ISeC Technical Report: 12-17-2005

Concept Description Language

Specifications of CDL.nl

Revised
Dec. 22, 2005

Meiying ZHU, Hiroshi UCHIDA, Toshio YOKOI

ISeC

Contents

1. Concept Definition Dictionary (CDD.nl)

Concept.nl　自然言語概念

As-Expression　表現で捉えた自然言語概念

Entity　実体

Relation　関係

Attribute　属性

As-Object　対象で捉えた自然言語概念

Thing　モノ

Event　コト

Concept.nl As-Expression　表現で捉えた自然言語概念

Entity　実体

ElementalEntity　要素実体

NominalEntity　もの

AgentThing　主体となりうるもの

ObjectThing　対象となりうるもの

InstrumentalThing　道具となりうるもの

Place　場所となりうるもの

State　状態となりうるもの

Time　時間となりうるもの

PronominalThing　代名物

VerbalEntity　こと

Do　する

Occur　なる

Be　ある（状態動詞・属性動詞による動詞述語、形容詞述語、名詞述語）

NominalModifier

NominalQuantifier　限定詞・決定詞・数詞

NominalQualifier=Adjective　形容詞

VerbalModifier

VerbalQuantifier　数量格

VervalQualifier=Adverb　副詞

CompositeEntity　複合実体

Event　事象

DoEvent　する事象

OccurEvent　なる事象

BeEvent　ある事象

Situation　状況　（複数事象による概念）

RELATION　関係

ElementalRelation　要素関係

IntraEventRelation　事象内関係=CaseRelation　格関係

［QuasiAgent　準主体］

Agt（agent:動作主）

Aoj（thing with attribute：属性主）

Coag（co-agent：並行動作主）
Cao（co-thing with attribute：並行属性主）
Ptn（partner：相手）
［QuasiObject　準客体］
Ben（beneficiary：受益者）
Cob（affected co-thing：並行対象）
Obj（affected thing：対象）
Opl（affected place：場所対象）
［QuasiInstrument　準方法］
Ins（instrument：道具）
Met（method or means：方法）
Man（manner：仕方）
［QuasiPlace　準場所］
Plc（place：場所）
Plf（initial place：起点）
Plt（final place：終点）
Scn（scene：場面）
［QuasiState　準状態］
Gol（goal, final state：終状態）
Src（source, initial state：始状態）
Via（intermediate place or state：経由）
［QuasiTime　準時間］
Dur（duration：期間）
Tim（time：時間）
Tmf（initial time：始時間）
Tmt（final time：終時間）
InterEntityRelation　実体間関係
And（conjunction：連結）
Con（condition：条件）
Coo（co-occurrence：同起）
Equ （equivalent：同義）
Fmt（range/from-to：範囲）
Frm（origin：起点･起源）
Icl （included/a kind of：上位）
Iof （an instance of：上位クラス）
Or（disjunction, alternative：選択）

Pur（purpose or objective：目的）

Rsn（reason：理由）

Seq（sequence：先行）

To（destination：目的地）

Restriction&ModificationRelation　限定･修飾関係

Bas（basis for expressing a standard：基準）

Cnt（content, namely ：内容）

Man（manner：仕方）

Mod（modification：限定）

Nam（name：名前）

Per（proportion, rate or distribution：単位）

Pof（part-of：部分）

Qua（quantity：量）

CompositeRelation　複合関係

Pos（possessor：所有者）

Attribute　属性

AttributeOfEntity

AttributeOfNominalEntity

AttributeOFVervalEntity

AttributeOfEvent

Aspectuality　アスペクト性

Temporality　時間性

Polarity　極性（真か偽か、成立か不成立か、肯定的か否定的か）

Modality　モダリティ

DiscourseModality　間事象モダリティ

SentenseModality　事象モダリティ

AttributeOfSituation

AttributeOfRelation

Concept.nl As-Object　対象で捉えた自然言語概念

Thing　モノ

ConcreteThing　具体物

Human　人
Organization　組織
Facilities　施設
Area　地域
Nature　自然界
Animal　動物
Plant　植物
NaturalSubstance　自然物
ArtificialSubstance　人工物

AbstractThing　抽象物

・

Event　コト

State　状態

・

Action　行動

・

表現対象として捉えた自然言語概念、さらに、その捉え方として次の 3 つが考えられる。

① モノ - コトの観点、事物 - 事象の観点
② 具体 - 抽象の観点
③ 世界を構成するものの観点、例えば、自然 - 人間 - 文化、あるいは、自然 - 人間 - 社会の観点

したがって、トップオントロジーとして、事物 - 事象、具体 - 抽象、自然 - 人間 - 社会・文化の 12 の組み合わせを想定しておく。また、表現として捉える自然言語概念（Concept.nl-As-Expression）との対応から、事物 - 事象の観点を最上位に置く。

2. Entities

3. Relations

In the definitions of relations, #1 is used to refer focused entities (in from-node), and #2 refers partner entities (in to-node) of each relation.
For example, as in {<Do> -- agt → <NominalEntity>} (which means <NominalEntity> is agt of <Do>), Do is the focused entity, NominalEntity is the partner entity.

The format of "<…> -- rel -> <…>" used in the CDL expressions is temporary. Description format of CDL expression will be finally fixed and reported in the Board meeting at Jan 27 2006.

