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概念的外延：以「社區」一詞為例

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by
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摘 要

在規劃設計的過程中，空間專業者很難去規避不同領域之間的合作。規劃師或設計者為了與不同專業者折衝協調，往往要花莫大的精力來整合他們所需要的資訊。因此，把不同知識領域的概念網絡理則化有助於發掘其內隱知識。本研究以認知語意學與本體知識建構工程為主要的研究方法，嘗試區辨出不同的概念，並提出一個具分析性的機制來理解某些詞彙。本文以「社區」一詞為例做為分析的主體以圖解的方式描繪其潛在的脈絡。也在相關的知識領域中探索它的意涵以及跟其他概念之間的關係。

關鍵字：概念結構、關係、探索知識本體

ABSTRACT

In the process of co-design, neither planner nor designer can be independent of any interdisciplinary collaboration. To negotiate with variant experts, they usually spend much energy on incorporating plenty information. That is why the research illustrates possible contexts in case of the term 'community'. Based on cognitive semantics and ontological engineering, there is an analytical technique which is made in the research in order to formalize concepts. Its senses and relationships would be explored and compared among diverse knowledge domains.

Keyword: concepts, relationships, exploring ontologies

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1. Introduction

Collaboration needs communication. Neither community design nor regional governance can be independent of cooperation with those who are from diverse backgrounds. Being a designer, essentially much does involve verbal communications the phase of conceptual design before form-making. Still more a planner does if spatial expertise is all about decision making of public affairs. Explicitly, to negotiate with experts of different domains, they usually spend much energy on incorporating information to achieve synergy. It is critical for co-workers to merge different perspectives and knowledge.

Both designers and planners are those who operate on visual forms of knowledge representation. However, there have been hardly any researches applied a linguistic view to urban studies. Likewise, so far as known in contemporary design research, the majority pays more attention to visual reasoning than speeches (e.g., Schön, 1983; Oxman, 2002; van der Lugt, 2005; Dong, 2005).

As a complement to urban studies that characterize spatial concepts, this research applies a linguistic view to show how speeches as a form of mental expression serve as a new field of inquiry by skills of formalizing. Therefore, in accordance of the proposed technique to proceed from corpora to a well-formed databank, a conceptual network is to be revealed in the research. Such an outcome we uncover verifies that people are possessed of diverse ideas even using one term in common.

1.1 The Scope of the Problem

To be concrete, there are situations domain experts would confront frequently when working together, e.g. 'Who treats valuable message as options? Information, data or nothing.', 'who makes the priority to proceed them?' or 'what deserve listing out?' etc. Moreover, experts as urban planners, the traits of their job are complicated projects which consist of extremely different scales, a long period for years and kinds of documents like pictures, maps, texts or digital statistics. Physically, the longer the job succeeds the larger amount to manage for its accumulation.

Doubtless, experts of any domain would never deny that the hard core of knowledge management for a team is essentially the tacit part of cooperation. Experience is a key in acquiring tacit knowledge. Yet, tacit knowledge is mainly based on lived experiences and so is difficult to identify and to transfer. Deeply rooted in action, commitment and involvement in a specific context, it refers to personal qualities such as cognitive and technique elements inherent to the individuals (Baets, 2005).

As we concern above, not just valuing verbal communication among designers, but exposing the ambiguity of concepts also means an issue for interdisciplinary cooperation. There ought to be some efforts devoted to bridge possible gaps generated from various angles. Then, it is bound to query that how different would it be even if using a term in common with diverse perception. There is less to say that domain experts can be integrated by a common framework before the terms they use has been agreed each other. Therefore, is it possible to generate a 'road map' of concepts to help aware of extraordinary premises or contexts telling spatial professions per se apart?

1.2 How to Solve It

There are many researches using linguistics or alternative approaches to discuss what makes a good communication. Even so, a feasible strategy we take in the research is to narrow down the scope to see what make sense for a specific concept across domain of human-geography knowledge. To explore the situation mentioned above, we employ a lexical concept to confirm our hypothesis.

Since speeches are rich fields in design and planning study, this research takes the term 'community' as an illustration to depict what a concept implies. We take three descriptive texts as samples. Their contents are about how interviewees thought during the event of Severe Acute Respiratory Syndrome (SARS), which was a viral respiratory illness in Taiwan in 2003 (Lin et al, 2004). The case is to observe that differences in attitudes and knowledge can be magnified in a stress situation. The SARS event is a calamity which happens to a perfect case to examine how consensus or knowledge integration is done in a stressful and urgent situation under deadly scare. That is why the research illustrates possible contexts in case of the term 'community'.

