

Documentation - Sagaland

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Version 2 – 31.01.2014

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Rough annotation scheme

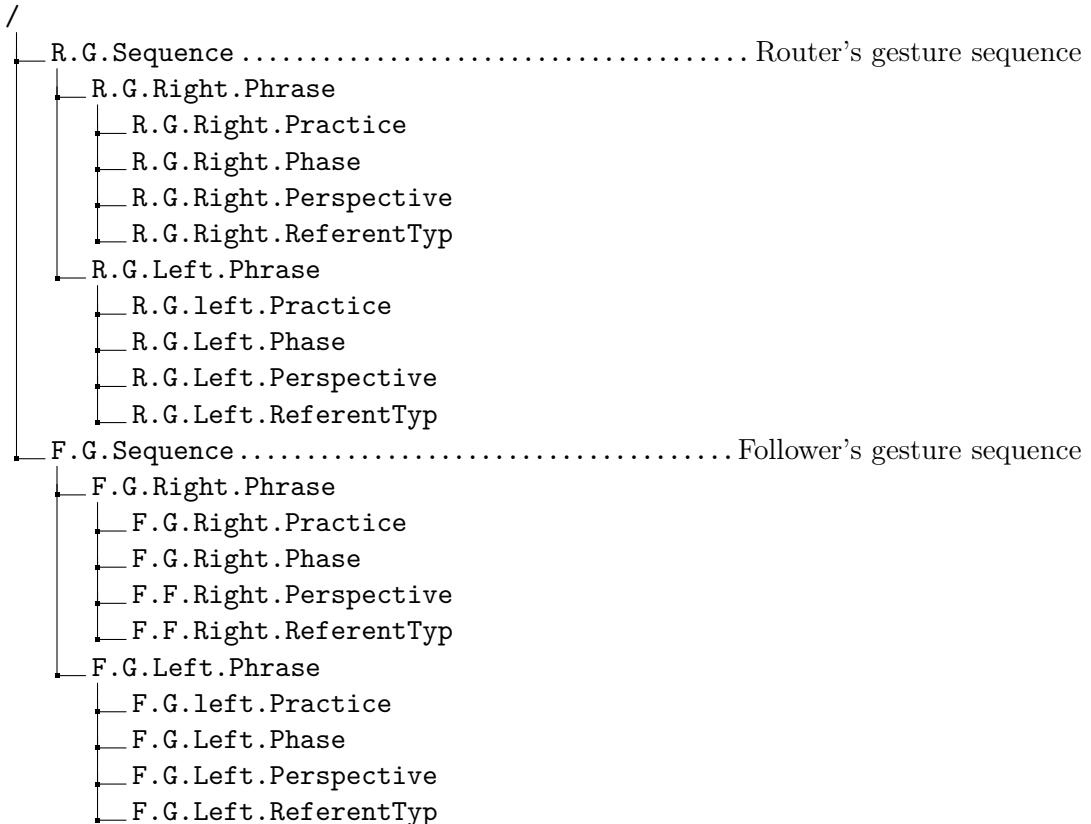
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1. Rough Annotation Scheme

1.1. Annotation hierarchy

The following labels are used: R.: *Router*, F.: *Follower*, G.: Gesture (with *Right* for the right, *Left* for the left hand). The annotation tiers for gestures with the root "/" are sorted by participant first and than by right and left hand.



1.2. Annotation overview

Tier	Values	Description
SEQUENCE	-	Gesture unit, which consists of at least one gesture phrase
PHRASE	deictic, iconic, beat, iconic-deictic, iconic-beat, deictic-beat, iconic-deictic-beat, move, discourse, unclear	The gesture phrase's values determine the gesture type; forms which are separated by hyphen are mixed forms. Move is the type of movement which are not expressions of communicative relevance. One gesture phrase consists of gesture phases.
PHASE	preparation, pre-stroke hold, stroke, post-stroke hold, retraction, unclear	gesture phases, where stroke is the expressive, content bearing part.
PRACTICE	grasping, shaping, sizing, drawing, pantomime, modelling, indexing, counting, hedging, unclear, grasping+indexing (fka placing), modelling+drawing (fka action)	methods of the gesture expression, partly Streeck
PERSPECTIVE	survey, speaker, unclear	perspective, from which a way/direction is described, influenced by Striegnyet et al.
REFERENT	object, location, action, event, time, direction, property, number, topic, proposition, infostate, unclear	The basis entity of a speech-gestures-ensemble

1.3. Explanation

The *building blocks* of an annotation are the *annotation elements*. Each annotation element is specified by four parameter:

1. Annotation tier;
2. start point (time);
3. end point (time);
4. content (annotation value).

Those four parameters are to be fixated by the annotator (Because of the dependency between tiers and the specific translation with other annotation tools, the decision of time stamps and content is maybe restricted).

Many values for the annotation elements are chosen from standard literature. In addition to those values, some helpful values are established by Andy Lücking, Kirsten Bergmann and Stefan Kopp. Those values are denoted accordingly. *

1.3.1. Sequence

A gesture sequence is a gesture unit, which consists of multiple gesture phrases. The gesture phrases of a gesture sequence are identified by kinetic cohesiveness, this means that movement, with which the single gestures are performed, are blend into each other. More prosaic: There is no pause between consecutive gesture phrases in terms of a resting posture. This characteristic is the formal identification criteria of a gesture sequence.

When does a gesture phrase start a new gesture sequence and when does it continue the existing gesture sequence? A sequence is characterised by multiple gesture phrases without a breaking resting posture. Resting posture means:

- (a) to pose in a resting position (resting hands in the lap or on the upper legs, or
- (b) a retraction from a expressive configuration from a previous gesture through relaxation without posing in a resting position.

The pose in a resting position (a) should be easy to identify and there should be no difficulty annotating them. More difficult is case (b). If there is a relaxation of the hand's expressive posture, it counts as relaxation. For example: Fixating the hand configuration, but arms are arranged aside the body; fixating the arm position, but finger configuration is relaxed. These relaxations are called retraction phase ('retraction'), the resting position does not have to be part of every gesture. In those cases criteria (b) is achieved. Therefore, the gesture starts a new sequence. If there is no relaxation, which means the new gesture starts from a Hold, the existing gesture sequence has to be continued. To distinguish relaxation (b) from "physiological unease" the relaxation has to be held for a distinct timeframe. For a rule of thumb this timeframe should be at least one second long.

Because of the person's ambidexterity there might occur the case, that one hand is already in a resting position while the other hand is retracting, therefore stopping the actual sequence while the first hand starts a new sequence. This case results in overlapping sequence elements. This can't be modelled by ELAN). Convention: The overlap will be cut from the ('retraction').

ELAN-notice: The sequence tier is mandatory. Therefore, a gesture sequence can also consist of exactly one gesture phrase. Elements in the sequence tier don't have an annotation value but mark a specific timeframe.

*For newly added values exists a higher demand of explanation and justification. The token should highlight this responsibility.

1.3.2. Phrase

A gesture phrase includes the whole movement, which is used to perform the gesture, therefore - in a prototypical case - from the onset's preparation phase until the renewed posing in a resting position.

For elements in the phrase tier, new annotation values with class names are introduced. The three basic classes are:

1. ‘deictic’;
2. ‘iconic’;
3. ‘beat’.

Additionally, these two classes

4. ‘move’ und
5. ‘discourse’

are included. Furthermore, these mixed forms are possible:

6. ‘deictic-beat’;
7. ‘iconic-beat’;
8. ‘iconic-deictic’;
9. ‘iconic-deictic-beat’.

If an annotation decision can't be put into those gesture classes, there is also the annotation value:

10. ‘unclear’.

deictic

The value ‘deictic’ is assigned for pointing gestures, this means gestures, commonly static, which are identified by - typically - stretching the index finger and which have no other function than pointing at an entity (for example, a concrete object or a position in the gesture space). Especially, deictic gestures have no descriptive function. They point at something but don't illustrate anything by themselves.

iconic

An iconic gesture, annotation value ‘iconic’, is every non-deictic movement in the gesture space, which describe a narrative item. Iconic gestures are typically dynamic and it is often the case that they resemble the object they illustrate in some way.

beat

Beats, value ‘beat’, are rhythmic gestures. They always have two phases (back and forth, up and down). They don’t represent an item but enhance the spoken language either emphatic or structural. Single beats may emphasize a (prominent) word. Iterative beats may follow and structure the spoken words.

Another usage of beats is overlapping. At that iconic or deictic or iconic-deictic gestures are accompanied with multiple beats, so they are overlain by those beats. Mixed forms, which contain a beat, have at least two strokes, which means, that the stroke is rhythmically repeated. Therefore, all iterative gestures are gestures overlapped by a beat. Beats appeal like a Kleene operator. +

Mixed forms

The three basic classes don’t always appear in pure form. For example, a deictic gesture may be overlapped by an circular iconic gesture; Every gesture may be overlapped by a single or multiple beats (s. 1.3.2). In those cases, the values should be taken from the upper list of mixed forms.

discourse (AL)

The value ‘discourse] is taken for gestures which help organizing or structuring the dialog, typically turn-taking signals. In contrast to the three basic classes the discourse gesture are not used for narration but for interaction. Typical discourse gestures are, for example, a lifted hand to signal the need to talk or a hand stretched towards the dialog partner to tell the partner to stop talking. A classification and annotation of those ‘discourse’-gestures in multiple different discourse-gestures follows when, according to the work packages, respective scientific goals are reached. orkpackages, entsprechende Forschungsziele untersucht werden.

move (AL)

Some movements are no expressive significant gesture (therefore no real gesture), but an unarticulated, small, twitching, etc. movement. Those movements don’t contribute to the narration; Their appearances are explained by speech/gesture production, which means on an psycholinguistic layer as well as with psychological states like nervousness, unease, etc. Those movements are annotated with the value ‘move’.

1.3.3. Phase

Arms and hands, which aren’t part of a gesture are held in a so called resting position. The exact resting position may vary from speaker to speaker but typically is a relaxed posture in which the arms and hands don’t have to be held in that position by force, for example the resting of both arms and hands in the speaker’s lap. Active arms and hands are expressing a *gesturephrase*. A gesture phrase can roughly be divided in three *phases*. The emphasizes lays on the part of the gesture movement, which describes or

means something. Those phases have to be distinguished from the movement which is made to bring the arms and hands in a position from where the central phase of the gesture can be performed and also the movement which leads arms and hands back to the resting position.

Remark: In a sequence, where gesture phrases follow each other without interruption, the retraction phase isn't always performed completely. This means, that after a stroke or post-stroke hold follows no retraktion phase, instead a preparation phase begins for the stroke of next gesture.

preparation

Movements, which are starting with the hands and arms in the resting position. Those preparation phase, value 'preparation', ends with reaching the stroke phase.

stroke

The stroke of a gesture is its central, meaningful part. It is physiologically identified as the part with the highest muscle tone. The stroke may be dynamic or static. The stroke is dynamic when it's realized by movement. A static stroke is realized by holding hands in a specific configuration without any movement. Both cases of strokes are identified over the whole time span by its annotation value 'stroke' (*independent hold* by Kita).

retraction

Both arms and hands are retracted from the stroke area to the resting position. Its annotation value is 'retraction'.

pre-hold

If in a hold phase the arms and hands are fixated in one position, constituting the next movement, it's called a pre-stroke hold. The annotation value is 'pre-hold'.

post-hold

If a hold phase is subsequent to a dynamic stroke and the posture of the hold is constituting to the stroke, it is called a post-stroke hold. The annotation value is 'post-hold'. Static strokes can't be followed by hold.

1.3.4. Practice

There are several ways of displaying iconic gestures. Those define methods of depictive use of hands and are annotated in the PRACTICE tier. Those *gesture practices* are independent from the current subject's referents. For example: Phantomime. If a hand with opened fingers is moved from the chest in a quarter circle to the mouth, it is seen as a "drinking gesture". But it is not determined whether this gestures refers to the *action* of drinking or the *object* glass. Reference objects are annotated separately in

tier REFERENT. It is alone the underlying strategy of the gesture which qualifies it as pantomime. In this, if possible, the gesture practice should be annotated both speech and referent independent. Those methods are not mutually exclusive, which means there may be overlaps and combinations. For example: movement alongside a path. One hand represents the object ('modelling'), the path is painted into the gesture space ('drawing'). The whole gesture is performed by the whole practice of 'modelling' and + 'drawing'. Mixed forms have to be added to the practice-dictionary in ELAN.

Moves, beats and discourse gestures are not of interest for the current annotation - the annotation tier remains empty at this point.

shaping

The hands form something in the gesture space. One can imagine the 'shaping' method like producing a sculpture in the air. The meaningful form is the shape formed in the gesture space, not the hands themselves. This method of iconic display is typically three dimensional and dynamic. Mostly, objects are formed by this method, therefore the standard type of referent is 'object'.

Helpful question: Is this shape three dimensional?

- No: drawing or sizing
- Yes: shaping

sizing (Kirsten & Stefan)

Displaying a size, distance or diameter. Sizing may be performed with one or two hands, for example through posture ("imposition of hands"). A sizing gesture is static. 'Sizing' refers to one axis of a body, therefore to its extension in one dimension.

The display of additional attributes of the depictive item is only possible with one other simultaneous practice, for example, 'l'shaping'.

modelling

The hands are in a static configuration and represent something narrative. The hands themselves represent something.

Helpful question: Do the hands stand for something else by themselves?

- No: shaping
- Yes: modelling

drawing

Normally, exactly one finger (mostly the index finger) is used as drawing tool. Therefore, one finger does not represent the referent. The finger draws outlines on an imaginary ("into the air") or an actual surface (for example on the other hand).

Helpful question: Is the outline, not the surface of an object being drawn?

→ yes: drawing

→ no: shaping

pantomime

A pantomimic method, which mimics an action or something else. As mentioned in the introduction to this chapter.

Helpful question: Is the pantomime subject of the mimiced action?

→ yes: pantomime

→ no: action

indexing

Pointing gesture, which refers to a specific position in the gesture space. The position is placeholder for an entity of the narration (compare to *remote indexing* according to Streeck). It is not the hand itself, which refers to an item or position but refers to something somewhere else.

grasping

The hands or one hand grasps an item. Grasping is a static gesture. As with shaping, the surface of an item is displayed.

Helpful question: Is an item only being touched and not completely covered?

