result state, and progresses linearly along a scale
NONINCREMENTAL ACCOMPLISHMENT: process that ends and reaches a result state, and does not progress linearly along a scale
DIRECTED ACHIEVEMENT: process that ends and reaches a result state within a single point in time, and progresses linearly along a scale
REVERSIBLE DIRECTED ACHIEVEMENT: process that ends and reaches a result state, which is not permanent, within a single point in time, and progresses linearly along a scale
IRREVERSIBLE DIRECTED ACHIEVEMENT: process that ends and reaches a result state,

which is permanent, within a single point in time, and progresses linearly along a scale



B Verbs and participant roles

(Change of) State		
Verb	**Microrole**	**Annotation**
Change of State		
eat	eater	ACTOR
	eaten food	UNDERGOER
wash	washer	ACTOR
	washed entity	UNDERGOER
break	breaker	ACTOR
	broken thing	UNDERGOER
	breaking instrument	INSTRUMENT
kill	killer	ACTOR
	killee	UNDERGOER
	killing instrument	INSTRUMENT
beat	beater	ACTOR
	beatee	UNDERGOER
	beating instrument	INSTRUMENT
cut	cutter	ACTOR
	cut thing	UNDERGOER
	cutting instrument	INSTRUMENT
grind	grinder	ACTOR
	ground thing	UNDERGOER
cook	cooker	ACTOR
	cooked food	UNDERGOER
drink	drinking person	ACTOR
	drunken thing	UNDERGOER
cover	coverer	ACTOR
	cover	INSTRUMENT
	covered thing	UNDERGOER
fill	filler	ACTOR
	filling material	INSTRUMENT
	filled container	UNDERGOER
wipe (cos)	wiper	ACTOR
	wiped surface	UNDERGOER
peel (cos)	peeler	ACTOR
	peeled object	UNDERGOER
Contact		
hit	hitter	ACTOR
	hittee	UNDERGOER
	hitting instrument	INSTRUMENT
touch	toucher	ACTOR
	touchee	UNDERGOER
	touching instrument	INSTRUMENT
push	pusher	ACTOR
	pushee	UNDERGOER

(Change of) State		
Verb	**Microrole**	**Annotation**
Inactive S		
die	dieer	UNDERGOER
be sad	sad person	UNDERGOER
be hungry	hungry person	UNDERGOER
sink	sunken entity	UNDERGOER
burn	burnt thing	UNDERGOER
be dry	dry thing	UNDERGOER
boil	boiled thing	UNDERGOER
be ill	sick person	UNDERGOER
cry	crier	UNDERGOER
fall	fallee	UNDERGOER
rain	rain	UNDERGOER
Reflexive-y Reciprocal-y		
dress	dresser	ACTOR
	dressee	UNDERGOER
shave (a body part)	shaver	ACTOR
	shaved body part	UNDERGOER
help	helper	ACTOR
	helpee	UNDERGOER
follow	follower	ACTOR
	followee	UNDERGOER
meet	meeter	ACTOR
	met person	UNDERGOER
hug	hugger	ACTOR
	huggee	UNDERGOER
Partly-unrealized		
search for	searcher	ACTOR
	searched thing	UNDERGOER
hunt (for)	hunter	ACTOR
	hunted thing	UNDERGOER
Creation		
build	builder	ACTOR
	built thing	UNDERGOER
	building material	MATERIAL
make	maker	ACTOR
	made thing	UNDERGOER

Motion/Location

Verb	Microrole	Annotation
Active S		
climb	climber	ACTOR
	climbing goal	UNDERGOER
run	runner	ACTOR
sit	sitter	ACTOR
	sitting place	PLACE
sit down	sit downer	ACTOR
	sitting-down place	GOAL
jump	jumper	ACTOR
go	goer	ACTOR
	going goal	GOAL
leave	leaver	ACTOR
	left person	SOURCE
live	liver	ACTOR
	living place	PLACE
roll	roller	ACTOR
blink	blinker	ACTOR
cough	cougher	ACTOR
laugh	laugher	ACTOR
play	player	ACTOR
sing	singer	ACTOR
dig	digger	ACTOR
Application		
put	putter	ACTOR
	put thing	THEME
	putting goal	GOAL
pour	pourer	ACTOR
	poured substance	THEME
	pouring goal	GOAL
load	loader	ACTOR
	loaded thing	THEME
	loading place	GOAL
tie	tier	ACTOR
	tied thing	THEME
	tying goal	GOAL
Removal		
taker	taker	ACTOR
	taken thing	THEME
	taking source	SOURCE
tear	tearer	ACTOR
	torn thing	THEME
	tearing source	SOURCE
wipe (motion)	wiper	ACTOR
	wiped material	THEME
	wiped surface	SOURCE
peel (motion)	peeler	ACTOR
	peel	THEME
	peeled object	SOURCE

Experiential

Verb	Microrole	Annotation
look at	looker	EXPERIENCER
	looked at entity	STIMULUS
see	seer	EXPERIENCER
	seen entity	STIMULUS
smell	smeller	EXPERIENCER
	smelled entity	STIMULUS
fear	fearer	EXPERIENCER
	fear stimulus	STIMULUS
frighten	frightenee	EXPERIENCER
	frightener	STIMULUS
like	liker	EXPERIENCER
	liked entity	STIMULUS
know	knower	EXPERIENCER
	known thing/person	STIMULUS
think	thinker	EXPERIENCER
	thought content	STIMULUS
hear	hearer	EXPERIENCER
	heard sound	STIMULUS
feel pain	pain-feeler	EXPERIENCER
	pain locus	STIMULUS
appear	appearer	STIMULUS
want	wanter	EXPERIENCER
	wanted thing	STIMULUS

Transfer		
Verb	**Microrole**	**Annotation**
Transfer		
give	giver	ACTOR
	gift	THEME
	giving recipient	RECIPIENT
send	sender	ACTOR
	sent thing	THEME
	sending recipient	RECIPIENT
carry	carrier	ACTOR
	carried thing	THEME
	carrying goal	GOAL
throw	thrower	ACTOR
	thrown thing	THEME
	throwing goal	GOAL
bring	bringer	ACTOR
	brought thing	THEME
	bringing recipient	RECIPIENT
steal	stealer	ACTOR
	stolen thing	THEME
	stealing source	AFFECTEE
get	receiver	RECIPIENT
	received thing	THEME
Communication		
talk	talker	ACTOR
	talked about content	THEME
	talked to person	RECIPIENT
ask for	asker	ACTOR
	requested thing	THEME
	askee	RECIPIENT
shout at	shouter	ACTOR
	shoutee	RECIPIENT
tell	teller	ACTOR
	told content	THEME
	tellee	RECIPIENT
show	shower	ACTOR
	shown thing	THEME
	showing addressee	RECIPIENT
hide	hider	ACTOR
	hidden thing	THEME
	hiding affectee	AFFECTEE
scream	screamer	ACTOR
teach	teacher	ACTOR
	taught content	THEME
	teachee	RECIPIENT
say	sayer	ACTOR
	said content	THEME
	saying addressee	RECIPIENT
name	namer	ACTOR
	name	THEME
	namee	RECIPIENT