For achieving our goal, how we make inquiries? we propose a technique to formalize concepts. The way of integrating variant information among persons is a technique to identify the words and their meanings based on the context in communication step by step. Then, the procedure of our research strategy is as below:

1. Collecting the Data — after retrieving the whole texts and discarding those sentences without the

term ‘community’, there are sentences remained to form the corpora of the research. Each sentence is an entry to be analyzed.

2. Building the Technique — the technique is to carry transformation for increasing the degree of maneuverability. That is, the steps of the technique are not only to break a sentence as an object, but also to transform them into tuples which reveal their senses and operators as possible.
3. Profiling the Concept — analyzing the corpora is the most critical part to clarify concepts and their relationships. Thus, this research creates a schema on profiling each sentence. The schema is a framework not only to structure our knowledge of lexical chains, but also to ‘deconstruct’ their interpretations in context.
4. Revealing the Mapping — According to the technique, the research outputs a well-formed databank to visualize the given texts with implicit context. There are results by categorizing the common set of extending senses and further to visualize them by the Unified Modeling Language (UML). UML is the universally accepted language for software design and conveys ideas of modeling visually.

According to the whole process introduced above, the research makes a comparison what constitutes a concept among groups of domain knowledge.

2. Literature Review

2.1 Generally Comprehending the Term ‘Community’

If looking the term ‘Community’ upon “the Compact Oxford English Dictionary (OED)”, we can find that the term ‘community’ is a noun and its plural form is ‘communities’. It also origins from both old French ‘comunete’ and Latin ‘communis’, which means ‘common’ in modern English. In fact, it shows five results as (1a) ~(1e):

(1a) A group of people living together in one place.

(1b) The people of an area or country considered collectively: society.

(1c) A group of people with a common religion, race, or profession: the scientific community.

(1d) The holding of certain attitudes and interests in common.

(1e) A group of interdependent plants or animals growing or living together or occupying a specified habitat.

Moreover, we also investigate the term on ‘WordNet’ (http://wordnet.princeton.edu/), it shows eight kinds of explanation as (2a) ~(2h) and figure 1:

(2a) A group of people living in a particular local area.

(2b) A group of people having ethnic or cultural or religious characteristics in common.

(2c) Common ownership.

(2d) A group of nations having common interests.

(2e) The body of people in a learned occupation.

(2f) Agreement as to goals.

(2g) A district where people live; occupied primarily by private residences.

(2h) A group of interdependent organisms inhabiting the same region and interacting with each other.

Actually, WordNet was not built by the way of which a typical dictionary does. WordNet is a lexical system that organizes English nouns, verbs, adjectives, and adverbs into lexicalized concepts connected by semantic links. WordNet does not claim that its structure is how people actually organize concepts in their minds; rather, it models semantic links based on the lexicographic definitions of English language words (Fellbaum, 1998; Dong, 2005).

It is obvious that WordNet extends more senses than OED. In terms of OED, most of its core perceptions refer to ‘people’ other than ‘nonfigurative share’ and ‘nature species’. However, except what OED has, there still are concepts to be found in WordNet, such as ‘agreements’ and ‘district’. Based on that, WordNet seems focusing more on the definition of words than the generally acceptable usage in English like OED. That is, lexical concepts are all about that word meaning can be systematically described. Concepts such as synonymy, antonymy, and hyponymy have been used to describe the ‘sense relations’ which words can enter into (Davidson, 2001).

As Dong (2005) studies, speeches generated by team work appear actually a kind of knowledge accumulation by ways of his Lexical Chain Analysis. His experiment suggests that ‘the occurrence of semantic links in discourse reveals the way that ideas are thought of and connected between communicators. Concept formation is driven by the accumulation of knowledge, where the accumulation is evidenced linguistically by the amassing of semantic link connections between lexicalized concepts.’

We are convinced that Dong applies semantic links between concepts as his insight into how to identify concepts in terms of relationship just like the functions of WordNet. Basically, the ways of WordNet to

represent lexicalized concepts are as following:

1. To reveal the psychology of how humans think about concepts.
2. To make connections between and among them.
3. To use context to ascertain the appropriate sense of a lexicalized concept.

That is why Dong makes a good use of the structure of WordNet on his technique 'Lexical Chain Analysis', such as these terms which are defined in the Table 1. Besides that, a few of his terminology about relationships are attached to directional links such as 'upward', 'horizontal', 'part-of' and 'downward'.

Terms	Definition
Gloss	The definition of a lexical concept.
Sense	The idea that is intended by a lexical concept.
Synset	A set of one or more synonyms.
Hypernym	A lexical concept that is a generic class of concepts.
Hyponym	A lexical concept that is a member of a class of concepts.
Meronym	A lexical concept that designates a concept as a constituent component of another class.