3.1 IntraEventRelation(CaseRelation) 事象内関係

3.1.1 QuasiAgent 準主体

- **Agent (agt)**

agt indicates a **nominal entity** in focus that initiates an **action**

<#1:Do or Action> **-- agt** → <#2:NominalEntity>
Where,
#1 is an action, and
#2 is a nominal entity that initiates the action or is thought of as having a direct role in making the action happen.

Differences between related relations

- An agent is different from **cag** in that an agent initiates the action, whereas a co-agent initiates a different, accompanied action.
- An agent is different from **ptn** in that an agent is the focused initiator of the action, whereas a partner is a non-focused initiator.
- An agent is different from **aoj** in that an agent initiates an action, whereas **aoj** indicates a thing that is in a state. A state is expressed by a UW that belongs to <Be>.

Examples

<John broke the door>
↓
{<broke> -- agt → <John>, -- obj → <the door>}

<A computer translated this document>
↓
{<translated> -- agt → <a computer>, -- obj → <this document>}

- **Nominal entity with attribute (aoj)**

aoj indicates a **nominal thing** that is in a **state** or has an **attribute**

<#1:NominalEntity or AdjectivePredicate> **-- aoj** → <#2:NominalEntity>
Where,
#1 is an attribute of #2, and
#2 is a nominal entity that has the attribute.
<#1:StateVerb or NominalPredicate> **-- aoj** → <#2:NominalEntity>
Where,
#1 expresses a state, and
#2 is a nominal entity that is in the state.

Differences between related relations

- A thing with an attribute is different from **mod** in that **mod** gives some restriction of the concept in focus, whereas **aoj** indicates a thing of a state or characteristic.
- A thing with an attribute is different from **ben** in that a beneficiary is quite independent from a focused event or state. This event or state can be considered as exerting a good or bad influence on the beneficiary, whereas **aoj** indicates a thing that has a direct relation with the event or state, the event or state can be considered as describing a state or characteristic about the thing.
- A thing with an attribute is different from **obj** in that **obj** indicates a thing which is directly affected by an action or phenomenon, whereas, **aoj** indicates a thing in a state.

Examples

<Leaves are green>
↓
{<green> -- aoj → <leaf>}

<John is a teacher>
↓
{<teacher> -- aoj → <John>}

<John knows the news>
↓
{<know> -- aoj → <John>, -- obj → <the news>}

- **Co-agent (cag)**

cag indicates a **nominal entity** not in focus that initiates an **implicit action** that is done in parallel

<#1:Do or Action> **-- cag** → <#2:NominalEntity>
Where,
#1 is an action, and
#2 is a nominal entity that is thought of as initiating an implicit action that is independent of, but accompanies, the agent's action.

Differences between related relations

– A co-agent is different from **agt** in that differing independent actions occur for an agent and a co-agent. Moreover, an agent and its action are in focus, while a co-agent and its action are not in focus.
– A co-agent is different from the **ptn** in that the co-agent initiates an action that is independent of an agent's action, whereas a partner initiates the same action together with an agent.

Examples

<John walks with Mary>
↓
{<walk> -- cag → <Mary>, -- agt → <John>}

<John lives with his aunt>
↓
{<live> -- cag → <aunt>, -- agt → <John>}

- **Co-nominal entity with attribute (cao)**

cao indicates a **nominal entity** not in focus that is in a parallel **state**

<#1:StateVerb or NominalPredicate> **-- cao** → <#2:NominalEntity>
Where,
#1 expresses a state of **aoj**, and
#2 is a nominal entity that is associated with an implicit state which is independent of, but accompanies, the state #1.

Differences between related relations

– A co-thing with an attribute is different from **aoj** in that there is a different, independent state for the thing with an attribute and a co-thing with an attribute, respectively.

Examples <John is at home with Mary>
↓
{<is(=exist)> -- cao → <Mary>, -- aoj → <John>, -- plc → <Home>}

- **Partner (ptn)**

agt indicates an indispensable non-focused initiator (**nominal entity**) of an **action**

<#1:Do> **-- ptn** → <#2:NominalEntity>

Where,

#1 is a collaborative event initiated by both the agent and the partner, and

#2 is a nominal entity that is thought of as having a direct role in making an indispensable part of the collaborative event happen and is seen as not being in focus (as compared to the agent).

Differences between related relations

– A partner is different from **agt** in that an agent and its event are in focus, while a partner and its event are not in focus.

– A partner is different from **cag** in that a co-agent initiates an event that is independent of an agent's event, whereas a partner initiates the same event together with an agent.

Examples

<to share the food with the poor>
↓
{<share> -- ptn → <the poor>, -- obj → <the food>}

<England fought against Germany in the First World War>
↓
{<fought> -- ptn → <Germany>, -- agt → <English>, -- tim → <the First World War>}

3.1.2 QuasiObject 準客体

- **Beneficiary (ben)**

ben indicates an indirectly related beneficiary or victim of an event

<#1:VerbalEntity> **-- ben** → <#2:NominalEntity>
Where,
#1 is an event, and
#2 is a nominal entity that is thought of as being indirectly affected by the event, as the beneficiary or victim.

Differences between related relations

– A beneficiary is different from **aoj** in that **aoj** has a direct relation with the focused state or event and the focused state or event can be considered as describing the thing of **aoj**; Whereas a beneficiary is quite independent from a focused event or state, but this event or state can be considered as exerting a good or bad influence on the beneficiary.

