Lexical Mismatches between English and Korean: with Particular Reference to Polysemous Nouns and Verbs

Yae-Sheik Lee*†
Kyungpook National University

Yae-Sheik Lee. 2000. Lexical Mismatches between English and Korean: with Particular Reference to Polysemous Nouns and Verbs. *Language and Information 4.1*, 43–65. Along with the flourishing development of computational linguistics, research on the meanings of individual words has started to resume. Polysemous words are especially brought into focus since their multiple senses have placed a real challenge to linguists and computer scientists. This paper mainly concerns the following three questions with regard to the treatments of such polysemous nouns and verbs in English and Korean. Firstly, what types of information should be represented in individual lexical entries for those polysemous words? Secondly, how different are corresponding polysemous lexical entries in both languages? Thirdly, what does a mental lexicon look like with regard to polysemous lexical entries? For the first and second questions, Pustejovsky's (1995) Generative Lexicon Theory (hereafter GLT) will be discussed in detail: the main focus falls on developing alternative way of representing (polysemous) lexical entries. For the third question, a brief discussion is made on mapping between concepts and their lexicalizations. Furthermore, a conceptual graph around conept'bake' is depicted in terms of Sowa (2000) **(Kyungpook National University)**

1. Introduction

Recently lexical semantics has gained growing popularity due to recent advancements in computational linguistics. One of its main task is to implement an intelligent computer system which can understand knowledge expressed in a natural language. Especially, such computational applications as machine translation and trans-lingual information retrieval require a machine-readable lexicon of the languages in question. Also the representation of lexical entries in the lexicon should be rich enough to enable the computer system to perform intelligent reasoning about natural language expressions based on them. Therefore, lexical semantics

whose main interest is in dealing with the meanings of individual words has come into fashion. As far as meaning description of individual words is concerned, polysemous lexical items pose the most thorny problems to semanticists and computer scientists alike.

The purposes of the present analysis of polysemous lexical items are threefold: first, to investigate what information should be represented in lexical entries; second, to discuss how to design entries for polysemous lexical items in English and Korean; third, to put forth conceptual structures of polysemous words and to get a picture of the lexicon based on them. To these ends, previous work, especially the GLT, is discussed in detail and compared with the current analysis. The present analysis is presented in the following manner: previous analyses of polysemy are first discussed and followed by treatment of the topics of designing lexical entries, comparing English and Korean polysemous lexical items in terms of conceptual structures and ways of lexicalizing relevant concepts.

2. Previous Analyses of Polysemy

2.1 Types of Polysemy in English and Korean
Polysemy generally refers to such a phenomenon that an expression or form can be associated with more than one sense or meaning. These polysemous words can, however, be further classified based on whether the senses are logically related or not. If the senses are unrelated to each other, then the lexical items responsible for the unrelated senses are called homonymous. Meanwhile, if a lexical item carries logically related multiple senses, it is usually called polysemous. Following Weinreich (1964),Pustejovsky (1995) names the former and latter phenomena 'contrastive ambiguity' and 'complementary polysemy,' respectively. The following English data exemplify two such types ofpolysemy:

(1) (i) contrastively ambiguous (homonym)
    a. Mary walked along the bank of the river.
    a'. Harbor Bank is the richest bank in the city.
    b. The judge asked the defendant to approach the bar.
    b'. The defendant was in the pub at the bar.

   (ii) complementarily ambiguous (polysemous)
    a. Mary painted the door blue yesterday.
    a'. Mary walked through the door yesterday.
    b. The magazine fired its editor.
    b'. John spilled coffee on the magazine.
    c. John sat on the book.
    c'. The book is difficult but interesting.

Copestake and Briscoe (1996) bifurcate the latter type of polysemy given in (1-ii) according to the causes of proliferating senses of lexical items. One is attributed to so-called sense modulation or syntagmatic combination; the other

is due mainly to metonymic and metaphoric sense extensions. Consider the data given in (2).

(2) (i) constructional polysemy (sense modulation)
    a. film reel   a'. fishing reel
    b. a fast car   b'. a fast driver
    c. John began the book.   c'. John began reading the book.
    d. John baked the cake.   d'. John baked the potato.

(ii) metonymic/metaphoric polysemy (sense extension)
    a. John ate lamb for breakfast.
    b. Sam wears rabbit regularly.
    c. The village voted conservative at the last election.
    d. The French fries/ham sandwich wants a coke.
    e. Mary watered the apple in the garden.
    e'. Mary ate the apple.