Table 1: Dong's terminology matched with the mechanism of WordNet.

In addition, it has to be mentioned is that an on-line intelligent agent 'Visual Thesaurus' (http://www.visualthesaurus.com/) able to present a conceptual network for any words. One of the panels on its settings is 'Relationships' which 'allows you to turn the different types of relationships that are available in the Visual Thesaurus on and off' (Think Map Inc., 2007). The Figure 1 shows the results as a graph diagram after looking term 'Community' upon 'Visual Thesaurus'.

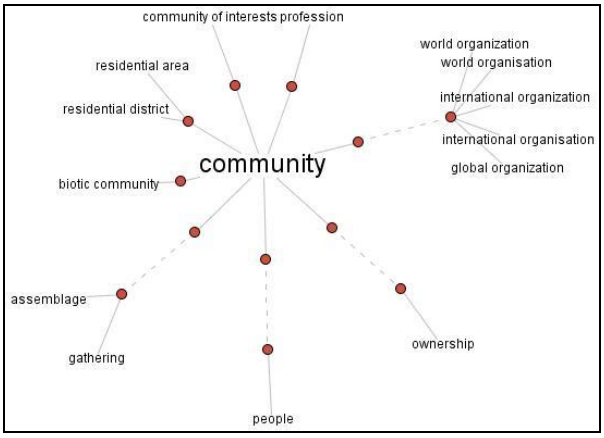

Figure 1: Looking the term 'Community' upon 'Visual Thesaurus'

In order to identify a concept in the research, we apply the Relationships theory like Dong has done in Table 1. Because sense cannot be determined by a processor for strings, the core of our task is to build up a technique as a semantic parser enables dividing corpora into small components, like words, phrases or types components belong. In terms of computer science, parsing is also a significant part, while compilers must translate source code into object code. Thus, we apply ideas of exploring ontology as a tool to help creating synergy among participants with different background in community strategies. There are also skills which are made use of encapsulating the term from sentences among texts. In that case, the technique we propose helps checking the term if with a mutual cluster of sub concepts. Nonetheless, by the relation theory as well, we make a typology of clause relations generated from corpora in the semantic dimension with four types, which are generalization, aggregation, dependency, and association.

2.2 On the Linguistic Approach

Natural languages in our daily life are full of imprecise and ambiguous concepts. Many terms are used in a 'conventional' manner, where common understanding and background knowledge of terms are implicitly assumed, so that sentences and communication times can be largely shortened but still effective. However, language is evolutionary in its use and meaning. As a fact, words of colloquial speech have vague, abstract, and far-reaching meanings. They refer to various aspects of an object field and have shifting boundaries. This is an important issue regarding words and ideas as a rich media to a real world (Lin, 1998:769; Poggenpohl et al, 2004).

Even human language are usually fuzzy and vague, Terms seem the same but denote different senses.

During the fermentation of an emerging concept, researchers are interested in deliberating and capturing the new ideas in a formal way (Lai, 2004). It is argued that representing conceptual design should facilitate multiple interpretations of design elements, which may be modified in various ways (Emdanat & Vakalo, 1998).

Based on the researches of A. Dong in 2005, he considered that language is used as a "tool" in design when language operates as an agent for mediated action as described in the four cases as following statements. As he expresses,

"…Language use does things: it accomplishes reflection, performs actions and enables professionals to project possibilities, forms concepts and negotiates the value of them. Thinking about language use in design as a tool means seeing language as a mechanism for performing design practice…." (Dong, 2005)

After all, to observe design cognition is completely based on verbal protocol analysis of designers thinking aloud. Yet, it seems in vain to witness mental actions no matter how hard designers could think aloud. Even words as a form of design representation have normally been treated as the way that designers consciously encode their thoughts and make those ideas accessible to the external world (Dong, 2005). It is for granted in design researches that language seems a key premise to an operational vehicle to observe human behaviors in design process.

Since speeches play a key role on design, their consequence appears no less than graphics. That is why the research illustrates possible contexts in case of the term 'community'. Based on cognitive semantics and ontological engineering, the research is to consider functionalities of words in communications.

2.3 Ontological Engineering

2.3.1 Defining Ontologies

Ontology is a branch of philosophy as a systematic account on the nature and organization reality (Simoff & Maher, 1998). Nowadays, ontology is studied by many scholars with diverse backgrounds and is applied to a variety of contexts and application areas. The study of ontology has been practiced mainly in the knowledge engineering community over the last decade (Kalfoglou, 2000). By ways of the ontological approach, many researches contribute decrease the cost of externalizing knowledge. From Artificial Intelligence, the concepts of ontology are formal systems representing domain concepts and their linguistic realizations with basic elements (Tu et al, 2002).