Examples <Smoking is not good for your health>
↓
{<not good> -- ben → <your health>, -- aoj → <smoking>}

<soldiers fighting for their country>
↓
{<fight> -- ben → <their country>, -- agt → <soldiers>}

- **Affected co-nominal entity (cob)**

cob indicates a **nominal entity** that is directly affected by an **implicit event** done in parallel or an **implicit state** in parallel

<#1:VerbalEntity> **-- cob** → <#2:NominalEntity>

Where,

#1 is an event, and

#2 is a nominal entity that is thought of as directly affected by an implicit event done in parallel.

Differences between related relations

– A co-object is different from **obj** in that the **obj** is in focus, whereas **cob** is related to a second, non-focused implicit event or state

Examples <John was injured in the accident with his friends>

↓

{<injured> -- cob → <his friend>, -- obj → <John>, -- scn → <the accident>}

- **Affected nominal entity (obj)**

obj indicates a **nominal entity** in focus that is directly affected by an **event**

<#1:VerbalEntity> **-- obj** → <#2:NominalEntity>
Where,
#1 is an event, and
#2 is a nominal entity that is thought of as directly affected by the event.

Differences between related relations

– An affected thing is different from **cob** in that **obj** is in focus, whereas **cob** is related to a second, non-focused implicit event or state.

Examples

<the table moved>
↓
{<moved> -- obj → <the table>}

<The tree produces big fruit>
↓
{<produce> -- obj → <big fruit>, -- agt → <the tree>}

<I know the news>
↓
{<know> -- obj → <the news>, -- agt → <I>}

- **Affected place (opl)**

opl indicates a **place** in focus affected by an **event**

<#1:Do or Occur> **-- opl** → <#2:NominalEntity>
Where,
#1 is either an action or a phenomenon, and
#2 is a place or a nominal entity defining a place that is seen as being affected by the event.

Differences between related relations

– An affected place is different from **obj** and **cob** in that what is affected by the event is a place rather than other kinds of things.
– An affected place is different from **plc** in that an affected place is directly by the event, while the physical and logical place (**plc**) defines the environment in which the event happens.

Examples <to cut the cake in the middle>
↓
{<cut> -- opl → <the middle>, -- obj → <the cake>}

3.1.3 QuasiInstrument 準方法

- **Instrument (ins)**

ins indicates an **instrument** to carry out an **action**

<#1:Do> **-- ins** → <#2:ConcreteEntity>
Where,
#1 is an action, and
#2 is a concrete nominal entity that is used in order to make the action happen.

Difference between related relations

– An instrument is different from **man** in that **man** describes an event as a whole, whereas **ins** characterizes one of the components of the event: the use of the instrument. And, a manner is an abstract thing whereas an instrument is a concrete thing.
– An instrument is different from **met** in that **met** is used for abstract things (abstract means or methods), whereas **ins** is used for concrete things.

Examples <to write with a pencil>
↓
{<write> -- ins → <a pencil>}

- **Method or means (met)**

Met indicates an **means** to carry out an **action**

<#1:Do> **-- met** → <#2:AbstractEntity or Do>
Where,
#1 is an action, and
#2 is an abstract nominal entity or an action that specifies the method or steps carried out in order to make the action happen.

Differences between related relations

– A method or means is different from **man** in that **man** describes an event as a whole, whereas **met** characterizes the component steps or procedures of an action.
– A method or means is different from **ins** in that **met** is used for abstract things (abstract means or methods), whereas **ins** is used for concrete things

Examples

<to solve this problem using … algorithm>
↓
{<solve> -- met → <…algorithm>, -- obj → <this problem>}

<to separate the cake by cutting>
↓
{<separate> -- met → <cut>, -- obj → <the cake>}

3.1.4 QuasiState 準状態

- **Goal, final state (gol)**

gol indicates the **final state** of the object or a nominal entity finally associated with the object of an event

<#1:VerbalEntity> **-- gol** → <#2:NominalEntity or AdjectivePredicate>
Where,
#1 is an event, and
#2 is a state describing the **obj** at the end of the event, or a nominal entity that is associated with the **obj** at the end of the event.

Differences between related relations

– A final state is different from **tmf** and **plf** in that **gol** describes qualitative characteristics and not time nor place related to an event.

Examples

<He became a dentist>
↓
{<became> -- gol → <a dentist>, -- obj → <he>}

<He gave me a book>
↓
{< gave> -- gol → <me>, -- agt → <he>, -- obj → <a book>}

- **Source, initial state (src)**

src indicates the **initial state** of the object or a nominal entity initially associated with the object of an event

<#1:VerbalEntity> **-- src** → <#2:NominalEntity or AdjectivePredicate>

Where,

#1 is an event, and

#2 is a state describing the **obj** at the beginning of the event, or a nominal entity that is associated with the **obj** at the beginning of the event.

Differences between related relations

– An initial state is different from **tmf** and **plf** in that src describes qualitative characteristics of the object and not time or place of an event.

– An initial state is different from **gol** in that **gol** describes the characteristics of the object at the final state of the event.