→ yes: grasping

→ no: shaping

counting (AL)

Counting with fingers. The number of stretched fingers represent the value. Iconic display of the unitary system.

hedging (AL)

Iconic display method of uncertainty. Typically performed by an blurring, shaking movement.

It is important to see, that gestures which are assigned the value ‘hedging’ have a different status than all other iconic methods. In contrast to those other methods, this method does not refer to an entity of the narration, but to the speaker’s certainty of some information. The function like a modification of a sentence (operator over proposition). Its referent has therefore the value ‘infostate’

1.3.5. Perspective

Descriptions of a path can appear from different perspectives. The perspective used is specified in the perspective tier. Pure beats or hedgings have no perspective, which means that this tier remains empty if the gesture class is ‘beat’ or ‘hedging’. While at mixed forms which include a beat, the perspective is determined by the non-beat part.

survey

The path is described from a top view. This view is annotated with the value ‘survey’.

Helpful question: Is the item arranged relative to the speaker?

→ no: survey

→ yes: speaker

speaker

The description is told as if the speaker himself walks along the path. The annotation value for gestures with the perspective point on the path is called ‘route’. The description of landmarks is normally performed from the ‘speaker’ perspective.

Helpful question: Is the item arranged relative to the speaker?

→ no: survey

→ yes: speaker

1.3.6. ReferentTyp

We have a rich ontology, which consists of objects, places, attributes, events, actions, relations, directions, topics, propositions and state of informations. The referent tier needs to specify to which type of referent it refers.

The tier REFERENT TYPE is completed by the tier REFERENT NAME, which holds a label for the virtual object or for the class of similar virtual objects of the simulated city.

1.3.7. unclear

On every tier it is possible to declare the annotation value as ‘unclear’. This value should be used as rare as possible and only if the annotator is positive, after consulting every annotation guideline, that there is no other annotation value possible.

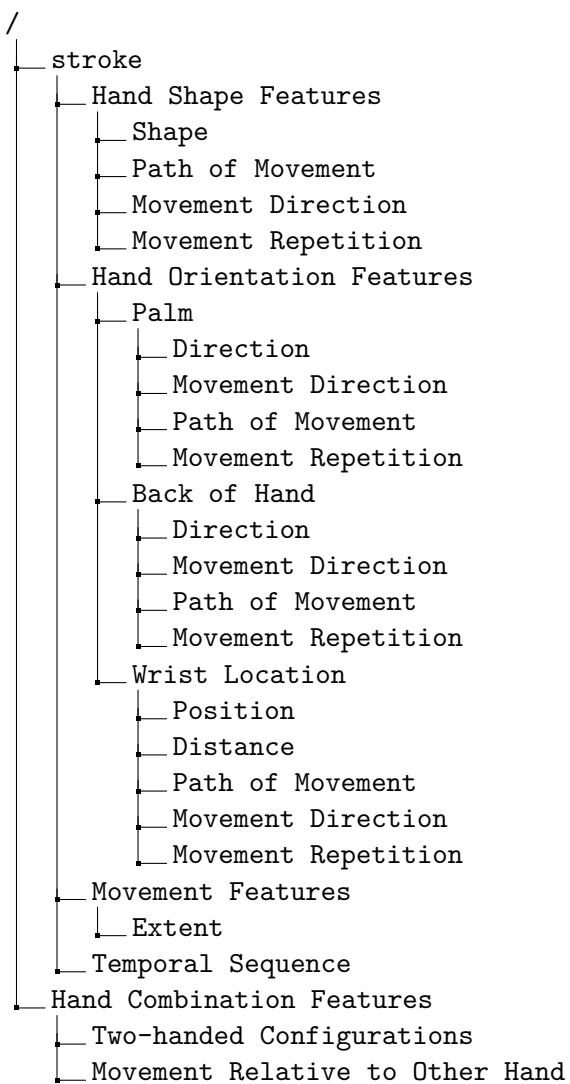
Annotation manual of gesture morphology

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Version 2 – 31.01.2014

2. Annotation manual of gesture morphology

2.1. Annotation hierarchy



2.2. Rules of thumb

1. To keep clarity, at the beginning of the first annotation of a video the dictionaries should be reduced to the most basic predicates. Therefore, the annotation should be made with the standard ELAN-template.
2. Always choose the most specific annotation predicate, for example, choose "FTT" instead of "BHA".
3. Always choose the smallest movement primitive, for example, "LINE>LINE>LINE>LINE" instead of LINE. Therefore, it is possible to uniquely identify the path through succession of the movement predicates.
4. The intermediate values of "palm direction" and "back of hand direction" (for example, "BTR/BAB"), which are expressed by "/" should be used when there's a deviation of 45 degrees.
5. The intermediate values of "palm direction" and "back of hand direction" are allowed to have three direction predicates at most.
6. "Movement directions", for example "MU>MD", and movement paths, for example "ARC", are only annotated with the greatest indicator. A change of "back of hand direction" and "palm" directions should always be annotated. For example:

	Hand Shape	Palm
Hand Shape	G>XI	—
Path	o	ARC
Movement Direction	o	MD
Direction	—	BUP>BDN

If the maximal cause can't be determined, a change of movement should be annotated in all tiers. There can be multiple maximal causes in one gesture, for example a change of wrist and back of hand direction can appear simultaneously.

7. Deictic-beats and iconic-beats have to be fully annotated. This means, if no repetition of movement can be annotated every movement direction has to be annotated.
8. If multiple predicates have to be merged together, it should happen in alphabetical order, for example: MF/ML/MU
9. A inverse repetition may only be annotated if it is *complete*. There's only one inverse repetition for each gesture.

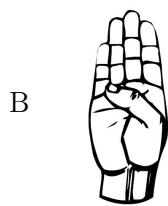
10. Slash predicates are only annotated as start or end values. The atomic predicates are also used as intermediate values. For example: PUP>PTL>PDN.
11. For every movement path stands: For each LINE value a movement value should be annotated. In the ARC case (exception: half circle, three quarters circle), there will be two annotation values; a segment consisting of n ARC values needs $n + 1$ movement values. The shape of a curve is always approximated by a series of straight lines. For example, a quarter circle from bottom left to top right is annotated by MU>MR. In case of a half circle or three quarters of a circle, but with the whole number of movement values.
12. For every repetition stands: Despite it being possible to have multiple repetitions of one movement, there may be only one inverse repetition. The repeated movement segment starts always with the beginning of the gesture. This means, the repetition refers only to the first movement or to a sequence of movements, which includes the first movement.
13. Moves, discourse and hedging gestures mustn't be annotated. Therefore, every two handed configuration is assigned to the value 0, even when one hand performs another gesture.

2.3. Hand Shape

2.3.1. Hand-Shape

If one gesture token does not match the listed hand shapes, the one hand shape, which resembles the given gesture token the most, has to be chosen. A change of hand shapes during a gesture is annotated by successive ASL-symbols, which are linked by ">". There are additions for form "C" (grasping gesture), "medium", "small" and "large", to determine the distance between index finger and thumb. "Medium" is the default distance. To hint a weak hand tension while performing B,C or G, there are the values "loose-V", "loose-C" and "loose-G". If the index finger, while forming a G-shape, does not point in the back of hand direction, the value "Bent-G" should be annotated. "5" is annotated as "loose B-spread". Y is an additional hand shape. To cover a orthogonally held finger (relative to "back of hand direction"), the value "bent-B" is introduced.

Predicate	Shape	Comment
A		In case of a fist with splayed out thumb, A-spread should be annotated



B

If the thumb isn't clearly folded, "B-spread" should be annotated. In this case, the thumb may be applied sideways. With spread out fingers, "loose" should be annotated.



O

If the fingers don't form a circle and are distanced from the palm, "tapered O" should be annotated. If only the thumb and index finger form a circle and the other fingers don't, "baby-O" should be annotated. In case of thumb and middle finger forming a circle, "O" should be annotated.



C



D

Thumb is positioned on top of the tip of the middle finger



F



Annotate "bent-G" in case of folded index finger.



H



L



S



Y

X



The difference to "bent-G" is the bent index finger and the folded thumb.

2



3



4



5



"Bent-5" requires a slightly bent finger and a curved palm.

7



2.3.2. Path of Hand-Shape

All following values may be combined at will; the single values should be separated by ">". Possible values for hand-shape movement are:

value	description
LINE	Movement in a straight line. A gesture may include a series of line segments; every segment requires one movement value.
ARC	Movement along an arc or curve; one ARC requires two movement values. A gesture may include a series of Arc segments. Two segments require three movement values; three segments require four movement values, and so on.
WIGGLE	Slight wiggling movement. In the hand shape, this is a wiggling of the fingers. In the orientation, this is a wiggle of the hand by moving the wrist. This seems to be uncommon in location.

2.3.3. Hand-Shape Movement Direction

For every LINE-value, a movement value should be annotated. There are two values for every ARC; a segment out of n ARC values requires $n + 1$ movement values. The shape of a curve will always be approximated by shapes of lines (e.g.: a quarter circle from bottom left to top right is annotated by "MU>MR"). From the following values, categories with up to three candidates may be formed (e.g.: MU/ML/MF). Possible values for hand-shape movement directions are:

value	description
o	no movement
MU	Up
MD	Down
ML	Left (right to left)
MR	Right (left to right)
MF	Forward (straight ahead, away from body)
MB	Backward (opposite of forward, towards body)

2.3.4. Hand-Shape Movement Repetition

Only the number of repetitions and not the first performance is annotated. If there is a repetition of movement, only the first item is described.

value	description
#N	Repeated N times
i#N	Repeated invert N times

2.4. Hand Orientation Features

2.4.1. Palm Direction

Intermediate values are described by the successive sequence of its extreme values and are separated by slashes. There may be only three intermediate values at the most.

Bsp.: PTL/PUP/PDN>PDN

value	description
PTL	palm facing toward left
PTR	palm facing toward right
PUP	palm facing upwards
PDN	palm facing downwards
PTB	palm facing towards body
PAB	palm facing away from body

2.4.2. Path of Palm Direction

value	description
LINE	(default Wert)
WIGGLE	Slight wiggling movement. In the hand shape, this is a wiggling of the fingers. In the orientation, this is a wiggle of the hand by moving the wrist. This seems to be uncommon in location.

2.4.3. Palm Direction Movement Direction

From the following values, one may create mixed categories with up to three tokens (e.g.: MU/ML/MF).

As movement direction for the palm and back of hand only two rotation axis and therefore four direction of movement are sufficient. The "back of hand" and "palm"-direction may be described by a ray with its starting point at the middle of the back of the hand. For rotations of that ray, the middle of the back of the hand is the hub. A rotation of a line in a three dimensional space is only possible in two directions (MU or MD, and MR or ML). Starting from the original posture of the hand, it is possible to determine the exact direction in which the hand was rotated.

Possible values for direction of palm movement are:

value	description
o	no movement of palm orientation
MU	Up
MD	Down
ML	Left (right to left)
MR	Right (left to right)

2.4.4. Palm Direction Movement Repetition

Only the number of repetitions and not the first performance is annotated. If there is a repetition of movement, only the first item is described.

value	description
#N	Repeated N times
i#N	Repeated invert N times

2.4.5. Back of Hand Direction

The expression of intermediate values is analogous to "palm directions". The "back of hand" direction correlates to the axis, which is formed by expanding the back of the hand.

For example: BTL/BUP>BUP

value	description
BTL	Back of Hand pointing left
BTR	Back of Hand pointing right
BUP	Back of Hand pointing upwards
BDN	Back of Hand pointing downwards
BTB	Back of Hand pointing towards body
BAB	Back of Hand pointing away from body

2.4.6. Path of Back of Hand Direction

value	description
LINE	Movement in a straight line.(default Wert)
ARC	Movement along an arc or curve
CIRCLE	A circular movement. This does not necessarily need to be a complete full circle, but should be close to a circle
WIGGLE	Slight wiggling movement. In the hand shape, this is a wiggling of the fingers. In the orientation, this is a wiggle of the hand by moving the wrist. This seems to be uncommon in location.

2.4.7. Back of Hand Direction Movement

There may be formed categories with slashes with three of the following values at most (e.g.: MU/ML/MF). There are two annotated values for ARC and four for a CIRCLE. Possible values for the back of the hand direction movement are:

value	description
o	no movement inside the back of the hand
MU	Up
MD	Down
ML	Left (right to left)
MR	Right (left to right)

If the movement of the back of the hand is identical to the movement of the palm, only one movement in direction of the back of the hand is being annotated.