It is also possible to classify the Korean polysemous lexical items into two types as mentioned above in (1). However, only a simple comparison of the polysemous lexical items in English and Korean reveals that no strict parallelism can be found between Korean and English polysemous lexical items. The following examples show this.

(3)   contrastively ambiguous (homonym)

    a. mos-ey   mul-i   eps-ta.
       pond-Loc water-Nom devoid-Dec
       'The pond is devoid of water.'

    a'. mos-ul   pak-ta.
        nail-Acc drive-Dec.
        'to drive a nail'

    b. onul-un   palam-i   eps-ta.
       today-Top wind-Nom devoid-Dec
       'Today has no wind.'

    b'. na-nun palam-i   eps-ta.
        I-Top   wish-Nom dovoid-Dec
        'I have no wish.'

(4)   complementarily ambiguous (polysemous)

    (i) **animal vs. meat**

    a. yang-i   wulko iss-ta.
       lamb-Nom bleat Prog-Dec
       'A lamb is bleating.'

a′. ??John -un cenyek-ulo yang-ul   mek-ess-ta.
         -top dinner-for lamb-Acc eat-pst-Dec
    'I ate lamb for dinner.'

(ii) **plant vs. food**

b. ??Mary -nun sakwa-ey mul-ul   cwu-ess-ta.
         -Top apple-at water-Acc give-pst-Dec
    'Mary watered the apple tree.'

b′. Mary -nun sakwa-lul mek-ess-ta.
         -Top apple-Acc eat-pst-Dec
    'Mary ate the apple.'

(iii) **producer vs. product**

c. ?? ku capci/chayk-nun   phyencipca-ul haykohay-ss-ta
     the magazine/book-Top editor-acc   fire-pst-Dec
    'The magazine/book fired its editor.'

c′. Mary- nun capci/chayk-ey   coffee-lul ssot-ass-ta
         -Top magazine/book-over coffee-Acc spill-pst-Dec
    'Mary spilled coffee over the magazine/book.'

c″. ku capci/chayk-nun   caymiiss-ta.
    the magazine/book-Top interesting-Dec
    'The magazine/book is interesting.'

(iv) **physical object vs. aperture**

d. John -nun mun-ul   phulukey chilhay-ss-ta.
         -Top door-Acc blue   paint-pst-Dec
    'John painted the door blue.'

d′. John -nun mun-ulo   tulewa-ss-ta.
         -Top door-thru enter -pst-Dec
    'John walked through the door.'

(v) **place vs its people**

e. ku maul-ey- nun cohun siktang-i   manh-ta.
    the village-at- Top good restaurant-Nom many-Dec
    'In the village, there are many good restaurants.'

e′. ku maul-un John- lul   cicihay-ss-ta.
    the village-Top   -Acc support-pst-Dec
    'The village supported John.'

(vi) **aspectual verbs showing complement alternations**

    f. ??Mary -nun chayk -ul   sicakhay-ss-ta.
           -Top book   -Acc begin-pst-Dec
     'Mary began a book.'

    f'. Mary -nun chayk -ul   ilk-ki   sicakhay-ss-ta.
           -Top book   -Acc read-ing begin-pst-Dec.
     'Mary began reading a book.'

The above examples show that even if complementarily polysemous lexical items carry logically related senses, they might not occur cross-linguistically. Such lexical discrepancies may result in mismatches in the lexicons of the languages in question. In the next section, previous analyses are reviewed concerning their treatments of polysemous lexical items.

2.2 Previous Treatments of Polysemy

In the literature there are mainly three groups of analyses on polysemy. One puts much stress on how to explicitly represent lexical entries for polysemous lexical items. Accordingly, most of the works thatfall within this group try to put forth an appropriate representational framework. Pustejovsky (1995) and Copestake and Briscoe (1996) are representative of this group. The other attempts to account for the reason why polysemy is systematic and abundant Those works within the second group propose pragmatic lexical rules which can capture behaviors of polysemous lexical items. Nunburg (1996) and Blutner (1998) can be said to representatively belong to the second group. Their main idea is that polysemy is a pragmatic phenomenon. The works belonging to the third group are done in the framework of cognitive linguistics or semantics. Lakoff (1993), Langacker (1998), Sowa (2000), and others represent the third group. What they have in common is the idea that the meaning carried by a lexical item is the concept named by the lexical item, and the prototypical concept of a polysemous lexical item extends to resemblant concepts.