One of the early definitions for ontology is as: 'the basic terms and relations comprising the vocabulary of a topic area as well as the rules for combining terms and relations to define extensions to the vocabulary' (Neches et al., 1991). This definition introduced the idea that ontology can be viewed linguistically, as extensible vocabularies regarding a topic area. In the context of knowledge sharing, Gruber offered a short definition which became the most widely cited in the literature: 'An ontology is an explicit specification of a conceptualization.' (Gruber, 1993).

Uschold (1998) offers a working definition which hints at the purpose of employing ontology: "An ontology is virtually always the manifestation of a shared understanding of a domain that is agreed between a numbers of agents. Such agreement facilitates accurate and effective communication of meaning, which in turn leads to other benefits such as inter-operability, reuse and sharing." However, there still have been definitions given by other researchers since 1995 as Table 2.

Date	researchers	Definitions
1991	Neches et al.	Ontologies can be viewed linguistically, as extensible vocabularies regarding a topic area.
1993	Gruber	Ontology is an explicit specification of a conceptualization.
1995	Skuce	Viewing Ontologies as vocabulary.
1996	Mark	Viewing Ontologies as standards.
1998	Uschold	Ontology is virtually always the manifestation of a shared understanding of a domain that is agreed between a numbers of agents.
1999	Fikes & Farquha	Viewing ontology as domain theories.
1999	Swartout & Tate	Ontology provides the basic structure or armature around which a knowledge base can be built.
2000	Kalfoglou	An explicit representation of a shared understanding of the important concepts in some domain of interest.

Table 2: A list of researchers about the definitions of "ontology"

From Table 2, we can find that most researches think ontology as an agreement utilizing the shared concepts among agents committed to the knowledge domain. That is, researches study ontology on its observable actions in consistency instead of completeness, concerning queries and assertions using the vocabulary defined in the ontology (Gruber, 1995; Kalfoglou, 2000).

2.3.2 Ontological Commitment

Knowledge changes over time and domains evolve. The ontology supporting domain knowledge has to keep up with this growth. The development of ontological studies leads to the notion of ontology-driven information systems (hereafter ODIS). Since adopting ontological principles and concepts, there have been influences on the area of information systems (hereafter IS). Practically, an ontological commitment is an agreement to use terminology (i.e., ask queries and make assertions) in a consistent way (Kalfoglou, 2000). Ontology and IS merge with each other and cover both the structural and the temporal dimensions of IS. Therefore, a growing need appears for a unified theory of structural representations of ontology (Sharman et al., 2006).

At present, neither artificial intelligence (hereafter AI) nor cognitive science (hereafter CS) communities would discard such notions to bring up multiple aspects of ontology. No matter in AI or CS perspective, ontology refers to the specification of knowledge about entities, and their relationships and interactions in a bounded universe of discourse only. Accordingly, a number of ontology within bounded-universe have been created over the last decade (Sharman et al., 2006).In order to manage the content and knowledge within organizations, ontological approaches and common taxonomies play an important role. It helps quite much if the ODIS approach is cited and compared with the current approach to give it a theoretical emphasis. Indeed, there are scholars' works in ODIS toward the functions of ontological commitments in applications (Kalfoglou, 2000).

After all, to build taxonomy systematically is almost regarded as the core theme in ODIS approaches. They are supposed to make each element only fitting one branch of the hierarchical tree. However, Guarino et al. (1994~1999) point out an ontological commitment should capture and constrain a set of conceptualizations. They propose a formalization of ontological commitments which:

> "….offers a way to show the intentional meaning of [a logical language] vocabulary by constraining the set of its models, giving explicit information about the intended nature of the modeling primitives used and their a priori relationships….." (Guarino, 1998; Kalfoglou, 2000)

Despite that ontological studies are broaden with diverse backgrounds, a variety of contexts and application areas, they move concerns toward the design phases of ontology in terms of knowledge modeling. Having their roots in knowledge representation, knowledge engineering methods and techniques, it gives a powerful tool for transforming contextual knowledge into well-defined forms to enable mechanized reasoning about a domain of interest. Ontology is a formal form of domain knowledge (Kalfoglou, 2000).

From above, the ontological issue of our research is actually akin to common enterprises. For example, companies need a platform to establish a shared vocabulary across unrelated sources of unstructured information. The shared vocabulary is the backbone of the entire content and knowledge management infrastructure (Sharman, 2006). The key ingredients that make up ontology are a vocabulary of basic terms and a precise specification of what those terms mean. The rich set of relations between these terms guide knowledge workers and knowledge systems navigate through the corporate semantic space (Varma, 2006).

