

A Hierarchical Unification of LIRICS and VerbNet Semantic Roles

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Overview and Purpose

- Compares thematic roles of VerbNet (VN) and thematic roles of the Linguistic InfRastructure for Interoperable ResourCes and Systems (LIRICS)
- Replace existing VN semantic roles and develop a standard set of thematic roles that would be appropriate for a variety of NLP applications

How do we label arguments with
one set of thematic roles?

Proposal: A unified set of semantic roles that will be incorporated into VN

- Map more easily to an ISO standard set
- Arranged hierarchically based on semantic feature inheritance and feature constraints

LIRICS

- Semantic roles should be defined
 - As semantic categories (not syntactic or lexical structures)
 - By distinctive semantic properties
 - As not restricted to only a few specific verb (/ noun/adjective) classes
 - As relational notions that link participants to an event
 - Intentional action? Affected by other participants? Exist through the event?

LIRICS

- Set of 29 roles
 - 11 central roles (agent, theme, patient)
 - 10 adjunct roles (time, location, manner)
 - 8 subroles for time and location (duration, frequency, path)

LIRICS

Example: theme role

- Essential to the event taking place, does not have control over the way the event occurs
 - Not structurally changed by the event
- In a fixed position/condition throughout the state
 - Essential to the state being in effect
 - Not as essential as the pivot role

LIRICS

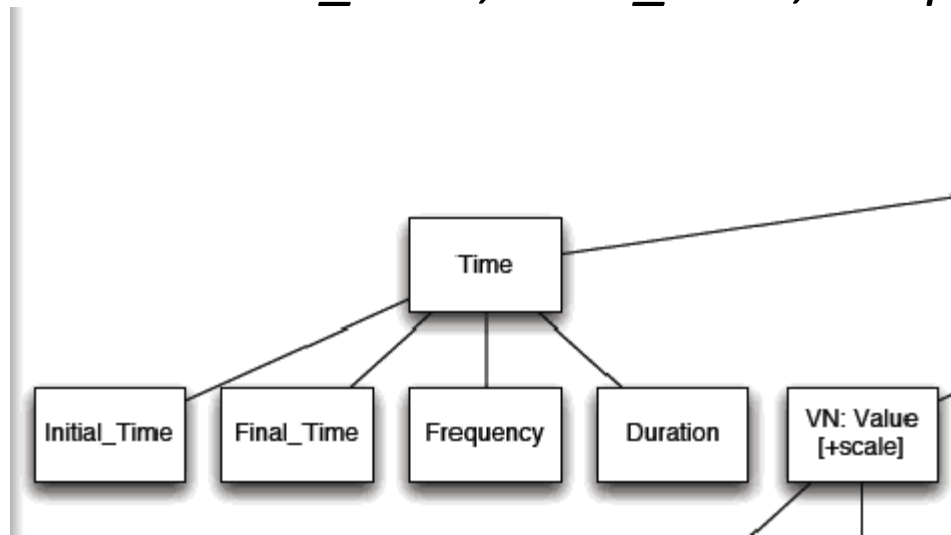
- Granularity

- Low-level roles inherit all the properties of high-level roles and have an additional feature

- Result: a shallow hierarchy for several semantic roles

- Example:

- *Time: Initial_Time, Final_Time, Frequency, and Duration*



VerbNet

- Describes the sets of diathesis alternations that are compatible with each verb in the lexicon
- Example:

	Break	Appear
Inchoative variation	The window broke	A rabbit appeared out of the magician's hat
Causative variation	The boy broke the window	*The magician appeared a rabbit out of his hat

VerbNet

- Fundamental assumption: syntactic frames that are compatible with a particular verb are a reflection of the underlying semantics
- Thematic roles are assigned to each syntactic argument in a given verb class
- Use of semantic predications denoting relationships between participants and events

VerbNet

- Example:

I put the book on the table

Syntactic Representation

NP V NP PP

Agent V Theme Destination

Semantic Representation

MOTION(DURING(E), THEME)

NOT(PREP: on (START(E), THEME, DESTINATION))