2.4.8. Back of Hand Direction Movement Repetition

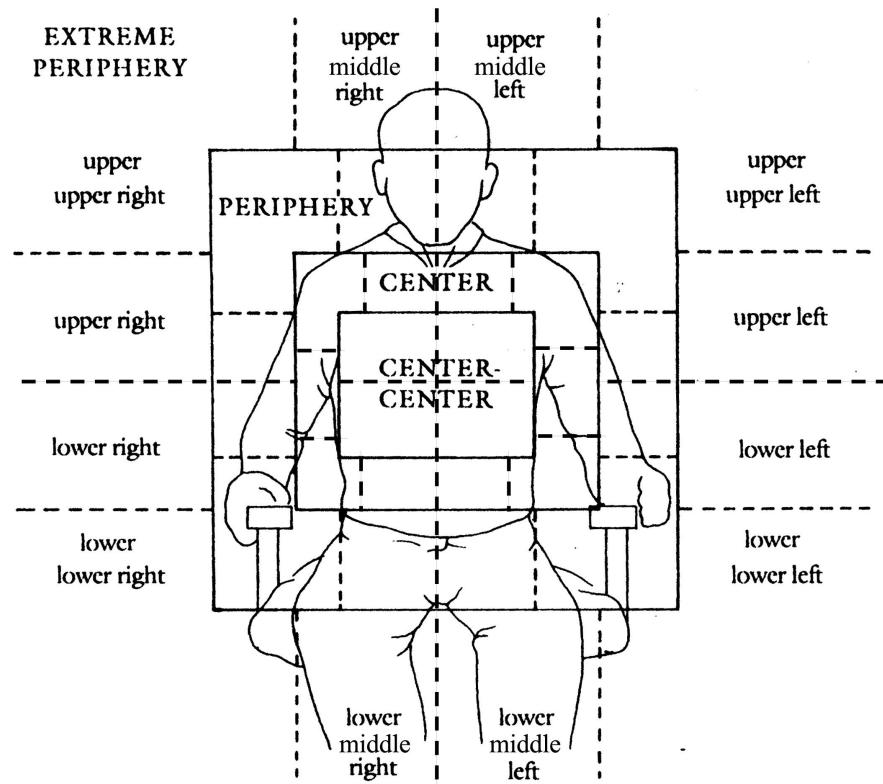
Only the number of repetitions and not the first performance is annotated. If there is a repetition of movement, only the first item is described.

value	description
#N	Repeated N times
i#N	Repeated invert N times

2.5. Wrist Location

2.5.1. Wrist Position

Hand location is coded using the McNeill schema plus a distance symbol (values illustrated in the figures below). For movements, only the starting position is coded, the rest can be reconstructed from the movement features.



value	description
CC	center center (@chest)
C-UP	center-upper (@neck)
C-UR	center-upper-right (@R-shldr)
C-UL	center-upper-left (@L-shldr)
C-RT	center-right (@R-arm)
C-LT	center-left (@L-arm)
C-LW	center-lower (@stomach)
C-LR	center-lower-right
C-LL	center-lower-left
P-UP	periphery upper (@face)
P-UR	periphery upper right (@abv R-shldr)
P-UL	periphery upper left (@abv L-shldr)
P-RT	periphery right
P-LT	periphery left
P-LW	periphery lower (@lap)
P-LR	periphery lower right
P-LL	periphery lower left
EP-UP	extreme periphery upper
EP-UR	extreme periphery upper right
EP-UL	extreme periphery upper left
EP-RT	extreme periphery right
EP-LT	extreme periphery left
EP-LW	extreme periphery lower
EP-LR	extreme periphery right
EP-LL	extreme periphery left

2.5.2. Wrist Distance

value	description
D-C	Hand in contact with body
D-CE	Hand between body and elbow's length away
D-EK	Between elbow and knee
D-KO	Between knee and length of outstretched arm in front away
D-O	Length of outstretched arm in front away

2.5.3. Path of Wrist Location

value	description
LINE	Movement in a straight line. A gesture may include a series of line segments
ARC	Movement along an arc or curve
CIRCLE	A circular movement. This does not necessarily need to be a complete full circle, but should be close to a circle
WIGGLE	Slight wiggling movement. In the hand shape, this is a wiggling of the fingers. In the orientation, this is a wiggle of the hand by moving the wrist. This seems to be uncommon in location.

2.5.4. Wrist Location Movement Direction

There may be formed categories with slashes with three of the following values at most (e.g.: MU/ML/MF). There are two annotated values for ARC and four for a CIRCLE. Possible values for the hand shape movement directions are:

value	description
o	wenn keine Bewegung des Wrist
MU	Up
MD	Down
ML	Left (right to left)
MR	Right (left to right)
MF	Forward (straight ahead, away from body)
MB	Backward (opposite of forward, towards body)
MBB	Behind body

2.5.5. Wrist Movement Repetition

Only the number of repetitions and not the first performance is annotated. If there is a repetition of movement, only the first item is described.

value	description
#N	Repeated N times
i#N	Repeated invert N times

2.6. Movement Features

2.6.1. Extent

value	description
SMALL	Within one region
MEDIUM	Across two regions
LARGE	Across three or more regions
o	statische Gesten

2.6.2. Temporal Sequence

Temporal sequence stance for the order in which the movements are performed. Therefore, the hand stages are listed in order of occurrence and are separated by ">". The default for synchronous gestures is "o". Cause of movements are: back of hand, wrist, palm direction and hand shape.

Wrist>Back of Hand

2.7. Hand Combination Features

2.7.1. Two-handed configurations

If the two-handed configuration at the beginning of a gesture is different from the ending, the predicates are put together in the right order and separated by ">". A break up of a FT is being annotated with "FT>BHA". All predicates are allowed to be annotated during a *stroke* or a *hold*. Contact with single fingers is annotated with FT or FTT. New predicates aren't introduced for this case. The annotation is performed by overlapping the stroke or hold. It is also possible to see a stroke in one hand and simultaneously a hold in the other hand. In that case, the annotation should be made respective to the hand which performs the stroke.

value	description
o	no stroke or hold is performed
FTT	Tips of fingers and thumbs touching
FT	Tips of fingers touching (thumbs not touching)
TT	Thumbs touching (tips of fingers not touching)
FTF	Tips of fingers facing
PT	Palms together
PF	Palms facing
LPBH	left palm faces right BOH
RPBH	right palm faces left BOH
LFTH	Tips of left hand finger touching right hand
RFTH	Tips of right hand finger touching left hand
LFTA	Left hand touching right arm
RFTA	Right hand touching left arm
BHA	Both hands active, without any facing or touching

2.7.2. Movement relative to other Hand

Mirror predicates SYNC may only be annotated for the duration of the overlap of the strokes. All other predicates (RHH, LHH, NOSYNC, o) can also be annotated in presence of a "hold"; the length of this annotation depends on the hand which performs the stroke.

value	description
o	Both hands perform no movement, both hands are static or one hand is not participating
Mirror-Sagittal	
Mirror-Frontal	
Mirror-Transversal	
RHH	Right hand is held in a stable position, anchoring the frame of reference, while the left hand is active
LHH	Left hand is held in a stable position, anchoring the frame of reference, while the right hand is active
NOSYNC	Use when actions of the left and right hand are not in sync with each other in some way that is significant to understanding the gesture
SYNC	Both hands move in the same way. Die Mirror Prädikate der Hände müssen identisch sein.

2.7.3. Two-handed Form

As additional tier, a two-handed form is introduced for router and follower. In this tier, the dynamic complex forms, which are performed by both hands together, are annotated.

For example, when both hands form a semi circle, CIRCLE is annotated as the two-handed form. The following list of possible predicates is open and should be expanded by the annotator if needed:

value	description
0	Both hands do not move or the movement does not form a recognizable complex shape
U-shape	
V-Shape	
RECTANGLE	
QUADRAT	
CIRCLE	
Tropfen	
Edge	

Speech referents for intermodal relations

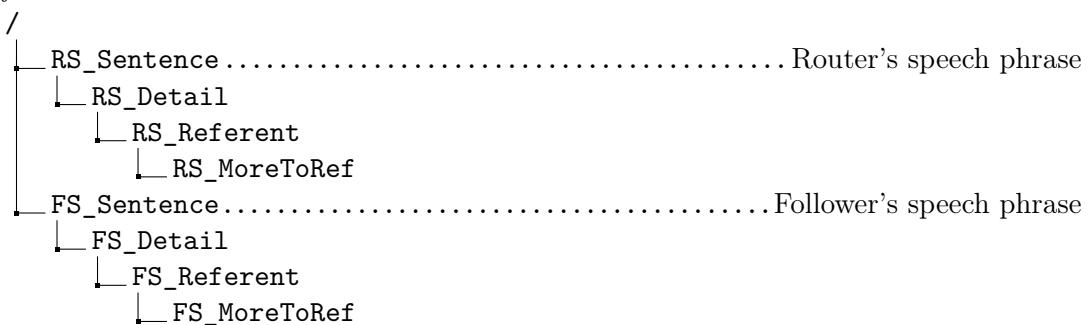
Farina Freigang Nicole Wittwer Sören Klett Julia Letetzki
Kirsten Bergmann

Version 1 – 31.01.2014

3. Annotation of Referents in Speech & Speech Details

3.1. Annotation hierarchy

The following labels are used: R: *Router*, F: *Follower*, S: *Speech*, MoreToRef: *More about Referents*.



For more information about the hierarchy cf. the appendix section A.1.

3.2. Annotation labels in the hierarchy

	Daniel & Denis (1998)	Dale, Geldof & Prost (2003)	Koulouri & Lauria (2009)
Categories	Direction giving to investigate language and spacial cognition	Architecture for synthetic direction giving	Direction giving for robots
Introducing L	Introducing Landmark	Points	→ LM
Describing L	Describing Landmark	Landmark	→ LD
Action mentioned together with L	Action wrt Landmark	Action + Landmark Action + Path entity	→ AL → LSO LSOP
Action: straight on	Progression	Paths	→ LOC
Action: turn	Reorientation	Direction	→ RO
Combinations		Point+Dir Path + Point	
Commentary	Commentaries		→ C

The diagram illustrates the mapping of labels from three literature sources to a simplified set of labels.
 - Labels from Daniel & Denis (1998) map to Dale, Geldof & Prost (2003).
 - Labels from Dale, Geldof & Prost (2003) map to Koulouri & Lauria (2009).
 - Specific labels include:
 - Introducing Landmark → Points → Landmark → LM
 - Describing Landmark → Landmark → LD
 - Action wrt Landmark → Action + Landmark → Action + Path entity → AL → LSO | LSOP
 - Progression → Paths → Action → LOC
 - Reorientation → Direction → RO
 - Point+Dir | Path + Point → C

Figure 3.1.: Categories for the sentence labels taken from the literature.

The annotation scheme was mainly developed on the basis three papers on route directions. Daniel and Denis (1998) analysed direction giving to investigate language and spacial cognition, Dale, Geldof, and Prost (2003) tackled the problem of generating natural route descriptions synthetically, and Koulouri and Lauria (2009) investigate spacial descriptions to navigate a robot. A reference work for capturing spacial language has been Pustejovsky, Moszkowicz, and Verhagen (2011). For abbreviations of the used labels cf. the appendix sections A.2 and A.3.

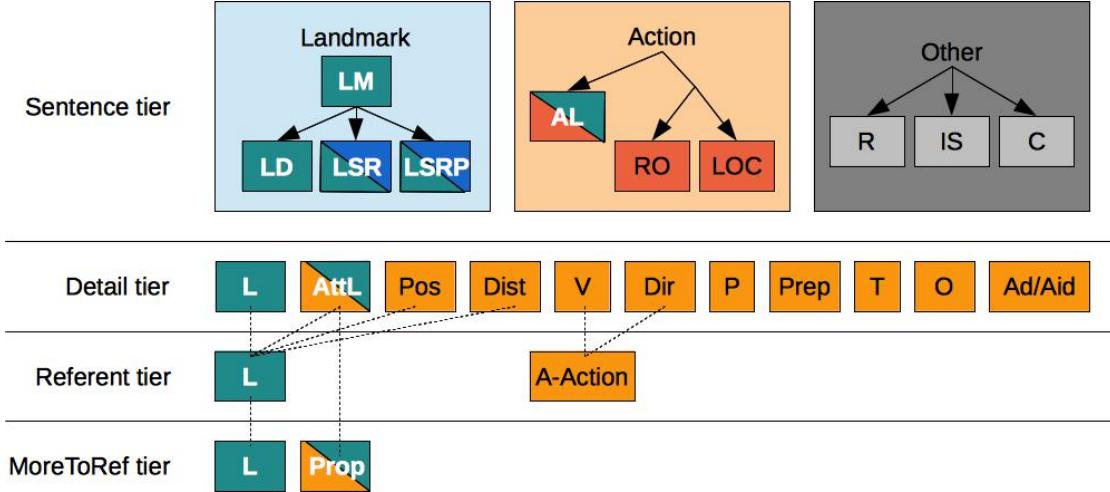


Figure 3.2.: The four annotation tiers and the appertaining annotation labels. The meaning of these labels are discussed in sections 3.4.1, 3.4.2, 3.4.3 and 3.4.4.

As indicated in figure 3.2, each hierarchy tier can be marked by several annotation categories. The tier **Sentence** is for the general annotation of a phrase with the following categories: [LM], [LD], [LSR], [LSRP], [AL], [RO], [LOC], [R], [IS], and [C]. In the following, the words *sentence* and *phrase* are used interchangeably.

The second tier **Detail** is for the specification of the first tier with the following categories, already including landmark referents ([L]) where they are mentioned explicitly: [L], [AttL], [V], [P], [Prep], [Pos], [Dir], [Dist], [T], [O], and [Ad/Aid]. The expressions "detail tier" and "word tier" have the same meaning here.

The third tier **Referent** is for the determination of possible referents in speech, which might later be linked to accompanying referents in gesture. Most of the time, speech referents are landmarks or objects [L] in the Sagaland. Sometimes gestures can also refer to carried out actions [A-action].

The fourth tier **MoreToRef** stands for *more information about the referents* and has been integrated at a later point in time to include speech details that were lacking before.

With [Prop], more elaborate categories of landmark attributes than [AttL]s are collected. Furthermore, spatial relations between landmarks or objects can be specified by the order of the [L] label-assignment.

Further tiers were planned (e.g., to determine the figure-ground allocation) and may be created in further annotations processes.

RS_Form	[7]	00:00:00.500	00:00:01.000	00:00:01.500	00:00:02.000	00:00:02.500	00:00:03.000	00:00:03.500	00:00:04.000	00:00:04.500	00:00:05.000
RS_Sentence	[1]	Wir	sind	durch	eine	große	Baumallee		gefahren		
RS_Detail	[6]	P-WirPerspektive		Dir-durch	Aid-femSg	AttL-size	L-baumallee-LBkl-pl		V-motion		
RS_Reference	[4]			A-action		L-baumalle	L-baumallee-LBkl-pl		A-action		
RS_MoreToRef	[1]					Prop-gross					

Figure 3.3.: A sample sentence including labels on all three tiers.

The meaning of a phrase can be found in its complete annotation on all tiers, e.g.: "Wir sind durch eine große Baumallee gefahren" {We were driving through a big grove}, "Wir" {we}, "durch" {through}, "eine" {a/an}, "große" {grove}, "Baumallee" {grove}, "sind ... gefahren" {were ... driving}.

3.3. General Rules

3.3.1. Organisational Matters

The following files were used during the annotation process:

- o_ErstellungAnnotationsdatei - *Preparation of the annotation file*
- o_Annotationsvorgang - *Annotation procedure*
- o_ErlaeuterungenAnnoLabels - *Explanation of the annotation labels*
- o_Annotationsregeln - *Annotation rules*
- 1_landmarks - *Labels for landmarks in the Sagaland*
- 2_otherAnnotations - *All other labels*
- 3_Prop-Labels - *More specific AttL labels*
- Fehler-OrthoAnnot - *Mistakes in orthographic annotation*
- Notizen - *Notes*

The first three files are mainly to organise the annotation process in the beginning. Once an annotator is familiar with the annotation process s/he works only with the last five files: Editing the annotation rules, adding/editing annotation labels, noting down mistakes in the orthographic annotation and making notes.

- If anything is unclear, open the file `2_otherAnnotations` and look up the annotation labels; all fixed categories are listed in this file.
- If new categories are created during the annotation process, add them to the file `2_otherAnnotations` and make notes in `o_Annotationsregeln` of when or in which cases to use these categories.
- Mistakes in the orthographic transcription: Make notes of all orthographic mistakes in a separate file named `FehlerOrthoAnnot`.