From above viewpoints, managing content in a reusable and effective manner is becoming increasingly important in knowledge centric organizations as the amount of content generated, both text based and rich media, is growing exponentially. Search, categorization and document characterization, content staging and content delivery are the key technology challenges in knowledge management systems (Varma, 2006). Conclusively, all ontological literatures we reviewed enhance this research to develop ideas of exploring ontology as a tool to achieve synergy. Our survey would aim at the term 'community' to explore its concepts among participants with diverse background knowledge in the domain of urban governance.

3. Analysis

Traditional techniques of identifying key concepts are usually looking for nouns, pronouns, and noun phrases from narrative sentences by parsing their syntactical structure, one of whose simple examples is shown in (1).

Subject (A) x Verb (A) x Object (A) → Sentence(A) (1)

Where A is a language, Subject (A), Verb (A) and Object (A) are sets of subjects, verbs, and objects of A with finite lexicons as their elements. However, there are shortcomings in the technique mentioned above. For example, many sentences of inappropriate forms are not easily to parse (Lee & Tepfenhart, 2001: 82~83). Instead of parsing their syntax, this research takes three phases, including rephrasing, inferring, and encapsulating, for transforming initial sentences to those of well-defined forms (Figure 2). The transformation Ψ can be shown as (2).

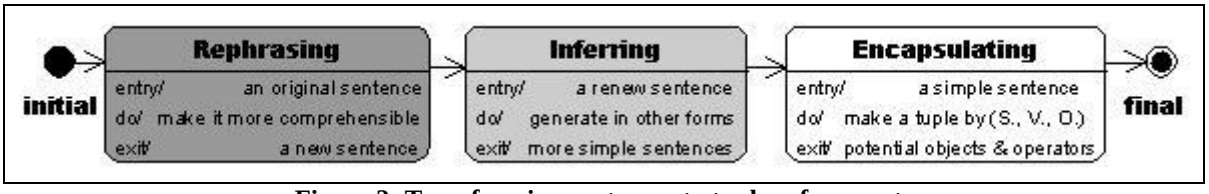

Figure 2: Transforming sentences to tuples of concepts

$$\Psi = (S, \Sigma, \Phi, C, P) \quad (2)$$

where S is the set of original sentences in a descriptive text; Σ is the set of sentences which are rephrased from the original sentences and become more comprehensible; Φ is the set generated from Σ and meanwhile in form of simple clauses to express a single action or an independent event like "Someone[subject] does[verb] something[object]." ; C is the set of tuples of well-defined forms; P is a set of three families of functions of rephrasing (ρ1), inferring (ρ2), and encapsulating (ρ3), whose signatures are shown below and in turn map original sentences in S to rephrased sentences in Σ, single idea sentences in Φ, and well formed tuples in C.

$$\rho 1: S \rightarrow \Sigma \quad (3)$$
$$\rho 2: \Sigma \rightarrow \Phi \quad (4)$$
$$\rho 3: \Phi \rightarrow C \quad (5)$$

For example, in Table 3, let si be the sentence "On the day of Jun 2, people in the civil community said that one of the reported case of SARS is a granny." The code number of si is happened to be given by A012. Using the functions of ρ1, ρ2 and ρ3, the following transformations are made.

Symbol	Sentence or Tuples	Code
s_i	On the day of Jun 2, people in the civil community said that one of the reported cases of SARS is a granny.	A012
s_i'	On the day of Jun 2, a granny living in civil community was reported as a case of SARS.	
t_{i1}	A granny is a reported case of SARS.	
t_{i2}	The reported time is a date of June 2.	
t_{i3}	The case lives in a civil community.	
$(WT_{i1},WR_{i1},WS_{i1})$	(granny, is-a, reported case of SARS)	A01201
$(WT_{i2},WR_{i2},WS_{i2})$	(reported time, is-a, date of June 2)	A01202
$(WT_{i3},WR_{i3},WS_{i3})$	(case, live, civil community)	A01203

Table 3: The assumption of all symbols for the example "s_i".

$$\rho 1\ (s_i) = s_i' \qquad (6)$$

where s_i' = "On the day of Jun 2, a granny living in civil community was reported as a case of SARS."

$$\rho 2\ (s_i') = \{t_{ij} \mid j=1,2,3\} \qquad (7)$$

where t_{i1} = "A granny is a reported case of SARS."

where t_{i2} = "The reported time is a date of June 2."

where t_{i3} = "The case lives in a civil community."

$$\rho 3\ (tij) = (WTij, WRij, WSij) \qquad (8)$$

where WT_{ij}, WR_{ij} and WS_{ij} are lexicons in t_{ij} and $WR_{ij} \in$ Verb (A)

In the above example, WT_{i1}='granny', WR_{i1}= 'is-a', WS_{i1}= 'reported case of SARS', the function of encapsulating maps the single idea sentence "A granny is a reported case of SARS." to the tuple (granny, is-a, reported case of SARS), whose code is A01201.