    Some previous analyses of polysemy in Korean are first warranted. Most of these analyses can be classified into two camps: works belonging to the first camp[1] mainly focus on descriptive representation of senses of one or two polysemous lexical items. In other words, they try to show how many senses a polysemous word can have. The analyses under the second camp are more theory-related. They attempt to account for the source of polysemy (Lim 1996) and to design the lexical entries for polysemous words (Lee 1987, Kwon 1999) within a theoretical framework. Lim (1996) tries to apply a cognitive view such as Langacker (1998) and Lakoff (1987) to the treatment of Korean polysemy. And Lee (1987) shows how to arrange the multiple senses of a polysemous word within its lexical entry for a traditional dictionary. His idea is that the prototypical sense should be given first in the lexical entry. Kwon's (1999) starting point is radically different from

---

1. Most of the Korean references in Lim (1996) and Shin (1991) can be taken as belonging to the first groups.

the other analyses of Korean polysemy. His ultimate goal was to come up with a machine-readable Korean dictionary. He states that polysemous lexical items can be treated differently from monosemous ones in terms of subcategorization and case-frame. Unfortunately he mentions it in passing so that it is impossible to guess how to design the lexical entries for polysemous lexical items.

Since one of the main tasks of this paper concerns the issue of how to design or represent lexical entries of polysemous words, most of this section is devoted to making a good introduction of the GLT framework of Pustejovsky (1995) . He wants to "achieve a model of meaning in language that captures the means by which words can assume a potentially infinite number of senses in context, while limiting the number of senses actually stored in the lexicon."[2] To this end, he proposes that the lexicon should consist of two parts: one is the list of lexical items which are represented as encoding the limited but adequate number of types of lexical semantics. To be more specific about how lexical entries are represented in the GLT, lexical entries contain the following three levels of lexical semantics:

(5) a. Argument Structure   b. Event Structure
    c. Qualia Structure

Firstly, Argument Structure contains information about participants which are involved in bringing the entity denoted by the lexical item into being. In other words, it specifies information about the number of arguments and their semantic types. Secondly, Event Structure encodes information not only about the type of event which the lexical item in question denotes or is relevant to, but also about the temporal relation between the subevents. Thirdly, Qualia Structure encodes information about what the entity of the lexical item in question is. In turn, it is composed of the following units of information: (i) Constitutive: the relation between an object and its constituents; (ii) Formal: information which distinguishes the object within a larger domain; (iii) Telic: purpose and function of the object; (iv) Agentive: factors involved in the origin or "bringing about" of an object. Pustejovsky borrows these four quale from Aristotelian essential properties for understanding things, stuff and nature[3].

The other is a set of generative devices or mechanisms which are responsible for such polymorphic behavior of language. These devices connect the different

---

2. See Pustejovsky(1995: 105) for more statements about his generative mechanisms.
3. Aristotle claims that to answer the following question of what it is, we need to cite the essence of the entity in question or the cause of its being what it is. Furthermore, there are four ways in which we cite cause: (i) material (ii) formal (iii) efficient, and (iv) final.
   To be more specific about each cause, what he means by *material cause* is that certain aspects of an object's being are caused by its matter. For example, certain aspects of being a table include properties such as hardness and burnability, which are caused by and thus explainable by reference to the kind of matter of which the object is constituted. *Formal cause* is aspects caused by the structure of an object. For example, a ball's ability to roll, a dog's ability to walk, a bird's ability to fly, etc. Efficient causes change in the structure of the matter in a fixed direction or way. *Final cause* explains the reason why particular objects with particular structures allow the organisms to function in various ways that allow them to grow, maintain, and reproduce themselves. See Prasada (1999: 121-125) for more details about the four causes.

levels of lexical semantics to provide for the compositional interpretation of words in context.

As representational formalism, Pustejovsky adopts the HPSG framework of Pollard and Sag (1994). The following examples show this.

(6) a. Lexical Entry for *cake*

$$
\begin{bmatrix}
\textbf{cake} \\
\text{ARGSTR} \quad = \quad \begin{bmatrix} \text{ARG1=x: \textbf{food}} \\ \text{D-ARG1=y: \textbf{mass}} \end{bmatrix} \\
\text{QUALIA} \quad = \quad \begin{bmatrix} \text{CONST=y} \\ \text{FORMAL=x} \\ \text{TELIC=eat(e2, z, x)} \\ \text{AGENTIVE=bake-act(e1,w,y)} \end{bmatrix}
\end{bmatrix}
$$