Examples

<The lights changed from green to red>

↓

{<changed> -- src → <green>, -- gol → <red>, -- obj → <the rights>}

<I withdrew my hands from the stove>

↓

{<withdrew> -- src → <the stove>, -- obj → <my hands>, -- agt → <I>}

- **Intermediate place or state (via)**

via indicates an intermediate **place** or **state** of an event

<#1:Do or Occur> **-- via** → <#2:NominalEntity>
Where,
#1 is an action or a phenomenon, and
#2 a place or state describing the **obj** at some time in the middle of the action/phenomenon, or a nominal entity that describes a place or state that the **obj** passed by or through during the action/phenomenon.

Differences between related relations

– An intermediate place or state is different from **src**, **plf** and **tmf** in that these all refer to the beginning of an event, whereas **via** describes the middle of an event.
– An intermediate place or state is different from **gol**, **plt** and **tmt** in that these all refer to the end of an event, whereas **via** describes the middle of an event

Examples

<to go to Geneva via Paris>
↓
{<go> -- via → <Paris>, -- gol → <Geneva>}

<to drive by way of the tunnel>
↓
{<drive> -- via → <the tunnel>}

3.1.5 QuasiPlace 準場所

- **Place (plc)**

plc indicates a **place** where an event happens, or a state is true, or a nominal entity exists

<#1:NominalEntity or VerbalEntity> **-- plc** → <#2:NominalEntity>
Where,
#1 is a nominal entity or an event, and
#2 is a place or a nominal entity understood as a place.

Differences between related relations

- A place is different from **plf** and **plt** or **src** and **go**l in that **plc** describes a place with respect to an event as a whole, whereas these other relations describe the position with respect to parts of an event.
- A place is different from **opl** in that **plc** is not seen as being affected by an event but merely as a reference point for characterizing it, whereas **opl** is seen as being affected

Examples

<to study in a university>
↓
{<study> -- plc → <a university>}

<It's warm in the room>
↓
{<warm> -- plc → <this room>}

<a city in the north>
↓
{<city> -- plc → <the north>}

- **Initial place (plf)**

plf indicates a **place** where an event begins, or a state becomes true

<#1:NominalEntity or VerbalEntity> **-- plf** → <#2:NominalEntity>
Where,
#1 is a nominal entity or an event, and
#2 a place or a nominal entity understood as a place.

Differences between related relations

- An initial place is different from **plc** in that **plc** describes events or states taken as a whole, whereas **plf** describes only the initial part of an event or state.
- An initial place is different from **plt** in that **plt** describes the final part of an event or state, whereas **plf** describes the initial part of an event or state.
- An initial place is different from **src** in that **plf** describes the place where the event began, whereas **src** describes the initial state of the object.

Examples

<to travel from Tokyo>
↓
{<travel> -- plf → <Tokyo>}

<It's red from here to there>
↓
{<red> -- plf → <here>, -- plt → <there>, -- aoj → <it>}

- **Final place (plt)**

plt indicates a **place** where an event ends, or a state becomes false

<#1:NominalEntity or VerbalEntity> **-- plt**→ <#2:NominalEntity>
Where,
#1 is a nominal entity or an event, and
#2 is a place or a nominal entity understood as a place.

Differences between related relations

- A final place is different from **plc** in that **plc** describes events or states taken as a whole, whereas **plt** describes only the final part of an event.
- A final place is different from **plf** in that **plt** describes the final part of an event or state, whereas **plf** describes the initial part of an event.
- A final place is different from **gol** in that **plt** describes the place where an event or state ended, whereas **gol** describes the final state of the object.

Examples

<to travel to Boston>
↓
{<travel> -- plt → <Boston>}

<It's red from here to there>
↓
{<red> -- plt → <there>, -- plf → <here>, -- aoj → <it>}

- **Scene (scn)**

scn indicates a **scene** where an event happens, or a state is true, or a nominal entity exists

<#1:NominalEntity or VerbalEntity> **-- scn** → <#2:NominalEntity>
Where,
#1 is a nominal entity or an event, and
#2 is an abstract or metaphorical nominal entity (world) understood as a scene.

Differences between related relations

– A scene is different from **plc** in that the reference place for **plc** is in the real place that something happens, whereas for **scn** it is an abstract or metaphorical world.

Examples <He has often played in comedies>
↓
{<has often played> -- scn → <comedy>, -- agt → <he>}

3.1.6 QuasiTime 準時間

- **Duration (dur)**

dur indicates a **period** of time during which an event happens, a state is true, or a nominal entity exists

<#1:NominalEntity or VerbalEntity> **-- dur** → <#2:VerbalEntity or AbstractEntity>
Where,
#1 is a nominal entity or an event, and
#2 is an event or an abstract nominal entity expressing a period of time.

Differences between related relations

Examples

<to talk during the meeting>
↓
{<talk> -- dur → <the meeting>}

<He came during my absence>
↓
{<came> -- dur → <my absence>, -- agt → <he>}

- **Time (tim)**

tim indicates the **time** when an event happens, a state is true, or a nominal entity exists

<#1:NominalEntity or VerbalEntity> **-- tim** → <#2:VerbalEntity or AbstractEntity>
Where,
#1 is a nominal entity or an event, and
#2 is an event or an abstract nominal entity that expresses or can be seen as a time.

Differences between related relations

– Time is different from **tmf** and **tmt** in that time characterizes the event or state as a whole, whereas **tmf** and **tmt** describe only parts of the event.
– Time is different from **coo** and **seq** in that time does not describe states and events relatively, with respect to each other, but with respect to certain points in time.