PREP: on (END(E), THEME, DESTINATION)

CAUSE(AGENT, E)

Current State of VN makes use of:

- Commonly used, coarse-grained roles like those of LIRICS (e.g. agent)
- Roles that are specific to certain classes of events, which are intended to convey key semantic components of some verb classes (e.g. topic)
- Roles that are partially syntactically motivated (e.g. predicate)
- Roles that are distinguished by internal properties of the participant (e.g. +/- animate)

LIRICS only makes use of roles that are:

- Not restricted to specific verb classes
- Not linked to particular syntactic structures
- Not related to internal properties of participants

Old VN role	New VN role	LIRICS role
Actor	Agent	Agent
Actor 1	Agent	Agent
Actor 2	Co-Agent	Partner
Agent	Agent	Agent
Asset	Asset	Amount
Attribute	Attribute	Attribute
Beneficiary	Beneficiary	Beneficiary
Cause	Cause	Cause
Destination	Destination	Final_Location
Experiencer	Experiencer	Pivot
Extent	Extent	Amount/Distance
Instrument	Instrument	Instrument
Location	Location	Location
Material	Material	Source
Patient	Patient	Patient
Patient 1	Patient	Pivot
Patient 2	Co-Patient	Patient

Predicate	-	-
Product	Result/Product	Result
Proposition	-	-
Recipient	Recipient	Goal
Source	Source/Initial_Location	Source/ Initial_Location
Stimulus	Stimulus	Theme
Theme	Theme	Theme
Theme 1	Theme	Theme
Theme 2	Co-Theme	Theme
Time	Time	Time
Topic	Topic	Theme

Roles specific to VN

- Example:
- Topic
 - Fine-grained
 - Specific to verbs of communication
 - More likely to be realized in the form of a complement clause
- Theme
 - Coarse-grained
 - More likely to be realized in the form of a noun phrase