b. Lexical Entry for *bake*

$$
\begin{bmatrix}
\textbf{bake} \\
\text{EVENTSTR} \quad = \quad \begin{bmatrix} \text{E1=e1:process} \\ \text{HEAD=e1} \end{bmatrix} \\
\text{ARGSTR} \quad = \quad \begin{bmatrix} \text{ARG1=\boxed{1}} \begin{bmatrix} \textbf{animate} \\ \text{FORMAL=physobj} \end{bmatrix} \\ \text{ARG1=\boxed{2}} \begin{bmatrix} \textbf{mass} \\ \text{FORMAL=physobj} \end{bmatrix} \end{bmatrix} \\
\text{QUALIA} \quad = \quad \begin{bmatrix} \textbf{state-change-lcp} \\ \text{AGENTIVE=bake-act(e1,\boxed{1},\boxed{2})} \end{bmatrix}
\end{bmatrix}
$$

c. Lexical Entry for *bake a cake*

$$
\begin{bmatrix}
\textbf{bake} \\
\text{EVENTSTR} \quad = \quad \begin{bmatrix} \text{E1=e1:process} \\ \text{E2=e2:state} \\ \text{RESTR=}\langle_\propto \\ \text{HEAD=e1} \end{bmatrix} \\
\text{ARGSTR} \quad = \quad \begin{bmatrix} \text{ARG1=} \quad \boxed{1} \begin{bmatrix} \textbf{animate} \\ \text{FROMAL=physobj} \end{bmatrix} \\ \text{ARG2=} \quad \boxed{2} \begin{bmatrix} \textbf{artifact} \\ \text{CONST=}\boxed{3} \\ \text{FORMAL=physobj} \end{bmatrix} \\ \text{D-ARG1=} \quad \boxed{3} \begin{bmatrix} \textbf{material} \\ \text{FORMAL=mass} \end{bmatrix} \end{bmatrix} \\
\text{QUALIA} \quad = \quad \begin{bmatrix} \textbf{creat-lcp} \\ \text{FORMAL=be(e2,\boxed{2})} \\ \text{AGENTIVE=bake-act(e1,\boxed{1},\boxed{3})} \end{bmatrix}
\end{bmatrix}
$$

So much for the representation of lexical entries. Let us discuss Pustejovsky's generative mechanisms. He proposes the following three generative devices:

(7) (i) Type Coercion   (ii) Selective Binding   (iii) Co-composition

As (8iii) shows, Type Coercion provides us with a way in which a lexical item or phrase is coerced into a semantic interpretation by a governing item in the phrase, without change of its syntactic type. But for coerced change in the semantic type of the governed expression, *the book* given in (8b), it is impossible to get an appropriate interpretation because *begin* cannot take as its argument an expression of which type is not of an event but of an individual. This operation is very similar to that of type-lifting in terms of Partee and Rooth (1983) . In contrast, cases like (8a) don't require such a type coercion because the object of the verb *begin* that is given in the form of a gerund or infinitive clause denoting eventive entities meets the type requirement by itself. All in all, the type coercion enables us to treat as monosemous such verbs as *like, enjoy, want* that can take as their object an expression denoting either a normal individual entity or an eventive entity.[4]

Meanwhile,(9) shows that the operation of Selective Binding captures a phenomenon that a lexical item or phrase operates specifically on the substructure of a phrase, without changing the overall type in the composition. Specifically, *fast* in (9a and 9b) selectively modifies the telic quale of the Qualia structure. By contrast, *fast* in (9c) selects the agentive quale and modifies it. This generative device can account for polysemous phenomena with adjectives like *good, old,* and *sad.* Furthermore, it also enables us to deal with the above adjectives as monosemous.

The verb *bake* is polysemous because it can be either interpreted as a sense of creation or as a sense of state-change as (10a) and (10a') show, respectively. Within the framework of GLT, the sense of state-change given in (4b) is taken as the 'basic' sense of *bake.* And the sense of creation is derived through the Co-composition of the verb and its complement as shown in (4c). In other words, Pustejovsky(1995:125-126) suggests that the derived sense of each pair given in (9) exists not lexically but phrasally.[5] $e \propto e'$ means that e is the initial part of event e'. Here Q(T) (the book) stands for the telic role of the qualia structure of the book.

(8)   Type Coercion:

a. John began to run/running.

b. John began the book.

b. John began the book.

c. semantic derivation of (b)

(i) *begin*:$\lambda R \lambda x \lambda e \exists e'[R(x)(e') \wedge e \propto e']$

---

4. See Pustejovsky (1995: Chapter 7) for more data which the operation of type coercion applies to.
5. See Pustejovesky (1995: 122-127) for more discussion on the semantic transformation of co-composition.