3.3.2. Annotation Process

Annotating the sentence tier resulted in many mistakes in the beginning. In order to overcome these, we created a guideline of which label to use in which case. Figure 3.3.2 illustrates the decision tree according to which the labels were assigned.

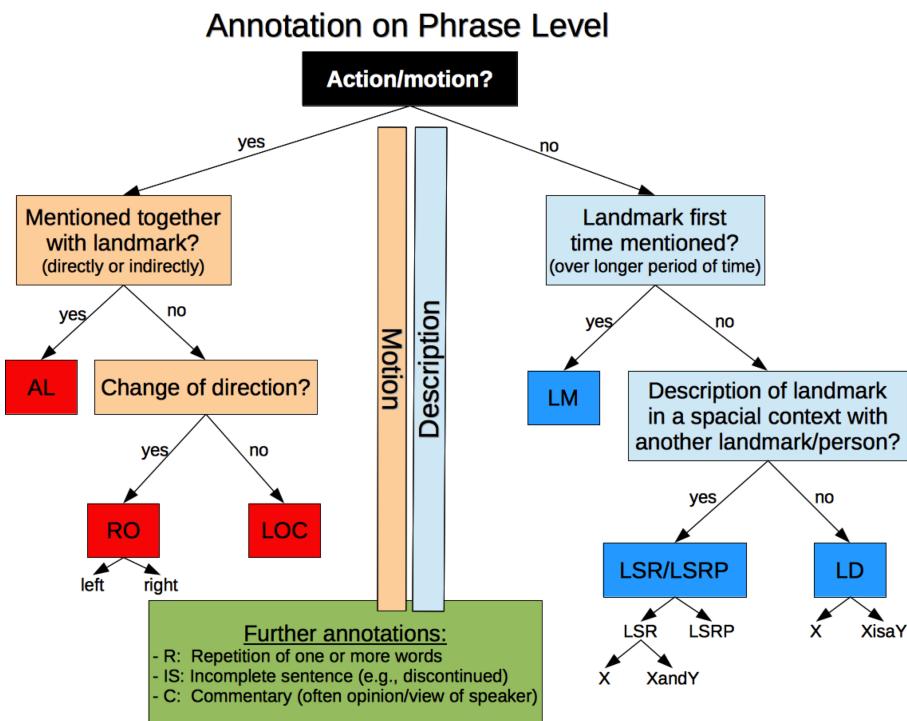


Figure 3.4.: A decision tree for choosing correct labels on the sentence tier.

All in all, it does not matter which tier to annotate first. In one approach, the words on the second tier are labeled first, because at the end of the phrase it is usually obvious what kind of phrase it is and which phrase annotation label should be used.

3.3.3. Annotation Techniques

- The video files should be watched while annotating to facilitate finding the correct annotations. This is important since there may be a lot of the information in the gesture; in particular if "so" and similar utterances appear, check the video file to find out what the participant means.
- Segments should be annotated as precisely as possible! In order to use the boundaries of an orthographic word, click into the segment of that word and then double click in the appropriate tier below. A new label appears with the exact boundaries of the orthographic word. Boundaries of a phrase can be marked as follows: Use the same technique mentioned before for the first and the last word of the phrase, then e.g., right click on the first label and select "merge with next annotation" and conversely.

3.4. Annotation Rules

Putting it in a nutshell, the annotation should:

- Reflect the meaning of a sentence
- Mark (explicitly and implicitly mentioned) landmarks
- Include other details: Actions, verbs, spacial relations, and time
- Include various perspectives: Router and follower, and perspective changes.

Always annotate what the study participant means. For example, when a participant uses a wrong word while referring to a landmark, annotate the label of the landmark that is meant (e.g., "Rundturmkirche" {church with a round tower} was called "Kapelle" {chapel}, in this case the referent must be annotated as "Rundturmkirche" {church with a round tower}).

More about the labels and examples on how the labels are used, can be found in the appendix in subsections A.2 and A.3.

3.4.1. Rules for Phrase Tier - First Tier

- One thought/description per phrase: It is better to label several small sentence segments than too large ones.
- The phrases of R and F should not overlap: If one participant starts a sentence, is interrupted and the phrase is not of major importance, annotate with [IS].

- All phrases should be annotated (if necessary with [IS] or [R]) unless there is no 'real' word on the sentence tier. For example, "ja" {yes} which is only annotated as [O-Bestaetigung] on the second tier.
- Phrase annotations in `2_otherAnnotations` are arranged according to priority. If the first category does not seem appropriate, choose the one beneath that matches best, i.e. first [LM], then [LD], then [LSR], then [LSRP], then [AL], then [RO], then [LOC], and lastly [IS] or [R].

LM *landmark mentioned* indicates that a landmark is mentioned for the first time or it is mentioned without a description/an action. If a different phrase annotation follows and the landmark is mentioned again, it is [LM] again. When a study participant wants to make clear which, e.g., church is meant and does not use any description, [LM] is used as well.

LD *landmark description* is used for all descriptions of landmarks that do not include actions.

AL *action with reference to landmark* is used when a landmark, also an indirectly mentioned one, is mentioned in combination with an action (V-motion or V-motion meant but not explicitly stated). If this action is a left or right turn, it is annotated as [AL] on the first and [Dir] on the second tier. For example, streets, intersections and bridges are landmarks as well ("Die Straße immer geradeaus gehen" {Keep on walking straight down the street}, "An der Kreuzung rechts" {Turn right at the intersection}). There is an exception for verbs which are not motion verbs but can be interpreted as such. For example, "Da musst du dann links" {You have to (turn) left there} is a AL-XV, because "musst" {have to} is meant as a motion. "Das nächste Mal wenn er sich so teilt rechts" {The next time it branches off, (turn) right} is a AL-X, because "teilt" {branches off} is a description of the street, not a motion.

RO *reorientation* (movement in a different direction) is used if the participant describes a left or right turn without mentioning a landmark: the phrase is annotated as [RO-linksV/RO-rechtsV] or [RO-links/RO-rechts] (without an explicitly mentioned verb).

LOC *locomotion* (continuous movement) may only be used if the action is an undefined locomotion (e.g., "weitergehen, geradeaus gehen" {keep on walking/keep on walking straight ahead}) and no landmark is mentioned in the same phrase.

LSR *a landmark's spacial relation* is used when a landmark is explicitly mentioned in spacial relation to another landmark, e.g., "die Litfasssäule (steht) neben dem Rathaus" {the advertising column (is located) next to the town hall}. If the phrase describes an action with that landmark, the category [AL] should be used.

LSRP *spacial relation between a person and a landmark* means that a person is in spacial relation to a landmark, e.g., "die Brücke ist rechts von dir" {the bridge is to your

right} (the entry for VX may vary: [LSRP-XVlinksVonP] or [LSRP-linksVonPVX], but the entry for this is always [LSRP-XVlinksVonP]). Important: "der Bus" {bus, since the subjects were 'driven' through the virtual world} is to be interpreted as a person as well and takes over the neutral perspective "man" {one/someone}. Spacial relations including the bus should therefore be annotated with [LSRP]!

- Other categories include [R] *repetition*, [IS] *incomplete sentence*, and [C] *comentary*. For rules regarding [R] and [C] see section 3.4.2, since there are different rules for the same phenomenon on different tiers. In general, [IS] is annotated if a phrase has been interrupted or has not been followed through by the speaker and does not carry new meaning regarding the Sagaland. One more specific rule concerning [IS] is stated at the beginning of this section.

3.4.2. Rules for Word Tier - Second Tier

L *landmarks* may be all objects in the Sagaland.

AttL *attributes of landmarks* are only used for landmark descriptions (a distance between two landmarks is not a description!).

- Include articles, prepositions or nouns in the annotation if they do not make sense on their own, e.g., "ein S" {an S} becomes [AttL-shape], "in blau" {in blue} becomes [AttL-color], "ein bisschen" {a bit} is a [AttL-quantity], "zwei Stück" {two pieces} is a [AttL-number], and "ein halber Meter hoch" {half a metre high} is [AttL-height].
- If an [AttL] describes a referent without mentioning it, the referent is annotated on the third tier; if there are several adjectives referring to a landmark or other referents, each adjective is annotated with the appropriate referent on the third tier (e.g., "dreigeschossig flach" {three floors high, flat}).

V we differentiate between three types of *verbs*: "motion" (most of the verbs), "static" and "perception" verbs, and "others" (see *SFB 673 Fortsetzungsantrag* dated 07.12.2009, p. 197).

- In verb constructions, only annotate the main verb (e.g., "bin gestartet" {have started}, use only "gestartet" [V-motion]).
- If the verb refers to a landmark which is static in Sagaland, annotate the verb with V-static ("Da kommt eine Kreuzung" {There comes an intersection} becomes "kommt" [V-static]).

P *perspectives*:

- The perspective has to be annotated, because of possible changes of perspective (first person POV, second person POV, first person plural POV, neutral perspective).
- Passive perspective: It is assumed that the change of active and passive appears in the descriptions because the study participants were "driven" through

Sagaland and perceive themselves as passive. For example, in "die Kapelle kommt auf dich zu" {the chapel approaches you}, "du" {you} is annotated with P-DuPerspektive-Passiv and the whole phrase is [LM].

Prep *prepositions* are used only if a suitable match in [Pos] and [Dir] cannot be found.

Pos *position* words are used only for the position of landmarks.

Dir *direction* words are used in combination with motion verbs.

Dist *distance* words refer to the spacial relation of objects and actors.

T *time* words may frame the temporal succession of the tour through the Sagaland.

O *others* may have an equivalent on the sentence tier.

- Commentaries on the sentence and the word tier: Only mark expressions that do not add any information to the Sagaland description as commentaries:
 - * C-Commentary: On sentence tier; if there is no connection in meaning between the previous and following phrase, e.g., "das heißt" {that means}, "ich glaub" {I think}, "ich sag mal" {I'd say}, "so musst du dir das vorstellen" {that's how you can imagine it}.
 - * O-Kommentar {commentary}: On word/detail tier; used for phrases that are not important for the description of Sagaland, e.g., "das ist höher als der Bus *ich sag mal* höchstens drei Meter" {it is taller than the bus *I'd say* three metres at most} V05 00:52:500 [R].
- Repetitions: On sentence and word tier.
 - * R-Wiederholung {repetition}: On sentence tier; only annotate if the phrases are exactly the same without other words in between: ("er ging *er ging*" {he went *he went*}). The annotated words show how much was repeated by the speaker.
 - * O-Wiederholung [repetition]: On word tier; only use for repetition of single words, e.g., "er *er* ging" {he *he* went}.
 - * If a referent appears in the repetition, it should be annotated on the third tier, because the speaker might perform a matching gesture.
- O-Negations: Words like "nicht" {not}, "nein" {no}, "ne" {nope} (Caution! "ne" can be meant as a question or negation; check video/audio file for reference). This label always appears within a sentence/phrase boundary on the first tier.
- O-Questions: "was" {what}, "welche" {which} or other interrogative particles; also verbs in interrogative sentences, e.g., "War da irgendifwas besonderes?" {Was there anything special?} and questions for backchannels such as "ne?" {right?} (Caution! Sometimes they are meant as a question, other times as a negation). This label always appears within a sentence/phrase boundary on the first tier.

- O-Bestaetigung {confirmation}: This label may appear independently from a sentence/phrase boundary on the first tier, unless it appears in the middle of a phrase. For example, a speaker may produce some backchannels, like "ja" {yes}, without saying more words that form a phrase and, consequently, the confirmation label appears independently from a phrase boundary.
- O-Versprecher {verbal error}:
 - * If something is repeated twice or more (e.g., "das fängt also *mit diesem* ähm *mit der Skulptur* an" {it starts with this, err, with the sculpture}), the first part is marked as [O-Versprecher] and the rest is annotated normally.
 - * Words that are interrupted (e.g., "o...") are also marked as verbal errors.
 - * If the verbal error refers to a landmark, the referent should be annotated on the third tier because the speaker might already start making a gesture to describe the referent.
- O-Unterbrechung {interruption}: If a speaker is interrupted by the communication partner or by him-/herself.

Ad/Aid there are two types of *articles*: Definite articles ("der, die, das" {the; masculine, feminine, and neutral articles}), indefinite articles ("ein, eine" {a/an; masculine, feminine articles}) and forms like "dieser" {this; masculine determiner} becomes [Ad-maskSg], "diese" {this; feminine determiner} becomes [Ad-femSg], "dieses" {this; neutral determiner} becomes [Ad-neuSg], and "es" is [Ad-neuSg].

- Exception: "des" {of} in cases like "in der Mitte des Kreisverkehrs" {in the middle of the roundabout} is a [Prep-von],
- If the wrong article is used, e.g., "der" {definite masculine article} instead of "die" {definite feminine article}, do not annotate the wrong form, use the correct one,
- "Es" should be analysed more closely to find out if it refers to a landmark or other referent (e.g., "Es gibt kaum Kreuzungen" {There are hardly any intersections} should be interpreted as "*Im Sagaland* gibt es kaum Kreuzungen" {*In Sagaland* are hardly any intersections}).

Words that are not annotated

Utterances/short phrases/words that are difficult to define and that do not give important information are *not* annotated at all: For example, "immer" {always}, "also" {so}, "nur" {only}, "ob" {if}, "oder" {or}, "und" {and}, "einfach" {simply}, "ähm/äh" {err}, "wieder" {again}, "auch" {also}, "nochmal" {again}, "naja" {well}, "grad" {just now}, "ähnlich" {similar}, "aber" {but}, "hm", "eigentlich" {actually}, "unbedingt" {absolutely}, "weil" {because}, "schon" {already}, "halt" {just}, "irgendwie" {somehow}, "erstmal" {for now}, "direkt" {directly}, "quasi" {virtually}, "eben" {just (now)}, "ganz" {fully/totally}, "sondern" {but}, "speziell" {special}, "wirklich" {really}, "außerdem"

{besides}, "sozusagen" {so to speak}, "auf jeden Fall" {in any case}, "insgesamt" {on the whole}, "mal", "gut" {good}, "unmittelbar" {immediately}, "dieselbe" {the same},

- "wie" {how/like} if it can be left out without changing the meaning of the phrase,
- "sich" {oneself} are left out or annotated with the appropriate personal pronoun,
- "ja" {yes} if it is only used as a filler, otherwise annotate as [O-Bestaetigung],
- "(eine) Art (Kirche)" {a kind of}, here "Art" {kind} is not annotated,
- "nicht mehr" {no longer/not anymore}, here "mehr" {longer/anymore} is not annotated.