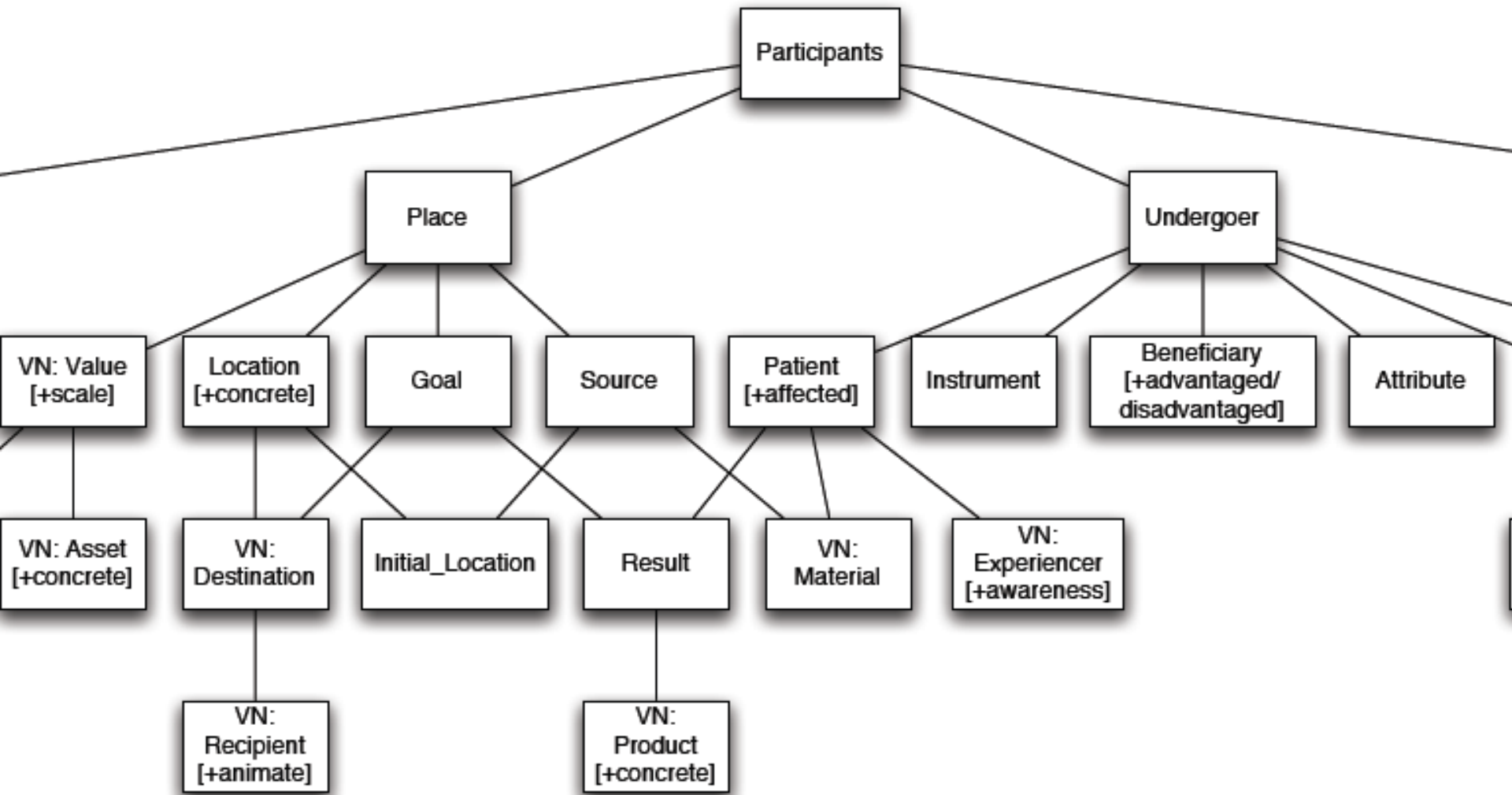


Fig. 1. Hierarchy of Unified Semantic Roles

Hierarchy

- Coarse-grained roles: for tasks that require a roleset that has the broadest coverage across all verbs
- Fine-grained roles/Class specific roles: for tasks that benefit from info that helps to distinguish classes of verbs

Revised Roleset

- Roles: Participant, Actor, Undergoer, Pivot
- Roles adapted or revised from LIRICS: Cause, Agent, Instrument, Theme, Patient, Attribute, Beneficiary, Place, Source, Initial_Location, Goal, Time, Initial_Time, Final_Time, Frequency, Duration
- Roles specific to certain event types: Co-Agent, Stimulus, Co-Theme, Topic, Co-Patient, Experiencer, Location, Material, Destination, Recipient, Result, Product, Value, Extent, Asset

Examples

- He talked about politics

LIRICS: He_{AGENT} talked_{RELATION} about_politics_{THEME}

VN 1 (coarse-grained): He_{AGENT} talked_{RELATION}
about_politics_{THEME}

VN 2 (fine-grained): He_{AGENT} talked_{RELATION} about_politics_{TOPIC}

- He sent the letter to Mary

LIRICS: He_{AGENT} sent_{RELATION} the_letter_{THEME} to_Mary_{GOAL}

VN 1 (coarse-grained): He_{AGENT} sent_{RELATION} the_letter_{THEME}
to_Mary_{GOAL}

VN 2 (fine-grained): He_{AGENT} sent_{RELATION} the_letter_{THEME}
to_Mary_{RECIPIENT}

Examples

- John collaborated with Paul on the task.

LIRICS: John_{AGENT} collaborated_{RELATION} with_Paul_{PARTNER}
on_the_task_{THEME}

VN: John_{AGENT} collaborated_{RELATION} with_Paul_{CO-AGENT}
on_the_task_{THEME}

- The tourists admired the paintings.

LIRICS: The_tourists_{PIVOT} admired_{RELATION} the_paintings_{THEME}

VN 1 (coarse-grained): The_tourists_{PATIENT} admired_{RELATION}
the_paintings_{CAUSE}

VN 2 (fine-grained): The_tourists_{EXPERIENCER} admired_{RELATION}
the_paintings_{STIMULUS}