Finally, a database can be built according to the tuples, where WT*ij* is also called target concept, WS*ij* source concept, and WR*ij* operator for convenience. It is noted that the operator WR*ij* can also be interpreted as a relationship between target concept WT*ij* and source concept WS*ij*. Thus, the operator WR*ij* belongs to one of the four basic relationships, namely generalization, aggregation, dependency, and association, in terms of characterizations agree with Unified Modeling Language (hereafter UML; Fowler, 2004).

Even though we approach the research based on OED's relationship theory shown in Table 1, however, the factors of the operator WR*ij* are in terms of object-oriented paradigm. Therefore, this research applies types of relationships, such as generalization, aggregation, dependency, and association to observe how concepts relate. In object-oriented technology, WRij is just like a vehicle to give an object access to the handle of another object. There are interdependencies embedded among objects. A relationship is not merely a link that ties one object to another object so that it can access the responses of other objects. A relationship also carries a sense in semantics. Object-oriented technology gives a very rich set of mechanisms or capture semantic meanings. In glossary of UML terms, they are defined as Table 4 (Lee & Tepfenhart, 2001)

Term	Definition
Generalization	A hierarchal relation between classes in which the subclass (child class) inherits all the attributes, operations, rules and objects relationships (association and aggregation) of its subclasses.
Aggregation	A hierarchy containment relationship in which part(s) can exist with the container.
Association	A peer-to-peer relationship between objects. Associative object is a special case of an object relationship in which the attributes (information) of the relationship need to be kept.
Dependency	A semantic relationship between two or more model elements. It shows that one element would be affected by the change or absence of another element.

Table 4: Definitions of four types of relationships

Then, there are results shown in Table 5 illustrating a part of database where the term 'community' shows up within the target or source concept.

Code	Target concept	Source Concept	Operators	Generalization	Aggregation	Dependency	Association
A10903	threats	Community contagion	Is_a	✓			
A06301	community named Tao-Da in Hong-Kong	pattern of space	Has_a		✓		
A07702	community	Inhabitants	Has_a		✓		
A11601	community	Contagion case	Has_a		✓		
A11103	experience of daily life in community	Activity of operation	Cause			✓	
A05702	community	case	Increase				✓
A11002	community	participation	Need				✓
A11002	community	participation	Need				✓
A07703	community	Volunteer	assemble				✓
A07902	community	Information	generate				✓
A08305	community	External control	accept				✓
A07301	community	Inhabitants	Mobilize				✓
A09101	community	People	Mobilize				✓
A08307	community	Community	Help				✓
A08303	community	The Interior of community	Self manage				✓
A08903	community	Network of Immunity	Run				✓

Table 5: Some tuples with the concept 'community' from the 'A' document

4. Results

4.1 The Set of 'Source Concept'

From equations (6) to (8), it shows a procedure to break a clause si into a tuple (WT*ij* , WR*ij* , WS*ij*). Then, we produce a databank to precede the corpora as table 5 presents. Supposed that the set WT*ij* (the 'Target' column) and the set WR*ij* (the 'Operator' column) both are given, the set WS*ij* (the 'Source' column) is as a set generated by an unknown variable to observe and the other vice versa.

Such pattern we make is from such an idea that relationships existed between two elements that can grip 'establishing a mapping, or systematic set of correspondences' (Holyoak & Thagard, 1996). For example, in the case of the term 'community,' there are two possible conditions to identify tuples. One is for the term in the target domain; the source domain is a set where one may collect possible concepts extended from it. On the other hand, if the term in the source domain, then the target domain becomes a set with concepts which play similar roles in their shared relational structure (Coulson, 2001).

Since the extended senses of a target concept can be deduced by the mechanism exemplified in Table 3, there is a case as Table 5 making a list of terms from the column of 'Source concept' where the lexicon 'community' appears in 'Target concept'. Therefore, the terms we collect are concepts as possible extending senses of the term 'community' offered by interviewees 'A', 'B' and 'C' who gave descriptive texts.