Fixed Annotations

- *Noun phrases*: The article and the noun are annotated separately, e.g., "der Baum" {the tree} is [Ad-maskSg], [L-baum]; "der große Baum" {the big tree} is [Ad-maskSg], [AttL-size], [L-baum].
- *Word combinations*:
 - Combinations of position [Pos] and direction [Dir] words: Annotate the words separately, e.g., "drauf zu" {towards} becomes [Pos-darauf] [Dir-zu].
 - Combinations of position [Pos] words and nouns: Annotate the words separately, e.g., "am Anfang" {at the beginning} becomes [Pos-an], [Pos-Anfang].
- *Word annotations*:
 - "mhmm", "aha", "ah", "ja" {affirmative interjections/yes} is a [O-Bestaetigung] if it is meant as such.
 - "aus" {out} as in "aus dem Park heraus" {out of the park} is annotated with [Pos-von]; "aus" as in "die Kirche sieht groß aus" {the church looks big} is not annotated.
 - If "so" {like this} is used to refer to a gesture, it is annotated as [AttL-shape]. If it has no meaning, it is not annotated.

Particularities of Landmark Annotations

- Streets and intersections: Streets and intersections should be annotated with the label for the matching section of the streets/paths/intersection. If it is not possible to determine which streets/paths/intersection the participant means, use [L-str_unbestimmbar/L-str_parkweg_unbestimmbar] or [L-strKr_Kr_unbestimmbar/L-strKr_TK_unbestimmbar/L-strKr_unbestimmbar].
- When the speaker mentions "Altstadt" {historic district} or "da bei den Kirchen" {where the churches are} they are both labeled with [L-lm3_kirchplatz]; if they explicitly mean the buildings surrounding the "Kirchplatz" {church square}, then they are labeled with [L-lm3_wohnsiedlungUmKirchplatz].

- "Straßenverlauf" {course of the road} should be annotated, if possible, with the matching section of the streets/paths (e.g., "Du folgst dem Straßenverlauf bis zum Kirchplatz" {You follow the course of the road up to the church square}, here "Straßenverlauf" {course of the road} should be labeled with [L-stro6_geschlaengeltZuAufKirchplatz]).

3.4.3. Rules for Referent Tier - Third Tier

L All landmarks/objects that are already marked on the second tier, are labeled on the third tier with exactly the same label. This way, all possible landmark referents are gathered on one tier.

- *Definite articles* which are not defined by a landmark referent [L] on the second tier but can clearly be linked to a landmark, are annotated on the this tier. For example, in "Da ist ein grüner Baum. Der steht links." {There is a green tree. It stands on the left side.} "Der" {It} is annotated with the referent "Baum" {tree} on the third tier to allocate the meaning of the article. Words such as "es" {it}, "daran" {at it}, "herum" {around}, "drauf" {on it} can refer to landmarks as well.
- If a landmark referent appears in *verbal errors* or *repetitions*, it is annotated on the third tier.
- If an [AttL] on the second tier is marked with a referent on the third tier, the [L] label must reach over the *whole* [AttL]-phrase.
- All [AttL], [Pos] and [Dist] labels are marked with the according landmark [L] on that tier, since object references can also be indicated by very short phrases: e.g., "Ja, rund!" {Yes, round!} (as in "Yes, the window is round.").
 - * For some labels of that category a referent label makes no sense, because there can't be a landmark or street assigned to it. Those shouldn't get a landmark label. Most likely to be of that kind are: e.g., [Dist-bis] and [AttL-quantity].

A has only one label, namely [A-action]. It is either assigned to the *action verb* [V-motion] of the phrase or to a *direction-giving word* [Dir].

- Every action verb (all labeled with [V-motion] on the second tier) should get an [A-action] label on the third tier.
- For action verbs with direction-giving prepositions (e.g., "Du fährst drauf zu." {You drive towards (it).}) a different rule applies: if the [A-action] label is on [Dir-zu] (for "zu" {towards}), it covers more information than being connected to the verb [V-motion] by itself. Therefore, the [A-action] label is placed below the [Dir-zu] label. Note that the direction-giving words usually occur in conjunction with "rechts" {right}, "links" {left} or "geradeaus" {straight on} or that they are only implicitly stated as in "zu" {towards}.
- In special cases, [Dir] hides a landmark, e.g., with the label [Dir-herum]: "Du fährst herum." {You drive around (it).} In those cases, the motion verb should

be labeled with [A-action] and the direction word with [L] in order to maintain as many labels as possible.

- If [Dir] is part of a landmark description [LD], it should get a landmark referent label [L] and not an action label.
 - * Those mistakes should be corrected by exchanging [Dir] with [Pos].
 - * In addition to this correction, the referent for [Pos] should be assigned on the third layer.

3.4.4. Rules for MoreToRef Tier - Fourth Tier

Prop stands for properties (or attributes) of the landmarks.

- On the one hand, [Prop] entries are more specific than [AttL] labels about the attributes or properties of landmarks in the Sagaland. And on the other hand, these [Prop] entries are more uniform than the lemmata of the adjectives. For example, "offen" {open} and "nicht geschlossen" {not closed} should be combined into one label: [Prop-open].
- The list of [Prop] entries has been extended throughout the annotation process and is accessible in the file 3_Prop-Labels. A few examples of possible labels are: [Prop-flach] {shallow}, [Prop-spitz] {spiky}, [Prop-rund] {round}, [Prop-rot] {red} etc.

L (landmark) labels specify spatial relations between landmarks on this tier. The relations are spacial and are created by referring to one of the labels [Pos] or [Dist] on the second tier. The first landmark is already marked under the [Pos]/[Dir] label on the third tier, which is the landmark object that the preposition refers to. The second landmark is labeled under the [Pos]/[Dir] label on the fourth tier. The relation can be read as follows: *landmark, relation, landmark directly effected by relation*.

- E.g.: [Pos-auf] {on}: "Die Kirchen stehen auf dem Kirchplatz." {The churches are placed on the church square.} can be read as *churches, on, church square*.
- A list of possible relation words: [Pos-auf] {on}, [Pos-zwischen] {between}, [Dist-definedlength], ...

Rules of annotation for gesture referents

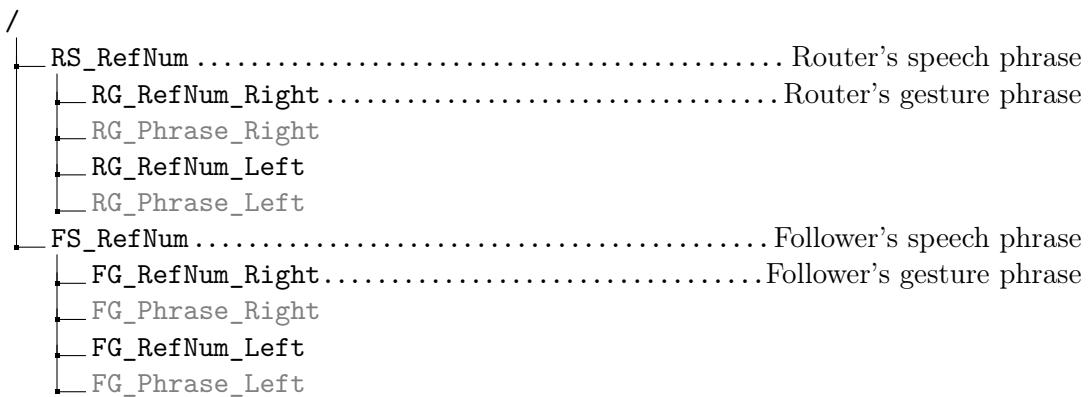
Farina Freigang Sören Klett Julia Letetzki Kirsten Bergmann

Version 1 – 31.01.2014

4. Rules of annotation for gesture referents

4.1. Annotation hierarchy

The following labels are used: R: *Router*, F: *Follower*, S: *Speech*, G: *Gesture*, RefNum: *Referent Number*.



For more information about the hierarchy cf. the appendix section A.1.

4.2. Annotation labels in the hierarchy

Two types of label categories were *added* (S/G_RefNum) within this annotation scheme and one type of label has been *imported* (G_Phrase) from the Rough Annotation Scheme (cf. Chapter 1.3.2) in order to link speech referents to gesture referents:

1. S/G_RefNum: For each referent label [L] or [A-action] in the speech annotations, a number label has been created. These number labels are consecutive, i.e., each annotation file starts with a number label [1] and there is only one label with a certain number in one file. Also, the labels are ordered by time and not by tier, meaning that the numbers 'jump' between the router and the follower tiers.
2. G_Phrase: For each gesture-phrase label from the imported gesture annotations (in the hierarchy marked in gray), a number label is created and given the number of the speech referent, to which the gesture should be linked. The gesture labels are: iconic, deictic, beat, iconic-deictic, iconic-beat, deictic-beat, iconic-deictic-beat, move, discourse, unclear (cf. chapter 1), and discourse-beat

(newly used in only a few cases). The rules that clarify which referent should be used are given below.

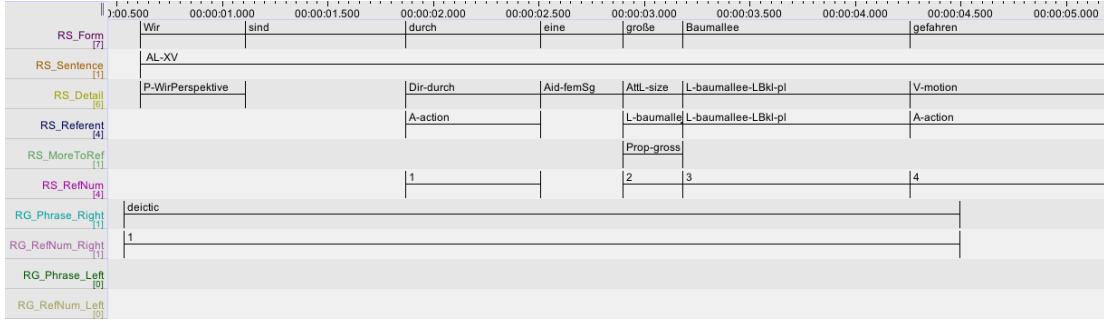


Figure 4.1.: The sample sentence from section 3.2 including reference labels.

4.3. General Rules

4.3.1. Organisational Matters

The following files were used during the annotation process:

- o_VorbereitungAnnotationsdatei-GestRef - *Preparation of the annotation file for gesture referents*
- o_Annotationsregeln-GestRef - *Annotation rules for gesture referents*
- Kurz-Anleitung-GestRef - *Brief instruction for gesture referents*
- Fehler-GestenAnnot - *Mistakes in gesture annotation*
- KeinWortFuerGeste - *No word exists to match with a gesture*
- Notizen - *Notes*

4.3.2. Annotation Process

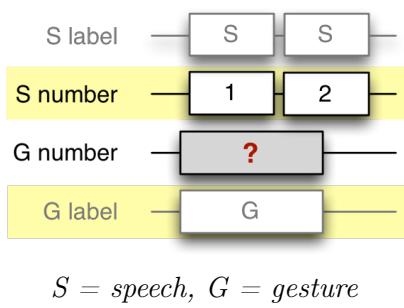
- For each gesture-number label that is associated to a particular gesture-phrase label (in the following referred to as "gesture label"), find the appropriate speech-referent label. Then take the number of the chosen speech-referent label and assign it to the gesture-number label. The speech referent and the gesture are visibly linked. More details are given in subsection 4.4.
 - The speech-number label (on the tiers RS/FS_RefNum) appears in the vicinity of the gesture label (on the tiers RG/FG_Phrase_Right/Left).

- The gesture-number label is assigned on the tiers
RG/FG_RefNum_Right/Left.
- Both hands must be annotated independently from another ("RefNum_Right/Left), because the subject can perform different gestures with both hands.

4.3.3. Annotation Techniques

- The video files should be watched while annotating to facilitate finding the correct speech referent for a gesture.
- The exact borders for the gestures-number labels should be copied from the RG/FG_Phrase_Right/Left tiers. If those labels have wrong borders or wrong annotations, they should be corrected and the corrections should be noted down in the file "Fehler-GestenAnnot".

4.4. Annotation Rules



Procedure: Based on the previous annotations, both the speech-number labels (that correspond directly to the speech-referent labels above) and the gesture labels are given (highlighted in yellow). In order to make the final connection between speech and gesture for the referent annotation, the annotator needs to decide on the speech-number label for a certain gesture and inserts this number at the gesture-number label (red question mark).

The allocation of the gesture number depends on how the gesture labels appear: Sometimes a gesture is divided into smaller gesture units and sometimes small repetitions of gestures or small pauses with continuations ("mid-stroke-hold") are marked as one large gesture unit.

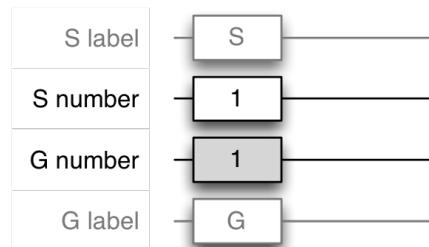
4.4.1. General annotation rules

- A gesture appears before or co-occurs at about the same time as the verbal referent, therefore, always use the speech label that is closest to or appears right after the gesture label.
- If there is a gesture referent but no fitting speech referent, that gesture will be documented in the file "KeinWortFuerGeste" and the gesture number is not used. Additionally, the gesture should be marked with "no-affiliate (xx)". The "xx" should be filled in with the meant referent. Those occurrences are very rare and therefore are no problem for computerised analyses.

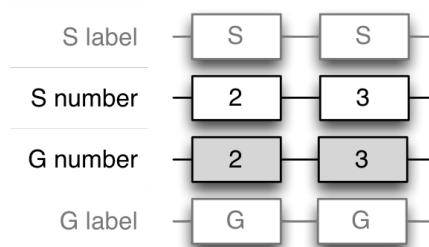
- New gesture labels on the tier RG_FG_Phrase_Right/Left can be provided if:
 - the gesture labels have a different meaning than annotated or
 - no gesture is labeled on the gesture-phrase tier but a gesture appears in the video.
- Gestures, which are annotated as "move" or "discourse" (cf. chapter 1) cannot be used as referencing gestures. If those labels are assigned by mistake they have to be corrected.
- If a verbal error appears on the speech tier, normally there is a referent on the third tier. If there is none and the error includes a referent, assign a new label to it with a number plus character on the gesture-reference tier (e.g., if the previous number was 55, use 55a).