Examples

<to leave on Tuesday>
↓
{<leave> -- tim → <Tuesday>}

<The play finished when he arrived>
↓
{<the play finished> -- tim → <he arrived>}

- **Initial time (tmf)**

tmf indicates the **time** when an event starts, or a state becomes true

<#1:NominalEntity or VerbalEntity> **-- tmf** → <#2:VerbalEntity or AbstractEntity>
Where,
#1 is a nominal entity or an event, and
#2 is an event or an abstract nominal entity that expresses or can be seen as a time.

Differences between related relations

- Initial time is different from **tim** in that **tmf** expresses the time at the beginning of the event or state whereas **tim** expresses the time for the event taken as a whole.
- Initial time is different from **src** in that **tmf** expresses the time at the beginning of the event or state whereas **src** expresses characteristics of the object at the beginning of the event.
- Initial time is different from **tmt** in that **tmf** expresses the time at the beginning of the event or state whereas **tmt** expresses the time at its end.

Examples

<to work from morning till night>
↓
{<work> -- tmf → <morning>, -- tmt → <night>}

<The city has changed a lot since I have lived here>
↓
{<the city has changed a lot> -- tmf → <I have lived here>}

- **Final time (tmt)**

tmt indicates the **time** when an event ends, or a state becomes false

<#1:NominalEntity or VerbalEntity> **-- tmt** → <#2:VerbalEntity or AbstractEntity>
Where,
#1 is a nominal entity or an event, and
#2 is an event or an abstract nominal entity that expresses or can be seen as a time.

Differences between related relations

- Final time is different from **tim** in that **tmt** expresses the time at the end of the event or state, whereas **tim** expresses the time for the event taken as a whole.
- Final time is different from **gol** in that **tmt** expresses the time at the end of the event or state, whereas **gol** expresses characteristics of the object at the end of the event.
- Final time is different from **tmf** in that **tmt** expresses the time at the end of the event or state, whereas **tmt** expresses the time at the beginning of the event.

Examples <to work from morning till night>
↓
{<work> -- tmt → <night>, -- tmf → <morning>}

3.2 InterEntityRelation　実体間関係

- **Conjunction (and)**

And indicates a partner entity to have conjunctive relation to

<#1:Entity> **-- and** → <#2:Entity>
Where,
#1 and #2 can be any type of entity.

Differences between related relations

- A conjunction is different from **or** in that with **and** things are grouped together to say the same thing about both of them, whereas with **or** we separate them to indicate that what is true about one is not true about the other.
- A conjunction is different from **cag** in that when the agents are conjoined, both initiate an explicit event, whereas with **cag**, the co-agent initiates an implicit event.
- A conjunction is different from **ptn** in that when the agents and partners are conjoined, both are in focus, whereas with **ptn**, the partner is not in focus (as compared to the agent).
- A conjunction is different from **coo** and **seq** in meaning, although in many cases the same expressions can be used for both. A conjunction only means that terms are grouped together; no information about time is implied. **Coo**, on the other hand, means that the terms are in the same time, whether they are considered to be grouped together or not. In turn, **seq** means that the terms are ordered in time, one after the other.
- A conjunction is different from **int** and **or** in that as a logical operator **int** makes an intersection, **or** makes differences, whereas **and** makes a union

Examples

<…easily and quickly>
↓
{<quickly> -- and → <easily>,…}

<…singing and dancing>
↓
{<dancing> -- and → <singing>,…}

<John and Mary…>
↓
{<Mary> -- and → <John>,…}

- **Condition (con)**

con indicates a non-focused **entity** that conditions a focused **verbal entity**

<#1:VerbalEntity> **-- con** → <#2:Entity>
Where,
#1 is an event, and
#2 is an entity that is thought of as having an indirect or external role in making the focused event happen, that is, as some conditioning or inhibiting factor (real or hypothesized) that influences whether or when the focused event can happen.

Examples <If you are tired, we will go straight home>
↓
{<we will go straight home> -- con → <you are tired>}

- **Co-occurrence (coo)**

coo indicates a co-occurrent event for a focused event

<#1:VerbalEntity> **-- coo** → <#2:VerbalEntity>
Where,
#1 is an event that happens at the same time as the partner event #2, and
#2 is another event.

Differences between related relations

– A co-occurrence is different from **seq** in that **seq** describes events or states that do not occur at the same time, but one after the other, whereas **coo** describes events that occur simultaneously.
– A co-occurrence is different from **tim** in that **coo** relates the times of events or states with other events or states, whereas **tim** relates events or states directly with points or intervals of time.

Examples <he was singing while running>
↓
{<was singing> -- agt → <he>}-- coo → {<was running> -- agt → <he>}

- **Equivalent (equ)**

equ indicates a equivalent concept

<#1:Entity> **-- equ** → <#2:Entity>
Where,
#2 is an equivalent concept of #1.

Examples <the deconverter (a language generator)>
↓
{<the deconverter> -- equ → <a language generator>}

- **Range/from-to (fmt)**

fmt indicates a range between two nominal entities

<#1:NominalEntity> **-- fmt** → <#2:NominalEntity>
Where,
#1 describes the end of the range, and
#2 describes the beginning of the range.

Differences between related relations

– A range is different from **src** and **gol** in that for **src** and **gol** the initial and final states of certain **obj** are characterized with respect to some event, whereas **fmt** makes a similar characterization but without linking the endpoints of a range to some event.
– A range is different from **plf** and **plt** or **tmf** and **tmt** in that **fmt** defines endpoints of a range without reference to any sort of event, whereas **plf**, **plt**, **tmf** and **tmt** delimit events.