(ii)*began the book*:$\lambda R\lambda x\lambda e\exists e'[R(x)(e') \wedge e \propto e']$(the book),
$\Rightarrow$ type mismatch!!

(iii) Type Coercion: Q_T(the book)$=\lambda z\lambda e[\text{read}(e, z, \text{the book})]$
began the book:$\lambda R\lambda x\lambda e\exists e'[R(x)(e')\wedge e\propto e'](Q_T(\text{the book}))$,
$=\lambda R\lambda x\lambda e\exists e'[R(x)(e')\wedge e\propto e'](\lambda z\lambda e[\text{read}(e, z, \text{the book})])$
$=\lambda x\lambda e\exists e'[[\text{read}(e', x, \text{the book})]\wedge e\propto e']$

(9)   Selective Binding

a.*fast car*:$\lambda x[....\text{TELIC}=\lambda e[\text{ride}(e, x)\wedge \text{fast}(e)]]$

b.*fast driver*:$\lambda x[....\text{TELIC}=\lambda e[\text{drive}(e, x)\wedge \text{fast}(e)]]$

c. *fast food*:$\lambda x[....\text{AGENTIVE}=\lambda e[\text{cook}(e, x)\wedge \text{fast}(e)]]$

(10)   Co-composition
        a. John baked the potato. (change of state)
        a'. John baked the cake. (creation)
        b. Mary wiped the table. (process)
        b'. Mary wiped the table dry. (transition)

Synthesizing what has been discussed, we are led to the conclusion that one of the GLT's merits is that it can treat a great proportion of complementarily polysemous lexical items as monosemous ones. In other words, the way of representing lexical entries with three levels of lexical semantics and the above generative mechanisms empower the GLT to treat many polysemous words as monosemous ones.

However, GLT also has its own problems with the above mentioned generative mechanisms and its way of representing lexical entries. In the next section, an alternative way is proposed of representing lexical entries which is free from those problems.

3. Polysemous Lexical Structures of English and Korean

3.1 Designing Polysemous Lexical Entries

The main purpose of this section is to propose an alternative way of representing lexical entries to that of Pustejovsky's, which meets the following needs: Firstly, Fodor and Lepore (1998) point out that GLT overstuffs lexical entries with pragmatic information. This problem will be discussed below. So lexical entries should be designed to encode not pragmatic but lexical information as faithfully as possible. Secondly, Pustejovsky's ways of dealing with polysemy might be short of cross-linguistic motivation. That is, as the data given in (3) and (4) show, polysemous lexical items in Korean do not show the same behavior as English counterparts do or vice versa. Within his framework, it is hard to capture such mismatches. So the way of representing lexical entries should be

as cross-linguistically motivated as possible. Thirdly, lexical entries are designed well enough to facilitate their employment by computational applications such as trans-lingual machine translation or information retrieval. Fourth, besides these needs, an adequate representation of lexical items is required for a faithful overall picture of a mental lexicon. To this end, the lexical entry for a lexical item should be designed to faithfully encode properties and concepts which can be associated with the lexical item by default when it is thought of.[6]

To meet these needs, at least the following fragments of information are assumed to be encoded in lexical entries:

(11) a. Lexical Information: (i) ortho-phonological information
                                  (ii) morphological information
                                  (iii) categorial information
                                  (iv) subcategorial information

      b. Argument Information: conceptual description of arguments

      c. Denotational Concept: concepts of the denotation

      d. Immediate Upper Concept: the minimally larger concepts to the denotational concept

      e. Sense Relational Information: relevant sense relations, viz synonym, antonym, hypernym, metronym, etc.

The above information is packed into lexical entries in a way similar to that of Pollard and Sag (1994) or GLT as follows:

---

6. What I have in mind by mental association are various phenomena of priming effects: semantic, phonological, orthographical priming effects. See more about them Meyer and Schvaneveldt (1976)