4.2 Categorizing Extended Source Concepts

The extended source concepts can be further categorized. For example, all the terms relevant to 'human being,' which is one of extended source

concept of target concept 'community' in Table 5, are shown in Figure 3. Thus, the terms form a set is named as (9):

Class_Source_'human being'
= { ws| ws is a term relevant to 'human being'}
= {case, contagion case, inhabitants, illegal inhabitants, people, people in need, professionals, volunteer, voluntary inhabitants} (9)

Based on (9), the extended source concept 'people' can be categorized into variant subclass according to certain attributes. Such as, the class 'People' can be judged by their addresses to decide if they are inhabitants of a community. Also, the subclass 'Inhabitants' can find out suspicious contagious cases in term of body temperature. Figure 3 is a diagram in a tree structure.

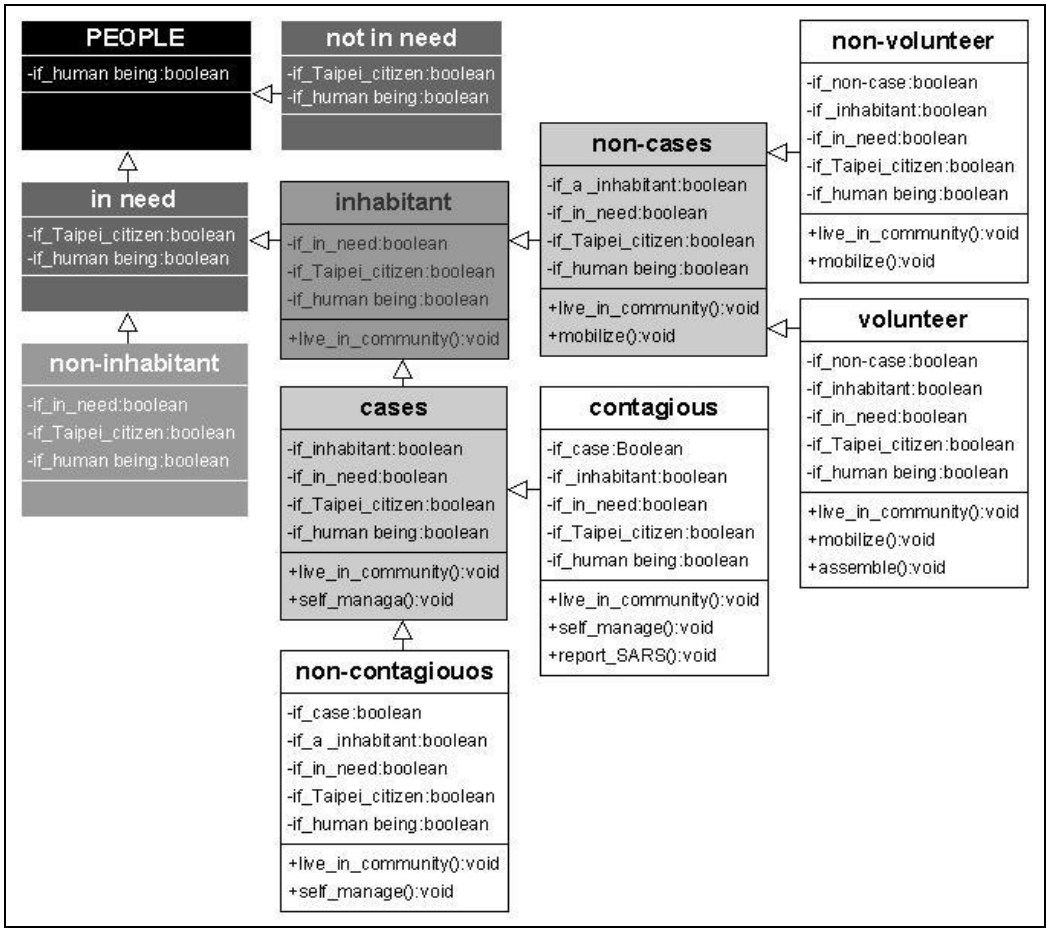

Figure 3: A diagram of the subclass 'People'

4.3 Illustrating Concepts by UML

The UML is a family of graphical notations which help in describing and designing software system, particularly for building in object-oriented style (Fowler, 2004). According to Table 5, Figure 4 is a diagram revealing the conceptual network of the term 'community'. Obviously, there are variant elements drawn in the diagram which is constructed by graphical components with definitions given by UML.

For the sake of its relatively open standard, this research applies its tools as outlining in a reverse-engineer direction (Fowler, 2004: 1-3). Although it is not a goal to compile a program in this research, building a diagram like Figure 4 gives benefits of making concept structure visible.