Examples <the alphabets from a to z>
↓
{<the alphabets> -- mod → {<z> -- fmt → <a>} }

- **Origin (frm)**

frm indicates a initial state of a nominal entity or a nominal entity initially associated with the focused nominal entity

<#1:NominalEntity> **-- frm** → <#2:NominalEntity>

Where,

#1 is a nominal entity, and

#2 is a nominal entity that is initially associated with the focused nominal entity #1, origin such as the original position of the focused nominal entity #1.

Differences between related relations

– An origin is different from **src** in that **src** is a relation used with an event or a state, whereas **frm** is directly linked to a thing. For instance, "a visitor from Japan" is expressed as "**frm** (visitor(icl>person), Japan(iof>country))", whereas "a visitor came from Japan" is expressed as "**src** (come(agt>thing), Japan(iof>country))" and "agt (come(agt>thing), visitor(icl>person))".

Examples <a visitor from Japane>
↓
{<a visit> -- frm → <Japan>}

- **Included/a kind of (icl)**

icl indicates an upper concept or a more general concept

<#1:Entity> **-- icl** → <#2:Entity>
Where,
#2 is an upper or more general class concept of #1, and
#1 is a subset concept of #2, and #1 inherits #2's property.

Examples <a bird is an animal>
↓
{<a bird> -- icl → <an animal>}

- **An instance of (iof)**

iof indicates a class concept that an instance belongs to

<#1:Entity> **-- icl** → <#2:Entity>
Where,
#2 is a class concept that #1 belongs to, i.e.
#1 is an instance of #2, and #1 inherits #2's property.

Examples <a bird is an animal>
↓
{<a bird> -- icl → <an animal>}

- **Disjunction (or)**

or indicates a partner to have disjunctive relation with

<#1:Entity> **-- or** → <#2:Entity>
Where,
#1 and #2 can be any type of entity.

Differences between related relations

– A disjunction is different from a conjunction in that the items of disjunction are grouped in order to say that something is true for one or the other, whereas in a conjunction they are grouped to say that the same is true for both. A disjunction in formal logic permits three situations for it to be true: 1) it is true for UW1, 2) it is true for UW2, and 3) it is true for both. On the other hand, a conjunction only permits the third situation.
– A disjunction is different from **and** and **int** in that as a logical operator **and** makes a union, **int** makes as intersection, whereas **or** makes differences.

Examples <will you stay or leave>
↓
{<leave> -- agt → <you>} -- or → {<stay> -- agt → <you>}
Or
{{<leave> -- or → <stay>} -- agt → <you>}

- **Purpose (pur)**

pur indicates the purpose or objective of an agent of an action or the purpose of a thing that exists

<#1:Do or Action> **-- pur** → <#2:Do or NominalEntity>
Where,
#1 is an action, and
#2 is an action or a nominal entity that specifies the agent's purpose or objective, or specifies the nominal entity (object, state, event, etc.) that the agent desires to attain by carrying out the focused action #1.

<#1:NominalEntity> **-- pur** → <#2:NominalEntity or VerbalEntity>
Where,
#1 is a nominal entity, and
#2 is what #1 is to be used for.

Differences between related relations

– A purpose or objective is different from **gol** in that **pur** describes the desires of an agent, whereas **gol** describes the state of the object at the end of an event.
– A purpose or objective is different from **man** and **met** in that **pur** describes the reason (purpose) why the event is being carried out, while **man** and **met** describe how it is being carried out.

Examples

<I came to see you>
↓
{<I came> -- pur → <to see you>}

<a budget for research>
↓
{<a budget> -- pur → <research>}

- **Reason (rsn)**

rsn indicates a reason why an event happens

<a verbal entity> **-- rsn** → <a verbal entity or a nominal entity>

Examples <a city known for its beauty>
↓
{<a city known> -- rsn → <its beauty>}

<I can't go, because I'm busy>
↓
{<I can't go> -- rsn → <I'm busy>}

- **Sequence (seq)**

seq indicates a prior event of a focused event

<#1:VerbalEntity> **-- seq** → <#2:VerbalEntity>
Where,
#1 is an event happens or becomes true after #2, and
#2 is another event.

Differences between related relations

– A sequence is different from **coo** in that **seq** describes events or states that do not occur at the same time, but one after the other, whereas **coo** describes events that occur simultaneously.

Examples

<It was green and then red>
↓
{{<was red> -- seq → <was green>} -- aoj →<it>}

<She came in and took her coat off>
↓
{<took her coat off> -- seq → <she came in>}

- **Destination (to)**

to indicates a final nominal entity associated with the focused nominal entity

<#1:NominalEntity> **-- to** → <#2:NominalEntity>

Differences between related relations

– A destination is different with **gol** in that **gol** is a relation used with an event or a state, whereas **to** is directly linked to a thing. For instance, "a letter to you" is expressed as "**to** (letter(icl>document), you)", whereas "a letter sent to you" is expressed as "**gol** (send(agt>thing,gol>thing,obj>thing), you)" and "obj (send(agt>thing,gol>thing,obj>thing), letter(icl>document))".