(12) Scheme of Lexical Entries

$$
\begin{bmatrix}
\alpha \\[4pt]
\text{LC} \quad = \begin{bmatrix} \textbf{orthophone}=[...] \\ \textbf{morpho} =[...] \\ \text{CAT}=[...] \\ \text{SCAT}=[...] \end{bmatrix} \\[20pt]
\text{ARGSTR} \quad = \begin{bmatrix} \text{ARG}\,1=\boxed{1}[...] \\ \text{ARG}\,2=\boxed{2}[...] \end{bmatrix} \\[14pt]
\text{DC} \quad = \begin{bmatrix} \alpha\prime \\ {[...]} \end{bmatrix} \\[14pt]
\text{IUC} \quad = \begin{bmatrix} 1{:}[...] \\ 2{:}[...] \\ ... \\ \text{BASE}=2 \end{bmatrix} \\[20pt]
\text{SR} \quad = \begin{bmatrix} \textbf{snynset}(\alpha\prime)= \quad [...] \\ \textbf{antset}(\alpha\prime)= \quad [...] \\ \textbf{hyperset}(\alpha\prime)= \quad [...] \\ ... \end{bmatrix}
\end{bmatrix}
$$

To specify the notations in the matrix above, 'α' stands for the name of the lexical entry. LC for the lexical concepts which can be associated with the lexical item. It contains the phonological information (phone), morphological information (morpho), and categorial (CAT) and subcategorial (SCAT) information. ARGSTR contains the conceptual information of each argument. The information encoded in ARGSTR is very similar to the selectional restriction of Chomsky (1965), Chomsky (1981). However, the information about the argument structure of a predicate and the thematic role of its arguments in Grimshaw (1990) is reflected in the description of denotational concepts (DC). DC contains the denotational (concepts of) properties which we crucially rely on when we try to

decide what entity the lexical item denotes.[7] And IUC contains the set of sets of properties for the 'immediately upper' concepts. BASE is a set of IUC elements which are necessary to determine the semantic sort of entities denoted by DC. For example, a complex concept like 'coffee mug' consists of its two IUCs 'coffee' and 'mug'. In this case, the BASE is the singleton set {MUG} since a coffee mug is a kind of mug. The notion of 'immediately upper' concepts will be dealt with in detail below. Finally, SR (sense relations) bears the information about relevant lexical items that stand in some sense relations such as synonym, antonym, hypernym, troponym, etc. Consider the following lexical entry for *book* which is represented in the current way.

(13) lexical entry for *book*

$$
\begin{bmatrix}
\textbf{book} \\[4pt]
\text{LC} = \begin{bmatrix} \textbf{orphophone} & = [\text{book}] \\ \text{morpho} & = [\text{pl}:\text{book}] \\ \text{CAT} & = [=\text{N},\text{-V}] \\ \text{SCAT} & = [\text{N/A}] \end{bmatrix} \\[4pt]
\text{ARGSTR} = \begin{bmatrix} \text{ARG1} & = & \boxed{1}[\text{bundle-of-paper}] \\ \text{ARG2} & = & \boxed{2}[\text{written-info}] \\ .... \end{bmatrix} \\[4pt]
\text{DC} = \begin{bmatrix} \text{book} \\ \lambda x \quad \exists \; y\; [\boxed{1}(x)\wedge\boxed{2}(y)\wedge\text{hold}(x,y)] \end{bmatrix} \\[4pt]
\text{IUC} = \begin{bmatrix} 1{:}\lambda x[\boxed{1}(x)] \\ 2{:}\lambda x[\boxed{2}(x)] \\ \text{BASE} & = \; 1,2 \end{bmatrix} \\[4pt]
\text{SR} = \begin{bmatrix} \text{snyneset} & = [\text{book,volume,...}] \\ \text{hyperset} & =[\text{publication,...}] \\ \text{meroset} & = \begin{bmatrix} \text{IUC-1} & =[\text{binding, cover,page}] \\ \text{IUC-2} & =[\text{headline,...}] \end{bmatrix} \\ \text{hyposet} & = \begin{bmatrix} \text{IUC-1} & = [\text{paperback,...}] \\ \text{IUC-2} & =[\text{dictionary, introduction...}] \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

Let us explicate the above matrix for *book*. Firstly, ARGSTR (Argument Structure) provides information about the two participants which are involved in bringing into being the object that is called 'book'. One is a bundle of paper; the other is written information. Secondly, the semantic information is given in two parts, DC and IUC. DC contains the denotational property or concept, namely, 'the

---

7. An anonymous reviewer pointed out that the motivation for introducing DC in a lexical entry is not described clearly and to a satisfactory extent. However, its motivation is linguistically obvious because lexical entries should be assumed to encode their semantics on which we are dependent to determine their denotations, and DC contains the integral part of the semantics.

set of bundles of paper containing written information.' IUC which is about the immediately upper concepts to the denotational concept consists in turn of two concepts: one is the concept responsible for the reading of *book* as a physical entity; the other is for the sense of *book* as the information or contents. To put this fact in terms of 'lexical access,' as soon as the lexical entry for *book* in the mental lexicon which contains a lexical entry like (13) is given access to, these two upper concepts are spontaneously and simultaneously activated. This can be taken to account for the polysemous behavior of *book* observed in data given in (1-ii). Note that *book* is dealt with as a monosemous lexical item.