4.4.2. Main annotation rules

The following examples in the annotation files are referred to by e.g. [V05-15]. They include the name of the annotation file (V05) and the label of the referent number (15) in square brackets.

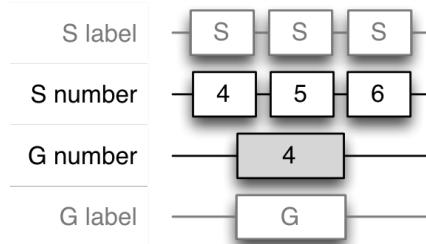


Normal case: One gesture label exists and it obviously belongs to a certain speech-number label, therefore the number of the speech-number label is allocated to the gesture-number label.

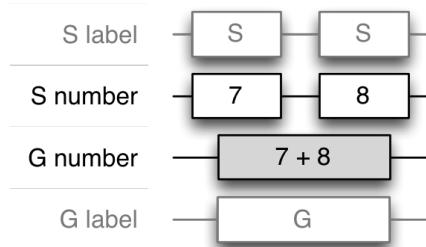


2 referents each: The procedure is similar to the one above. In one case two different speech-referent labels are connected with two different gesture labels.

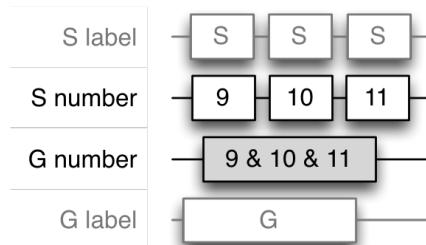
- In the case of the second speech referent being an article referring back to the first referent ("Here is a house. *It* is red.") and the second gesture refers to the second speech unit, the speech-referent label of the article is used for the second gesture-number label (e.g. [V05-598]).
- The second speech-gesture pair can also be a repetition of the first pair but with a clear pause between the production processes.



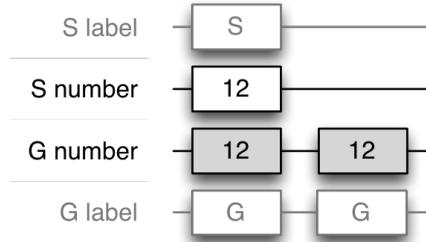
More than 1 speech referents and 1 gesture: If there are multiple occurrences of a speech referent while there is only one gesture at that time, only the first occurrence of the referent should be used.



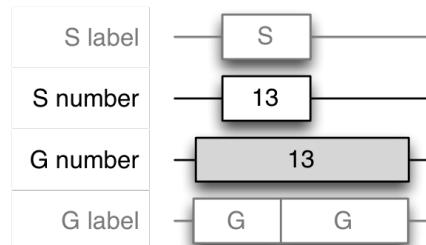
More than 1 speech referents and 1 gesture: If there are multiple identical speech referents but only one large gesture label that represents repetitions of gestures, the speech referents can all be added up by the "+" sign in the gesture-number label (e.g. [Vo5-249+254]). The "+" sign is also used, if the speech is interrupted and then taken up again but the gesture is carried out during the whole production process (e.g. [Vo5-18+21]).



Complex gestures: If gestures resemble two or more referents that cannot be divided up into phases, these gestures should be annotated as one gesture with multiple labels from the according speech referents separated by "&" (e.g. [Vo5-211&213&214]).



1 speech referent and more than 1 gesture referents: If a speech-referent label appears (only once) together with an accompanying gesture and a similar gesture is repeated without a second speech referent, the same gesture-number label should be used for both gestures (e.g. [Vo5-15]).



In rare cases:

1 speech referent and more than 1 gesture referents: If there are several gesture labels that represent repetitions of gestures (one right after the other) but only one speech referent, the gesture-number label should be stretched over the two (or more) gestures (e.g. [Vo5-60]).

4.4.3. Special annotation rules

A-action If there is a gesture which could refer to more than one [A-action] label in one phrase, e.g. [Dir-into] -> [A-action] and [V-motion] -> [A-action], then the [Dir-into] should be used, because it holds more information.

Dir However, if [Dir] is part of a landmark description [LD], then the referent label should not be labeled by [A-action]. If those mistakes exist, [Dir] should be exchanged with [Pos-nach] {to} for "in direction" and [Pos-hinter] {behind} should be corrected in "a crossing appears after the city hall". Additionally, [Pos] referent labels have to be added to the word tier.

L vs AttL If is it not clear whether a gesture describes a landmark or its attributes, then the attribute label will be tagged with the gesture-reference label, because it holds more information (e.g., [V05-48/49]).

L vs A If a street (and no other landmarks!) and a [A-action] appears in one phrase and it is not clear whether the subject's gesture refers to the street or to the motion on the street, the label should be assigned to the street (e.g., [V05-17/19] and [V05-65/66]).

AttL If there are two AttLs in one sentence but only one gesture label, then there are two solutions (e.g., [V05-31/33]):

- The gesture describes only one of both AttLs and that AttL should be labeled.
- If there are two meanings in the gesture which could be split to fit both AttLs, the gesture label may be split into two parts (be careful when naming the new label).

Relations There are special rules dealing with the relations of landmarks, e.g. the distance between and the hight differences of landmarks. Landmark relations were first introduced in subsection ??.

- A relation word marks the connection between these landmarks, as it is tagged with these landmark labels on the third and on the fourth layer.
- Distance: If a gesture holds information about the landmarks in general and about their distance to another, the relation word for distance is e.g. "between" and therefore, also the gesture-number label should be tagged on "between" (cf. [Dist-definedLength] [V05-50/51/52]).
- Height: The same as with distance. A relation word for distance is e.g. "higher as" (cf. [AttL-height] [V05-41/42]).
- If one hand gesture represents one landmark *and* the relationship it has to another landmark, it is marked by a comma referring to the first landmark and the relation word. This should be annotated with both numbers separated by a comma (e.g. "41,42" in [V05-41/42]).

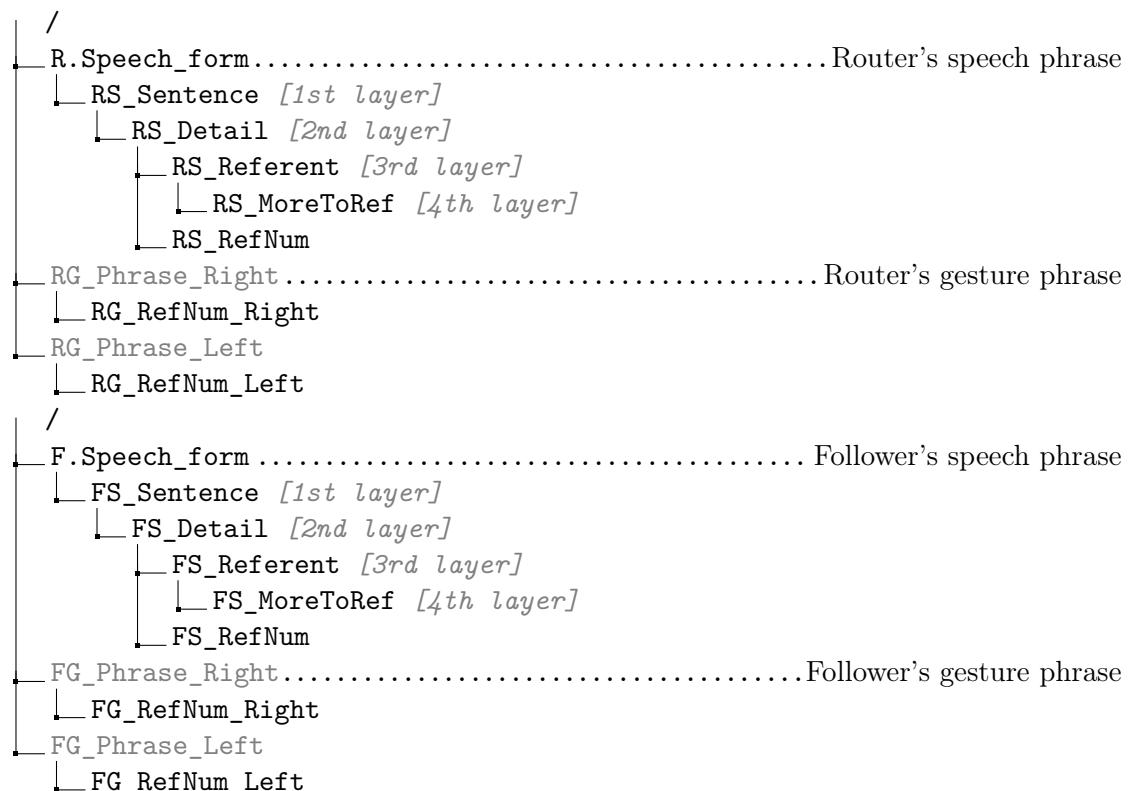
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Appendices

A. Abbreviations and Labels of the Referent Annotation

A.1. Standard order of tiers of Speech and Gesture Referents Annotation



A.2. Abbreviations of Labels Used as Controlled Vocabulary

A.2.1. Abbreviations of general Labels

- X = one or more landmarks that have been referred to
- Z = referred to landmark with special focus compared to other landmarks (X)
- L = any landmark

- V = verb (more below)

A.2.2. Abbreviations of Labels for Phrase Tier - First Tier

Landmarks:

- LM = landmark mentioned - landmarks that were mentioned without descriptions
- LD = landmark description - further details to already mentioned landmark
- LSR = landmark with spacial relation - sth! that has a spacial orientation to a landmark (Z)
- LSRP = landmark with spacial relation and perspective - a landmark that has a certain spacial orientation to sb!

Actions:

- AL = actions with reference to landmark - referring to a landmark in combination with movement
- RO = reorientation - movement in a different direction
- LOC = locomotion - continuous movement

Other Sentences:

- R = repetition - a phrase that contains exactly the same words as the phrase directly before
- IS = incomplete sentence - not finished sentence/sentence that does not make any sense

A.2.3. Abbreviations of Labels for Word Tier - Second Tier

Movement:

- V = verb - 3 types and another type - some structures are only possible with action verbs

Perspective:

- P = perspective - 4 perspectives (active), plus one passive perspective

Prepositions:

- Prep = preposition - only make use of these when you cannot find a suitable match in Pos and Dir
- Pos = position prepositions - only for the position of landmarks

- Dir = direction prepositions - in combination with motion verbs

Landmark:

- AttL = attributes of landmark - shape, size, amount, etc.

Other Aspects:

- Dist = distance
- T = time
- O = other - Kommen-tar/Versprecher/Unterbrechung/Negation/Frage/Bestaetigung/Wiederholung

Articles:

- Ad/Aid = definite and indefinite articles

A.3. Labels Used as Controlled Vocabulary

A.3.1. Labels for Phrase Tier - First Tier

Landmark Mentioned [LM]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]
 - LM-XV (z.B.: Zuerst kommt die "Skulptur")
 - LM-X (z.B.: Genau das "Rathaus")

Landmark Description [LD]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]
 - LD-XV (z.B.: Die "Skulptur" ist "rot")
 - LD-X (z.B.: Etwa "drei Meter" hoch)
 - LD-XisaY (z.B.: Die "linke Kirche" ist wie "eine Moschee")

Landmark with Spacial Relation [LSR]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]
 - LSR-ZXV (z.B.: Der "Eisstand" steht neben dem "See")
 - LSR-ZX (z.B.: Die "Brücke" neben dem "Rathaus")
 - LSR-ZVXundY (z.B.: Der "Weg" geht zwischen den "Kirchen" durch)
 - LSR-ZXundY (z.B.: Der "Weg" zwischen den "Kirchen")

Landmark with Spacial Relation and Perspective [LSRP]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]

- LSRP-XVP (z.B.: "Du" stehst direkt vor dem "Rathaus")
- LSRP-XP (z.B.: Die "Straße" links von "dir")

Actions with Reference to Landmark [AL]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T],[V-motion]
 - AL-XV (z.B.: Dann "kommst" du auf die "Kapelle" zu)
 - AL-X (z.B.: Einmal um den "See" herum)

Reorientation [RO]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T],[V-motion]
 - RO-linksV (z.B.: Dann "biegst" du "links" ab)
 - RO-links (z.B.: Dann nach "links")
 - RO-rechtsV (z.B.: Da gehst du nach "rechts" weiter)
 - RO-rechts (z.B.: Danach dann "rechts")

Locomotion (only with motion verbs) [LOC]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T],[V-motion]
 - LOC-LokomotionV (z.B.: Du "gehst" einfach "geradeaus")
 - LOC-Lokomotion (z.B.: Immer "geradeaus")

Repetition [R]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]
 - R-WiederholungV (Repetition of a whole phrase including a verb)
 - R-Wiederholung (Repetition of a whole phrase without a verb)

Incomplete Sentence [IS]:

- Applicable labels: [P],[Prep],[Pos],[Dir],[AttL],[Dist],[T]
 - IS-incompleteSentenceV (Phrase that cannot be classified as any of the other phrase annotations or that doesn't make sense)
 - IS-incompleteSentence (see above, but without a verb)

Commentary [C]:

- Applicable labels: alles
 - C-commentaryV (z.B.: So musst du dir das vorstellen)
 - C-commentary (z.B.: Keine Ahnung)

A.3.2. Labels for Word Tier - Second Tier

Verbs [V]:

- V-motion (z.B.: "gehen, abbiegen, ankommen")
- V-static (z.B.: "stehen, sein")
- V-perception (z.B.: "sehen, bemerken")
- V-other (z.B.: "genannt")

Perspective [P]:

- P-egozentrisch (z.B.: "Ich" fuhr)
- P-WirPerspektive(z.B.: "Wir" sind dann links abgebogen)
- P-DuPerspektive (z.B.: "Du" musst dann rechts)
- P-DuPerspektive-Passiv (z.B.: Die Kapelle kommt auf "dich" zu)
- P-neutral (z.B.: "man" geht/"der Bus" fahrt auf dem Kirchplatz herum)

Preposition [Prep]:

- Prep-mit (z.B.: "mit" zwei Türmen)
- Prep-von (z.B.: in der Mitte "des" Kreisverkehrs)
- Prep-um (z.B.: "um" dahin zu kommen)
- Prep-unter (z.B.:
- Prep-zu (z.B.: Die sind direkt "zu" sehen)
- Prep-nach (z.B.: Sieht auch mehr "nach" Altstadt aus)
- Prep-bei (z.B.: "Bei" dir sieht es vielleicht dann anders aus)

Position of landmark [Pos]:

- Pos-links (z.B.: Die Kirche mit dem runden Turm steht "links")
- Pos-rechts (z.B.: Der Baum ist "rechts" von der Kapelle)
- Pos-geradeaus (z.B.: Der Weg verläuft "geradeaus")
- Pos-entlang (z.B.: Die Straße führt am Fluss "entlang")
- Pos-gabelt (z.B.: Der Weg "gabelt" sich an der Stelle)
- Pos-nach (z.B.: "nach links, nach rechts"; in combination with a direction)

- Pos-oben (z.B.: "Oben" drauf ist ein Kreuz)
- Pos-ueber (z.B.: Die Brücke geht "über" einen Fluss)
- Pos-unten (z.B.: "Unten" ist eine größere Säule)
- Pos-unter (z.B.: "Unter" der Schale ist noch eine Säule)
- Pos-von (z.B.: "von" da gehst du dann rechts weiter)
- Pos-vor (z.B.: Du stehst "vor" den Kirchen)
- Pos-davor (z.B.: "Davor" ist ein quadratischer Platz)
- Pos-vorne (z.B.: "Vorne" sind so Feuerleitern dran)
- Pos-hinter (z.B.: Der Fluss verläuft "hinter" den Kirchen)
- Pos-hinten (z.B.: Die Kapelle steht "hinten")
- Pos-ab (z.B.: Vom Park gehen zwei Straßen "ab")
- Pos-an (z.B.: Die Treppen sind "an" der Vorderseite)
- Pos-dran (z.B.: Vorne sind Feuerleitern "dran")
- Pos-auf (z.B.: Die Skulptur steht "auf" einem runden Platz)
- Pos-darauf (z.B.: Rechts ist ein Kreuz "drauf")
- Pos-in (z.B.: "In" der Mitte ist ein See)
- Pos-drinnen (z.B.: Im Sockel ist Wasser "drin")
- Pos-draussen (z.B.: Von "draußen" kann man den See noch nicht sehen)
- Pos-neben (z.B.: Der Eisstand steht direkt "neben" dem Weg)
- Pos-zwischen (z.B.: Der Weg geht "zwischen" den Kirchen durch)
- Pos-herum (z.B.: Um den See "herum" führt ein Weg)
- Pos-durch (z.B.: Der Weg führt da "durch")
- Pos-hier (z.B.: Dann geht es "hier" weiter)
- Pos-da (z.B.: "Da" waren zwei Kirchen)
- Pos-drueben (z.B.: Der Park kommt erst "drüben" auf der anderen Seite vom Fluss)
- Pos-gegenueber (z.B.: Das ist direkt dir "gegenüber")

- Pos-um (z.B.: Es stehen sechs Laternen "um" den Brunnen)
- Pos-wo (z.B.: Da wo die Litfassssäule steht biegst du rechts ab)
- Pos-Vorderseite (z.B.: Die Treppen sind an der "Vorderseite")
- Pos-Rueckseite (z.B.: Auf der "Rückseite" war keine Tür)
- Pos-imKreis (z.B.: Der Weg führt "im Kreis")
- Pos-Seite (z.B.: Auf der rechten "Seite" der Kapelle)
- Pos-Mitte (z.B.: In der "Mitte" steht die Skulptur)
- Pos-Anfang (z.B.: Am "Anfang" von der Straße)
- Pos-Ende (z.B.: Am "Ende" dieser Allee)

Dir [Dir]:

- Dir-links (z.B.: Da gehst du nach "links")
- Dir-rechts (z.B.: Dann gehst du nach "rechts")
- Dir-andereRichtung (z.B.: Nein, das war in der "anderen Richtung")
- Dir-inRichtung (z.B.: Dann geht es "in Richtung" Fluss weiter)
- Dir-geradeaus (z.B.: Du gehst immer "geradeaus")
- Dir-entlang (z.B.: Immer weiter die Straße "entlang")
- Dir-denWegEntlang (z.B.: Es geht einfach immer "den Weg entlang")
- Dir-imKreis (z.B.: Du läufst "im Kreis")
- Dir-imViertelkreis (z.B.: Du machst einen "Viertelkreis")
- Dir-imHalbkreis (z.B.: einen "Halbkreis" um die Skulptur)
- Dir-imDreiviertelkreis (z.B.: Du läufst einen "Dreiviertelkreis" um den See)
- Dir-imUhrzeigersinn (z.B.: Der Bus fährt "im Uhrzeigersinn")
- Dir-zu (z.B.: Du kommst auf das Rathaus "zu")
- Dir-in (z.B.: Du gehst "in" den Park rein)
- Dir-vorbei (z.B.: An der Brücke gehst du "vorbei")
- Dir-um (z.B.: Die Fahrt geht "um" den See)
- Dir-herum (z.B.: Du läufst um die Skulptur "herum")

- Dir-ueber (z.B.: Du gehst nicht "über" die Brücke)
- Dir-rueber (z.B.: Du gehst da nicht "drüber")
- Dir-durch (z.B.: Du musst "durch" den Torbogen gehen)
- Dir-raus (z.B.: Dann geht es wieder aus dem Park "raus")
- Dir-rein (z.B.: Du gehst in den Park "rein")
- Dir-runter (z.B.: Du läufst die Straße "runter" bis zur nächsten Kreuzung)

Attribute Landmark [AttL] (shape, size, amount):

- AttL-beauty (z.B.: Das sieht ziemlich "hässlich" aus)
- AttL-color (z.B.: Die Häuser sind alle "gelb")
- AttL-difficulty (z.B.: Jetzt wird der Weg "schwierig")
- AttL-hedging (z.B.: Da gehts dann "irgendwie" eine S-Kurve entlang)
- AttL-height (z.B.: Die Skulptur ist so "zwei Meter hoch")
- AttL-number (z.B.: Die hat "zwei" Türme)
- AttL-others (z.B.: Die Skulptur ist so "komisch" verschlungen)
- AttL-quantity (z.B.: Da stehen "ein paar" Bäume)
- AttL-shape (z.B.: Das sieht "rund" aus wie eine Kuppel)
- AttL-size (z.B.: Ein "großer" Baum)

Distance [Dist]:

- Dist-weit (z.B.: Die liegen "weit" auseinander)
- Dist-inNaehe (z.B.: Die Kapelle war "in der Nähe" vom Park)
- Dist-definedLength (z.B.: Die Kirchen liegen)
- Dist-weiter (z.B.: Du gehst erstmal "weiter")
- Dist-von (z.B.: Die sieht man "von" weitem)
- Dist-davon (z.B.:
- Dist-bis (z.B.: Du gehst "bis" zur T-Kreuzung)
- Dist-Anfang (z.B.:
- Dist-Ende (z.B.:

Time [T]:

- T-dann (z.B.: "Dann" kommt schon das Rathaus)
- T-davor (z.B.: Die Skulptur war "vor" dem Rathaus)
- T-danach (z.B.: "Danach" geht es nach links weiter)
- T-wenn (auch causal) (z.B.: "Wenn" du den Torbogen siehst)
- T-amAnfang (z.B.: "Am Anfang" stehst du auf einer Kreuzung)
- T-amEnde (z.B.: Da ist das dann "zu Ende")
- T-irgendwann (z.B.: Da kommt "irgendwann" eine Litfasssäule)
- T-automatisch (z.B.: Dann kommst du "automatisch" darauf zu)
- T-jetzt (z.B.: Jetzt musst du abbiegen)
- T-bisJetzt (z.B.: Da war jetzt aber nirgendwo "bis jetzt" die Kapelle oder?)
- T-ueberZeitraum (z.B.: so ungefähr "dreißig Sekunden" lang geradeaus)

Others [O]:

- O-Kommentar (z.B.: "ich glaube")
- O-Versprecher (z.B.: "Skul...")
- O-Unterbrechung (If a participant interrupts the other speaker with e.g. an interjection or a question)
- O-Negation (z.B.: Du nimmst "nicht" den ersten Eingang)
- O-Frage (z.B.: "Was" kam nochmal danach?)
- O-Bestaetigung (z.B.: "ja, genau, ach ja")
- O-Wiederholung (Repetition of one or more words within a phrase)

Articles [A]: (d=definite, id=indefinite);

- Ad-maskSg (z.B.: "der" Baum)
- Ad-femSg (z.B.: "die" Laterne)
- Ad-neuSg (z.B.: "das" Fenster)
- Ad-femPl (z.B.: "die" Baeume)
- Aid-maskSg (z.B.: "ein" Brunnen)
- Aid-femSg (z.B.: "eine" Litfasssaeule)

A.4. Labels for Referent Tier - Third Tier

Landmark Reference [L]:

- L-... (plus any of the terms below)
- sagaland, rundfahrt, bus, busstop, 5stationen, lms-sg_unbestimmbar, objekt-sg_unbestimmbar, lm1_skulptur, lm1_skulptur-bauteile, lm1_platz, lm1_kreisverkehr, lm1_sockel, lm1_sockel-abgrenzung, lm2_rathaus, lm2_rathaus-platz, lm2_rathaus-quadratVorTuer, lm2_rathaus-bauteile, lm2_flachdach, lm2_treppe-pl, lm2_treppe-sg-l, lm2_treppe-sg-r, lm2_treppe-sg_unbestimmbar, lm2_HHuLFuRF-tuer-pl, lm2_HHuLFuRF-fen-pl, lm2_HH, lm2_HH-vordach, lm2_HH-tuer, lm2_HH-tuer-rahmen, lm2_HH-fen-pl, lm2_HH-fen-sg-eg-1, lm2_HH-fen-sg-eg-2, lm2_HH-fen-sg-eg-3, lm2_HH-fen-sg-eg-4, lm2_HH-fen-sg-1og-1, lm2_HH-fen-sg-1og-2, lm2_HH-fen-sg-1og-3, lm2_HH-fen-sg-1og-4, lm2_HH-fen-sg-1og-5, lm2_HH-fen-sg-2og-1, lm2_HH-fen-sg-2og-2, lm2_HH-fen-sg-2og-3, lm2_HH-fen-sg-2og-4, lm2_HH-fen-sg-2og-5, lm2_HH-fen-sg_unbestimmbar, lm2_LFuRF-pl, lm2_LFoRF-sg, lm2_LFuRF-pl-vorderseite, lm2_LFuRF-tuer-pl-v, lm2_LF, lm2_LF-vorderseite, lm2_LF-tuer-pl, lm2_LF-tuer-sg-r, lm2_LF-tuer-sg-v, lm2_LF-fen-pl, lm2_LF-fen-sg-r-eg-1, lm2_LF-fen-sg-r-eg-2, lm2_LF-fen-sg-r-eg-3, lm2_LF-fen-sg-r-eg-4, lm2_LF-fen-sg-r-1og-1, lm2_LF-fen-sg-r-1og-2, lm2_LF-fen-sg-r-1og-3, lm2_LF-fen-sg-r-1og-4, lm2_LF-fen-sg-r-1og-5, lm2_LF-fen-sg-r-2og-1, lm2_LF-fen-sg-r-2og-2, lm2_LF-fen-sg-r-2og-3, lm2_LF-fen-sg-r-2og-4, lm2_LF-fen-sg-r-2og-5, lm2_LF-fen-sg-v-eg-1, lm2_LF-fen-sg-v-eg-2, lm2_LF-fen-sg-v-1og-1, lm2_LF-fen-sg-v-1og-2, lm2_LF-fen-sg-v-2og-1, lm2_LF-fen-sg-l-eg-1, lm2_LF-fen-sg-l-eg-2, lm2_LF-fen-sg-l-eg-3, lm2_LF-fen-sg-l-eg-4, lm2_LF-fen-sg-l-eg-5, lm2_LF-fen-sg-l-eg-6, lm2_LF-fen-sg-l-eg-7, lm2_LF-fen-sg-l-eg-8, lm2_LF-fen-sg-l-1og-1, lm2_LF-fen-sg-l-1og-2, lm2_LF-fen-sg-l-1og-3, lm2_LF-fen-sg-l-1og-4, lm2_LF-fen-sg-l-1og-5, lm2_LF-fen-sg-l-1og-6, lm2_LF-fen-sg-l-1og-7, lm2_LF-fen-sg-l-1og-8, lm2_LF-fen-sg-l-2og-1, lm2_LF-fen-sg-l-2og-2, lm2_LF-fen-sg-l-2og-3, lm2_LF-fen-sg-l-2og-4, lm2_LF-fen-sg-l-2og-5, lm2_LF-fen-sg-l-2og-6, lm2_LF-fen-sg-l-2og-7, lm2_LF-fen-sg-l-2og-8, lm2_LF-fen-sg_unbestimmbar, lm2_RF, lm2_RF-vorderseite, lm2_RF-tuer-pl, lm2_RF-tuer-sg-l, lm2_RF-tuer-sg-v, lm2_RF-fen-pl, lm2_RF-fen-sg-l-eg-1, lm2_RF-fen-sg-l-eg-2, lm2_RF-fen-sg-l-eg-3, lm2_RF-fen-sg-l-eg-4, lm2_RF-fen-sg-l-1og-1, lm2_RF-fen-sg-l-1og-2, lm2_RF-fen-sg-l-1og-3, lm2_RF-fen-sg-l-1og-4, lm2_RF-fen-sg-l-1og-5, lm2_RF-fen-sg-l-2og-1, lm2_RF-fen-sg-l-2og-2, lm2_RF-fen-sg-l-2og-3, lm2_RF-fen-sg-l-2og-4, lm2_RF-fen-sg-l-2og-5, lm2_RF-fen-sg-v-eg-1, lm2_RF-fen-sg-v-eg-2, lm2_RF-fen-sg-v-1og-1, lm2_RF-fen-sg-v-1og-2, lm2_RF-fen-sg-v-2og-1, lm2_RF-fen-sg-r-eg-1, lm2_RF-fen-sg-r-eg-2, lm2_RF-fen-sg-r-eg-3, lm2_RF-fen-sg-r-eg-4,