Examples

<a train for London>
↓
{<a train> -- to → <London>}

<a letter to you>
↓
{<a letter> -- to → <you>}

3.3 Restriction&ModificationRelation 限定・修飾関係

- **Basis (bas)**

bas indicates a nominal entity used as a **basis** (standard) of comparison

<#1:Do or Be or VerbalQualifier> **-- bas** → <#2:NominalEntity>
Where,
#1 is an entity expressing/implying a comparison, and
#2 is an entity used as a basis for evaluating the characteristic or quantity of the focused entity (**aoj** or **obj)**.

Examples <A tulip is more beautiful than a rose>
↓
{<more beautiful> -- bas → <a rose>, -- aoj → <a tulip>}

<I prefer physics to chemistry>
↓
{<prefer> -- bas → <chemistry>, -- obj → <physics>, -- agt → <I>}

- **Content (cnt)**

cnt indicates the content of an entity

<#1:Entity> **-- cnt** → <#2:Entity>
Where,
#2 is the content of #1.

Examples <No one can deny the fact that smoking leads to cancer>
↓
{<the fact> -- cnt → <that smoking leads to cancer>}

- **Manner (man)**

Man indicates a **way** to carry out an event or the **characteristics** of a state

<#1:VerbalEntity> **-- man** → <#2:VerbalEntity or VerbalQualifier>
Where,
#1 is an event or a state, and
#2 shows a way how #1 happen, is carried out or exists.

Differences between related relations

– A manner is different from **ins** or **met** in that **ins** describes how an event is carried out in terms of the instruments, **met** describes how an event is carried out in terms of the component steps of the event, whereas **man** describes other quantitative or qualitative characteristics of the event as a whole.

Examples

<to move quickly>
↓
{<move> -- man → <quickly>}

<very beautiful>
↓
{<beautiful> -- man → <very>}

- **Modification (mod)**

mod indicates an entity that restricts a focused nominal entity

<#1:NominalEntity> **-- mod** → <#2:NominalEntity or NominalQuantifier or NominalQualifier>
Where,
#1 is a nominal entity, and
#2 is a restriction or a nominal entity restricting the focused entity #1 in some way.

Differences between related relations

– A modification is different from **aoj** in that **aoj** indicates a thing that is in a state or has some characteristic, whereas **mod** merely indicates a restriction of the focused thing, which might indirectly suggest some characteristics of the thing described.
– A modification is different from **man** in that **man** describes a way to carry out an event or the characteristics of a state, whereas **mod** restricts a thing

Examples

<the whole story>
↓
{<story> -- mod → <whole>}

<a master plan>
↓
{<plan> -- mod → <master>}

<the main part>
↓
{<part> -- mod → <main>}

- **Name (nam)**

nam indicates a name of a nominal entity

<#1:NominalEntity> **-- nam** → <#2:a name>

Examples <his son “Hikari”>
↓
{<his son> -- nam → <Hikari>}

- **Proportion or rate (per)**

per indicates a basis or unit of proportion or rate

<#1:NominalEntity> **-- per** → <#2:NominalEntity>

Examples <eight hours a day>
↓
{<eight hours> -- per → <a day>}

- **Part of (pof)**

pof indicates an entity of which a focused entity is a part

<#1:NominalEntity> **-- pof** → <#2:NominalEntity>

Examples <the preamble of a document>
↓
{<the preamble> -- pof → <a document>}

- **Quantity (qua)**

qua indicates the quantity of a nominal entity

<#1:NominalEntity> **-- qua** → <#2:a quantity>

Examples

<two dogs>
↓
{<dogs> -- qua → <two>}

<many books>
↓
{<books> -- qua → <many>}

3.4 CompositeRelation　複合関係

- **Possessor (pos)**

pos indicates the possessor of a nominal entity

<#1:NominalEntity> **-- pos** → <#2:VolitionalEntity>

Examples　<John's dog>
↓
{<dog> -- pos → <John>}

4. Attributes

Attributes are mainly for the purpose to describe subjectivity information of sentences. They show what is said from the speaker's point of view: how the speaker views what is said. This includes phenomena technically called "speech acts", "propositional attitudes", "truth values", etc. Attributes are also used to express ranges and logicalities of concepts.

Relations and entities (of concepts) are used to describe objectivity information of sentences. Attributes modify the concepts including compound concepts to indicate subjectivity information.

Attributes are divided into the following groups:

Describing speaker's view of reference to concept
Describing speaker's view of emphasis, focus, and so on
Describing logicality of concept
Describing time with respect to speaker
Describing speaker's view on aspect of event
Describing speaker's attitude
Describing speaker's feeling and judgment

4.1 Attributes describing speaker's view of reference to concept

These attributes show the range or type of a concept.

generic	Generic concept The dog is a faithful animal
def	Specific concept The book you lost
indef	Non-specific concept There is a book on the table
not	Complement set of concept
ordinal	An ordinal number The 2nd door

4.2 Attributes describing speaker's view of emphasis, focus and so on

These attributes show how the speaker thinks a concept is important.

contrast	Contrast concept He is poor but happy
emphasis	Emphasized concept I do like it
entry	Main concept
qfocus	Focused concept of a question Are you painting the bathroom blue?
theme	Theme
topic	Topic He was killed

4.3 Attributes describing logicality of concept

These attributes are used to attach to the concepts that have the logicality.

transitive — To indicate an concept that has transitivity
'transitive' can be attached to concept such as 'ancestor'. Because if "A is ancestor of B" and "B is ancestor of C" are true, "A is ancestor of C" will be true.

symmetric	To indicate an concept that has symmetricity 'symmetric' can be attached to UW 'partner'. Because if "A is a partner of B" is true, "B is a partner of A" will be true also.
identifiable	To indicate an concept that can identify the subject 'identifiable' can be attached to (compound) concept 'national health insurance id' as the content of the concept can identify the person who hold the ID.
disjointed	To indicate a concept or a group of concepts of which all element concept do not hold common instance. 'disjointed' can be attached to a scope consists of "men and women" as these two element concepts do not share common instances.