3.2 Comparison with Pustejovsky's Polysemous Lexical Entries

With regard to accounting for the behavior of polysemous lexical items like those given in (1) to (4) above, what desirable consequences follow from the current way of representing lexical entries, compared with that of GLT? Firstly, consider the data given in (14).

(14) a. John began the book last month.
      a′. John began to read the book last month.
      a″. John began to write the book last month.
      b. The author began the book last month.
      b′. The author began to write the book last month
      c. The reader began the book last month.
      c′. The reader began to read the book last month.
      d.??John began the rock.

As explained above, Pustejovsky (1995) tries to fill the meaning gap 'to write' or 'to read' with the Agentive or Telic quale of Qualia Structure and a generative device, Type Coercion. However, he leaves unexplained how the Type Coercion chooses (14a′) or (14a″) for the interpretation of (14a). The pairs of (b and b′) and (c and c′) show that the contextual knowledge or pragmatics is responsible for this business. This is the reason why Copestake and Briscoe (1996) try to represent as a defeasible predicate Putesjovsky's Telic predicate of Qualia Structure. However, this revision is inadequate because Copestake and Briscoe have to take the Agentive predicate of Qualia Structure to be defeasible, as well. Furthermore, GLT and its proponents will have difficulty in accounting for why English data like (14d) sound awkward. Besides, even if it is taken for granted that the information about Agentive and Telic should be represented in the lexical entry, GLT cannot explain why the Korean counterparts like (4vi) sound ungrammatical. In other words, why can Type Coercion not apply to cases such as (4vi)? Such an undesirable situation is due to Pustejovsky's cramming of pragmatic stuff into the lexical semantics bag. That is why the current analysis takes such pragmatic stuff out of lexical entries, and tries to replace it with denotational stuff.

As the following lexical entries show, the current way of representing lexical entries for *begin* and *sicakha* can generate a plausible explanation for the above

problem: English *begin* can take an object-denoting NP as its complement while its Korean counterpart *sicakha* can only take what refers to an event-type entity.[8][9]

(15)   a. lexical entry for *begin* in English

$$
\begin{bmatrix}
\text{begin} \\[4pt]
\text{LC} =
\begin{bmatrix}
\text{ORTHOPHONE}= \begin{bmatrix}\text{BEGIN}\end{bmatrix} \\[4pt]
\text{MORPHO} = \begin{bmatrix}\text{PST:BEGAN} \\ \text{P:BEGUN}\end{bmatrix} \\[4pt]
\text{CAT} = \begin{bmatrix}\text{-N,+V}\end{bmatrix} \\[4pt]
\text{SCAT} = \begin{bmatrix}\text{NP V-ING}\end{bmatrix}
\end{bmatrix} \\[20pt]
\text{ARGSTR} =
\begin{bmatrix}
\text{ARG1}= \boxed{1}\begin{bmatrix}\text{HUMAN}\end{bmatrix} \\[4pt]
\text{ARG2} = \begin{bmatrix} \boxed{2}\text{-1:}\begin{bmatrix}\text{PHYOBJ}\end{bmatrix} \\ \boxed{2}\text{-2:}\begin{bmatrix}\text{ENENTIVE}\end{bmatrix}\end{bmatrix} \\[8pt]
\text{TYPE1: BEGIN}(\boxed{1},\boxed{2}\text{-1}) \\[4pt]
\text{TYPE2: BEGIN}(\boxed{1},\boxed{2}\text{-2})
\end{bmatrix} \\[24pt]
\text{DC} =
\begin{bmatrix}
\text{BEGIN-ACT}' \\[4pt]
\text{TYPE1} = \text{C}\boxed{1}:\Big[\lambda\text{E,E,X}\big[\text{E}\propto,\text{E}' \wedge \text{R}(\text{E}',\boxed{2}\text{-1})\wedge\text{R}(\text{E}',\text{X})\wedge\text{AGENT}(\text{E}',\text{X})\big]\Big] \\[8pt]
\text{TYPE2: C}\boxed{2}:\Big[\lambda\text{E,E}',\text{X}\big[\text{E}\propto,\text{E}' \wedge \boxed{2}\text{-2}(\text{E}')\wedge \text{AGENT}(\text{E}',\text{X})\big]\Big]
\end{bmatrix} \\[24pt]
\text{IUC} =\begin{bmatrix}...\end{bmatrix} \\[4pt]
\text{SR} =\begin{bmatrix}...\end{bmatrix}
\end{bmatrix}
$$

---

8. Event type entities mean objects of which beings occupy an amount of time and space. What VPs denote are representative examples of this type. Among nouns, what *war*, *study*, *work*, etc refer to also exemplify this type of object. For more about event type objects see Pustejovsky (1995: Chapter 8).