lm2_RF-fen-sg-r-eg-5, lm2_RF-fen-sg-r-eg-6, lm2_RF-fen-sg-r-eg-7,
 lm2_RF-fen-sg-r-eg-8, lm2_RF-fen-sg-r-1og-1, lm2_RF-fen-sg-r-1og-2,
 lm2_RF-fen-sg-r-1og-3, lm2_RF-fen-sg-r-1og-4, lm2_RF-fen-sg-r-1og-5,
 lm2_RF-fen-sg-r-1og-6, lm2_RF-fen-sg-r-1og-7, lm2_RF-fen-sg-r-1og-8,
 lm2_RF-fen-sg-r-2og-1, lm2_RF-fen-sg-r-2og-2, lm2_RF-fen-sg-r-2og-3,
 lm2_RF-fen-sg-r-2og-4, lm2_RF-fen-sg-r-2og-5, lm2_RF-fen-sg-r-2og-6,
 lm2_RF-fen-sg-r-2og-7, lm2_RF-fen-sg-r-2og-8, lm2_RF-fen-sg_unbestimmbar,
 lm2_fen-pl, lm2_fen-sg_unbestimmbar, lm2_baum-LBkl-pl,
 lm2_baum-LBkl-sg-l, lm2_baum-LBkl-sg-r, lm2_baum-LBkl-sg_unbestimmbar,
 lm3_kirchplatz, lm3_kirchen, lm3_wohnsiedlungUmKirchplatz,
 lm3_RTuD-Tuer-pl, lm3_RTuD-fen-pl, lm3_RTuD-dach-pl,
 lm3_RTuD-kreuz-pl, lm3_RTuD-bauteile, lm3_RT, lm3_RT-bauteile,
 lm3_RT-moschee, lm3_RT-rundturm, lm3_RT-rundturm-fen-pl, lm3_RT-fen-pl,
 lm3_RT-dach-pl, lm3_RT-kuppeldach, lm3_RT-kuppeldach-kreuz,
 lm3_RT-tuer-sg-v, lm3_RT-tuer-sg-h, lm3_RT-tuer-pl-vUh,
 lm3_RT-langHuQuerH-dach-pl, lm3_RT-langH, lm3_RT-langH-dach-sg,
 lm3_RT-langH-fen-pl, lm3_RT-langH-fen-sg-l-1, lm3_RT-langH-fen-sg-l-2,
 lm3_RT-langH-fen-sg-l-3, lm3_RT-langH-fen-sg-r-1, lm3_RT-langH-fen-sg-r-2,
 lm3_RT-langH-fen-sg-r-3, lm3_RT-langH-fen-pl-v-lUr, lm3_RT-langH-fen-sg-v-l,
 lm3_RT-langH-fen-sg-v-r, lm3_RT-langH-fen-sg_unbestimmbar,
 lm3_RT-querH, lm3_RT-querH-dach-sg, lm3_RT-querH-fen-pl,
 lm3_RT-querH-fen-sg-l-1, lm3_RT-querH-fen-sg-l-2, lm3_RT-querH-fen-sg-l-3,
 lm3_RT-querH-fen-sg-l-4, lm3_RT-querH-fen-sg-r-1, lm3_RT-querH-fen-sg-r-2,
 lm3_RT-querH-fen-sg-r-3, lm3_RT-querH-fen-sg-r-4,
 lm3_RT-querH-fen-pl-v-lUr, lm3_RT-querH-fen-sg-v-l,
 lm3_RT-querH-fen-sg-v-r, lm3_RT-querH-fen-sg_unbestimmbar, lm3_DT,
 lm3_DT-bauteile, lm3_DT-langH, lm3_DT-langH-dach-sg,
 lm3_DT-langH-dach-sg-giebel, lm3_DT-tuer-sg-v, lm3_DT-tuer-sg-h,
 lm3_DT-tuer-pl-vUh, lm3_DT-rundfenster, lm3_DT-fen-pl, lm3_DT-fen-sg-l-1,
 lm3_DT-fen-sg-l-2, lm3_DT-fen-sg-l-3, lm3_DT-fen-sg-l-4, lm3_DT-fen-sg-l-5,
 lm3_DT-fen-sg-r-1, lm3_DT-fen-sg-r-2, lm3_DT-fen-sg-r-3, lm3_DT-fen-sg-r-4,
 lm3_DT-fen-sg-r-5, lm3_DT-fen-pl-v-lUr, lm3_DT-fen-sg-v-l,
 lm3_DT-fen-sg-v-r, lm3_DT-fen-sg_unbestimmbar, lm3_DT-turm-pl-lUr,
 lm3_DT-turm-sg-l, lm3_DT-turm-sg-r, lm3_DT-turm-dach-sg-l,
 lm3_DT-turm-dach-sg-r, lm3_DT-turm-dach-pl, lm3_DT-turm-kreuz-sg-r,
 lm3_DT-turm-fen-pl, lm3_DT-turm-l-fen-pl, lm3_DT-turm-l-fen-sg-v,
 lm3_DT-turm-l-fen-sg-h, lm3_DT-turm-l-fen-sg-l, lm3_DT-turm-l-fen-sg-r,
 lm3_DT-turm-l-fen-sg_unbestimmbar, lm3_DT-turm-r-fen-pl,
 lm3_DT-turm-r-fen-sg-v, lm3_DT-turm-r-fen-sg-h, lm3_DT-turm-r-fen-sg-l,
 lm3_DT-turm-r-fen-sg-r, lm3_DT-turm-r-fen-sg_unbestimmbar, lm4_kapelle,
 lm4_kapelle-bauteile, lm4_turm, lm4_turm-dach, lm4_turm-uhr, lm4_halle,
 lm4_halle-dach, lm4_tuer, lm4_fen-pl, lm4_fen-sg-l-1, lm4_fen-sg-l-2,
 lm4_fen-sg-l-3, lm4_fen-sg-r-1, lm4_fen-sg-r-2, lm4_fen-sg-r-3, lm4_fen-sg-v-l,
 lm4_fen-sg-v-r, lm4_fen-sg_unbestimmbar, lm4_grundstueck,

lm4_laterne-pl-rund-lUr, lm4_laterne-sg-rund-l, lm4_laterne-sg-rund-r,
lm4_hecke-pl, lm4_hecke-sg-v-l, lm4_hecke-sg-v-r, lm4_hecke-sg-l,
lm4_hecke-sg-r, lm4_LBgr-baum, lm4_LBgr-baum-krone,
lm4_LBgr-baum-stamm, lm5_brunnen, lm5_brunnen-bauteile,
lm5_kreisverkehr, lm5_sockel, lm5_sockel-abgrenzung, lm5_wassergraben,
lm5_inneresPodest, lm5_brunnen-schale-pl, lm5_brunnen-schale-sg-gr,
lm5_brunnen-schale-sg-kl, lm5_brunnen-schale-sg_unbestimmbar,
lm5_brunnen-saeule-pl, lm5_brunnen-saeule-sg-gr, lm5_brunnen-saeule-sg-kl,
lm5_brunnen-saeule-sg_unbestimmbar,
geb_mitEingangstreppe-zuAufKirchplatz, eingangstreppe-zuAufKirchplatz,
kapelle-naeheBrunnen, geb_bruecke, geb_mitMansarddach-zwParkUKapelle-r,
geb_sg_unbestimmbar, geb_01-EFH-pl-zuAufSkulptur,
geb_02-EFH-pl-umKreisverkehr, geb_03-EFH-pl-wegVonSkulptur,
geb_04-EFH-pl-zuAufKirchplatz, geb_05-MFH-pl-umKirchplatz,
geb_06-MFH-pl-hinterFlussUParallelZuPark,
geb_07-MFH-pl-parallelZuParkeingang, geb_08-B-sg-inPark,
geb_09-MFH-pl-parallelZuParkausgang,
geb_10-MFH-pl-geradeausUrechtsHinterPark, geb_11-EFH-B-pl-linksHinterPark,
geb_12-RH-pl-zuAufKapelle, geb_13-MFH-pl-hinterKapelle,
geb_14-RH-pl-zuAufBrunnen, geb_15-RH-pl-umBrunnen,
geb_20_siedlung-skulptur, geb_21_siedlung-kapelle, geb_pl_unbestimmbar,
geb_dach-sg_unbestimmbar, geb_dach-pl_unbestimmbar,
str_01-geschlaengeltZuAufSkulptur, str_02-geschlaengeltWegVonSkulptur,
str_03-durchBaumallee, str_04-vorRathaus, str_05-nebenRathaus,
str_06-geschlaengeltZuAufKirchplatz, str_07-wegVonKirchplatz,
str_08-parallelZuPark, str_09-parkweg-eingang, str_10-parkweg-rundgang,
str_101-parkweg-rundweg-1, str_102-parkweg-rundweg-2,
str_103-parkweg-rundweg-3, str_104-parkweg-rundweg-4,
str_11-parkweg-ausgang, str_12-rausAusPark, str_13-zuAufKapelle,
str_14-parallelZuKapelle, str_15-zuAufBrunnen, str_unbestimmbar,
str_parkweg_unbestimmbar, strKr_01-Kr-zuAufSkulptur,
strKr_02-Kr-vorBaumallee, strKr_03-TK-vorRathaus, strKr_04-TK-vorFluss,
strKr_05-Kr-nebenRathaus, strKr_06-TK-vorKirchplatz-1,
strKr_07-TK-vorKirchplatz-2, strKr_08-TK-hinterKirchplatz,
strKr_09-TK-zumPark-1, strKr_10-TK-zumPark-2, strKr_11-TK-park-1,
strKr_12-TK-park-2, strKr_13-TK-park-3, strKr_14-TK-park-4,
strKr_15-Kr-rausAusPark, strKr_16-Kr-hinterPark,
strKr_17-Kr-zwParkUKapelle, strKr_18-TK-vorKapelle,
strKr_19-Kr-hinterKapelle, strKr_20-Kr-zuAufBrunnen,
strKr_Kr_unbestimmbar, strKr_TK_unbestimmbar, strKr_unbestimmbar,
park, park_eingang-torbogen, park_ausgang-naeheEisstand,
park_zugang-rechtsVonBungalow, park_zugang-naeheKirchplatz, park_hecke,
park_hecke-parallelZuFluss, park_hecke-parallelZuSiedlung,
park_heckenecke-kirchplatz, park_heckenecke-siedlung, park_bank-pl,

park_bank-sg-1, park_bank-sg-2, park_bank-sg-3, park_bank-sg-4,
 park_bank-sg_unbestimmbar, see, see_seegras, berge, bergmitbaeumen,
 bruecke-naeheKirchplatz, bruecke-naeheRathaus, bruecke-naeheSkulptur,
 bruecke_unbestimmbar, fluss, baumallee-LBkl-pl, baumallee-baum-LBkl-pl,
 baumallee-baum-LBkl-sg-r-1, baumallee-baum-LBkl-sg-r-2,
 baumallee-baum-LBkl-sg-r-3, baumallee-baum-LBkl-sg-r-4,
 baumallee-baum-LBkl-sg-r-5, baumallee-baum-LBkl-sg-l-1,
 baumallee-baum-LBkl-sg-l-2, baumallee-baum-LBkl-sg-l-3,
 baumallee-baum-LBkl-sg-l-4, baumallee-baum-LBkl-sg-l-5,
 baumallee-baum-LBkl-sg_unbestimmbar, baum_o1-NBklkS-sg-naeheSkulptur,
 baum_o2-LBkl-pl-parallelZuFluss, baum_o21-LBkl-sg-parallelZuFluss-1,
 baum_o22-LBkl-sg-parallelZuFluss-2, baum_o23-LBkl-sg-parallelZuFluss-3,
 baum_o24-LBkl-sg-parallelZuFluss-4, baum_o25-LBkl-sg-parallelZuFluss-5,
 baum_o3-LBkl-NBklkS-Bs-pl-vorKirchplatz,
 baum_o4-NBklkS-NBkllS-NBgr-pl-vorBergen,
 baum_o5-LBkl-Bs-NBklkS-pl-parallelZuPark,
 baum_o6-LBgr-LBkl-pl-aufHuegelInPark, baum_o7-inPark-pl,
 baum_o71-NBkllS-pl-inPark-1, baum_o72-NBgr-NBkllS-pl-inPark-2,
 baum_o73-NBklkS-pl-inPark-3, baum_o74-NBklkS-pl-inPark-4,
 baum_o75-NBgr-pl-inPark-5, baum_o76-NBkllS-pl-inPark-6,
 baum_o77-NBgr-NBkllS-pl-inPark-7, baum_o8-NBgr-NBkllS-NBklkS-pl-aufBerg,
 baum_o9-NBklkS-pl-vorRHVorBrunnen,
 baum_o91-NBklkS-sg-vorRHVorBrunnen-r,
 baum_o92-NBklkS-sg-vorRHVorBrunnen-l, baum_10-LBkl-pl-vorBrunnen,
 baum_101-LBkl-pl-vorBrunnen-l, baum_102-LBkl-pl-vorBrunnen-r-1,
 baum_103-LBkl-pl-vorBrunnen-r-2, baum_sg_unbestimmbar,
 baum_pl_unbestimmbar, liffasssaeule, eisstand, muelleimer-sg-park,
 muelleimer-pl-umBrunnen, muelleimer-sg_unbestimmbar,
 laterne-sg_ueberhaengend, laterne-pl_ueberhaengend, laterne-sg-rund,
 laterne-pl-rund, laterne-sg_unbestimmbar, laterne-pl_unbestimmbar, rasen

A.5. Labels for MoreToRef Tier - Fourth Tier

- Landmark Reference [L] (see above)
- Properties (of an Reference [L]):
 - Prop.... (plus any of the terms below)
 - hoehe-0,5Meter, rot, ueberlappend, hoehe-3,0Meter, offen, grau, schief, bogenfoermig, flach, orange, gelb, eckig, blau, kurvig, eng, spitz-winkel, dreigeschossig, auffallend, gleicheFarbe, vageMengenangabe, haesslich, steigerung, alles, abschwaechung, zwei, eins, fuenf, jeweils, unterschiedlich, aehnlich, drei, symmetrisch, gross, rund, spitz, t-foermig, breit, mathematisch, liegende-acht, verbunden, gerade, relativ, klein, neubau,

s-foermig, neunzig, winkel, braun, typisch, gotisch, normal, hinauf,
quadratisch, getrennt, dick, halbkugel, umschlossen, verziert, neu, komisch,
schwarz, vier, Uhrzeit, umgedreht, y-foermig, gruen, hinten, schwierig, neun,
fuenfzehn, dreieeckig, beschreibung, schwer, sechs, u-foermig, parallel, kurz,
bunt