4.4 Describing time with respect to speaker

past	Happened in the past
present	Happening at present
future	Will happen in the future
permanent	Permanently true (necessary?)

4.5 Describing speaker's view on aspect of event

begin	Beginning of an event The machine began to work again.
complete	Completion of an (whole) event I've looked through the script.
continue	Continuation of an event He went on talking
custom	Customary or repetitious action I used to visit him
end	Termination of an event I have done it. (?)
experience	Experience I have been Tunis
progress	An event in progress He is singing
repeat	Repetition of an event It is so windy that the tree branches are knocking against the roof.
state	Final state of a object on which an action has been taken It is broken.

The following are used to modify the attributes above to express various aspects.

just	Expresses an event that has just begun, ended or completed He has just come.
soon	Expresses an event that is about to begin, to end or to complete. The train is about to leave.
yet	Expresses an event that has not yet begun, ended or completed, together with attribute 'not'. It's not yet finished (will be finished soon).

4.6 Describing speaker's attitude

The speaker can also express, directly or indirectly, what his attitudes or emotions are towards what is being said or whom it is being said to. This includes respect and politeness towards the listener and surprise toward what is being said.

confirmation	It's red, isn't it?
exclamation	How beautiful it is!
imperative	You will please leave the room.
interrogative	Who will come?
invitation	Shall we go?
polite	Could you please come
request	Please don't forget to come?
respect	
…	

4.7 Describing speaker's feeling and judgment

These attributes express the speaker's feelings or how the speaker views or judges what is said. This sort of subjective information is very much dependent on the type of language. It should be possible to express every kind of subjective information from all languages. Thus, the development of the attributes is open to the developers of each language, who can introduce a new attribute when no current attribute expresses its meaning. The new attribute must be also introduced in the same way.

ability	Ability, capability of doing thing The child can 't walk yet.

get-benefit	Speaker's feeling of receiving benefits through the fact or result of something (to be) done by somebody else I'll have my secretary type the letter.
give-benefit	Speaker's feeling of giving benefits by doing something for somebody else

conclusion	Logical conclusion due to a certain condition He is her husband; she is his wife.
consequence	Logical consequence He was angry, wherefore I left him alone.

sufficient	Sufficient condition You only have to do this

consent	Consent feeling of the speaker about something
dissent	Dissent feeling of the speaker about something But that's not true
grant	To give/get permission to do something Can I smoke in here?
gant-not	Not to give permission to do something You {mustn't/are not allowed to/may not} borrow my car.

although	Something follows against [contrary to] or beyond expectation Although he didn't speak, I felt a certain warmth in his manner.
discontented	Discontented feeling of the speaker about something (I'll tip you 10 pence.) But that's not enough!
expectation	Expectation of something If you leave now, you should get there by five o'clock.
wish	Wishful feeling, to wish something is true or has happened If only I could remember his name! (~I do wish I could remember his name!)

insistence	Strong determination to do something He will do it, whatever you say.
intention	Intention about something or to do something We shall let you know our decision.
want	Desire to do something I want to go.
will	Determination to do something We won't stay longer than two hours.

need	Necessity to do something

	I must be going now.
obligation	Obligation to do something according to (quasi-) law, contract, or … The vendor shall maintain the equipment in good repair.
obligation-not	Obligation not to do something, forbid to do something according to (quasi-) law, contract or … Cars must not park in front of the entrance.
should	To do something as a matter of course You should do as he says.
unavoidable	Unavoidable feeling of the speaker about doing something I could not help speaking the truth.

certain	Certainty that something is true or happens They should be home by now.
inevitable	Logical inevitability that something is true or happens All living things must die.
may	Practical possibility that something is true or happens It may be true. It could be.
possible	Logical possibility that something is true or happens Anybody can make mistakes.
probable	(Practical) probability that something is true or happens He must be lying.
rare	Rare logical possibility that something is true or happens If such a thing should happen, what shall we do?
unreal	Unreality that something is true or happens If we had enough money, we could buy a car.

admire	Admiring feeling of the speaker about something.
blame	Blameful feeling of the speaker about something A sailor, and afraid of the sea.
contempt	Contemptuous feeling of the speaker about something You never could do it.
regret	Regretful feeling of the speaker about something It's a pity that he should miss such a golden opportunity.
surprised	Surprised feeling of the speaker about something (He has succeeded!) But that's great!
troublesome	Troublesome feeling of the speaker about the occurrence of something My house was [I had my house] broken into yesterday.

Acknowledge

This research is supported by the Ministry of Internal Affairs and Communications of Japan under the Strategic Information and Communications R&D Promotion Programme (SCOPE).

References

Hiroshi Uchida, Meiying Zhu, Tarcisio G. Della Senta: UNIVERSAL NETWORKING LANGUAGE, UNDL Foundation, 2005