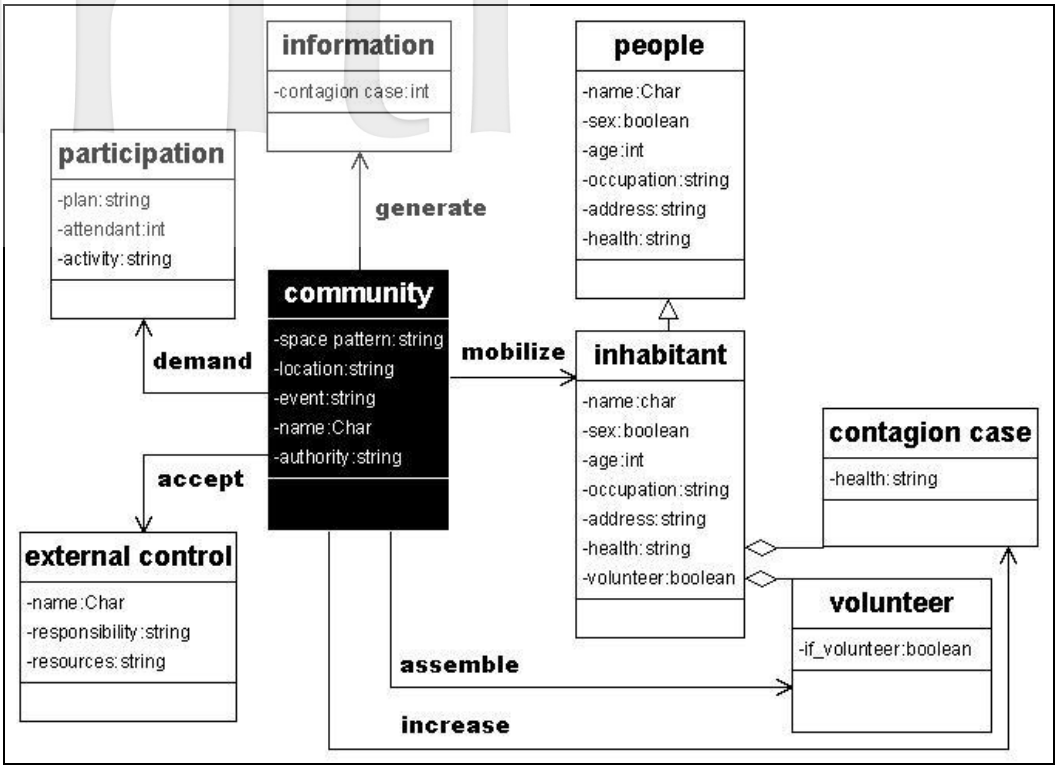

Figure 4: The conceptual network of the term 'community'

5. Conclusive Discussions

In viewpoint of data processing, natural languages possess not only strings of syntactical structures but also senses embedded mentally. As an issue of knowledge representation, what a challenge is to make documents both machine-readable and comprehensive precisely as human being.

This research proposes an analytical method to construct a well-defined conceptual network, which is to build up a relational data model in form of OODA from decomposing descriptive texts. Furthermore, a schema for integrating data is the main requirement to explore concepts and their relationships. Hence, the steps of technique are not only reconstructing a sentence as an artifact, but also transforming into tuples to mine potential sources and operators within concepts with respect to a specific target term.

Based on results of analyzing the term 'community', the database we obtain is helpful to compare what constitutes a concept among variant descriptive texts, find out and categorize the set of extending senses in common, and visualize the implicit context by UML. So far as what we've found is that the concept 'community' would never be a lexicon independent of relevant sub concepts. It exposes both valid and credible for a term making senses upon situations by the research.

In term of semantics, the concept of 'community' is not a lexicon independent of other relevant senses. Even in an approach to ontology engineering, it can be observed that extended senses from a term can vary dynamically. After all, what obstruct knowledge representation most are issues about techniques of formalization. Behaving in a well-defined form remains the key point to build up a database. Therefore, finding more effective techniques, as denotation in the research, may go further at next phase.

6. Further Works

The research applies different domain knowledge, e.g., linguistics and software engineering, to define an informative technique for real-world problems. From the viewpoint, there are still some shortcomings to be improved in the future:

In the research, it seems that only a well-trained expert could utilize this technique. Therefore, in order

to benefit the designers or planners who are not familiar with UML and linguistics, this technique is expected to be better implemented as automatic or semi-automatic than what it does in current. At least, a complete procedure of formalization in the research should be carefully endued with operational steps as possible.

This research uses the content of newspapers written in Mandarin during the event SARS. If we are going to compare the ontology of the term 'community' in other culture using different language, it needs some specific strategies to solve translation problems cross cultures with highly idiosyncratic interpretations.

What obstruct knowledge representation most are issues about techniques of formalization. Behaving in a well-defined form remains the key point to build up a database. Therefore, finding more effective mechanisms, as denotation in the research, may go further at next phase.

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