9. A reviewer challenged the current idea about the lexical entry for *sicakha* 'begin' in Korean with the following example which seems to allow for a normal noun as the object of the verb *sicakha*.

    wuli-nun   capci-lul   sicakha-ltheyni,
    tangsin-tul-un yenghwa-lul sicakhay-posio.
    we-top   magazine-Acc begin-will
    you-pl-Top movie-Acc   begin-try
    'We will begin with magazines and you try to begin with movies.'

The reviewer contended that the above sentence is quite acceptable under a 'clear' context like that of censorship. In my intuition, however, the verb *sicakha* employed in the above sentence is used as a light verb, and *capci* and *yenghwa* are licensed as the internal argument of a possible object of the light verb, *kemyel* 'censoring,' which is dropped. Given that Korean is a heavily context-dependent language (e. g., drops of contextually well understood expressions such as subject and object), such a judgement might be shared by many native Korean speakers. In sum, the point is that in a neutral context, the above sentence will come with an expression denoting an event like kemyel 'censoring,' before the light verb *sicakha* as other normal examples with the verb *sicakha*.

b. lexical entry for *sicakha* in Korean

$$
\begin{bmatrix}
시작하 \\
\text{LC} = \begin{bmatrix}
\textbf{orthophone} = \begin{bmatrix} 시작하 \end{bmatrix} \\
\textbf{morpho} = \begin{bmatrix} \textbf{pst.} \ 시작했 \end{bmatrix} \\
\text{CAT} = \begin{bmatrix} \text{-N, -V} \end{bmatrix} \\
\text{SCAT} = \begin{Bmatrix} \text{NP} \\ \text{V-기} \end{Bmatrix} \\
\text{ARGSTR} = \begin{bmatrix}
\text{ARG1} = \boxed{1} \begin{bmatrix} \textbf{human} \end{bmatrix} \\
\text{ARG2} = \boxed{2} : \begin{bmatrix} \textbf{eventive} \end{bmatrix} \\
\text{TYPE1: } 시작하(\boxed{1}, \boxed{2})
\end{bmatrix} \\
\text{DC} = \begin{bmatrix}
\textbf{begin-act}' \\
\lambda e,e',x \ [e \propto e' \wedge \boxed{2}(e') \wedge \textbf{agent}(e',x)]
\end{bmatrix} \\
\text{IUC} = \begin{bmatrix} ... \end{bmatrix} \\
\text{SR} = \begin{bmatrix} ... \end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

In DC of (16a), there is a relation R that is left unspecified. Pragmatics will take care of its specification. In other words, the ongoing context determines what R is. The lexical matrix given in (16) can account for why (14d) sounds awkward. To make some sense out of cases like (14d) requires a lot of effort. All the effort is taken up with determining the predicate R. If the contextual knowledge provides such information that John is an artist, eg. a sculptor, then the R is likely to be 'cut' or 'sculptor'. The present analysis gives this problem back to the field of pragmatics.

Secondly, concerning Co-composition and polysemous lexical items like *bake*, let us consider the lexical entry given in (16).

(16) lexical entry for *bake* in English

$$
\begin{bmatrix}
\text{bake} \\[4pt]
\text{LC} = \begin{bmatrix}
\text{orthophone} = [\text{bake}] \\
\text{morpho} = [\text{pst. baked}] \\
\text{CAT} = [\textbf{-N, +V}] \\
\text{SCAT} = [\textbf{NP}]
\end{bmatrix} \\[4pt]
\text{ARGSTR} = \begin{bmatrix}
\text{ARG}1 = \boxed{1}\,[\text{human}] \\
\text{ARG}2 = \left\{\begin{array}{l} \boxed{2}\text{-}1 : [\text{pastry}] \\ \boxed{2}\text{-}2{:}[\text{vegetable}] \end{array}\right\} \\
\text{D-ARG}1 = \text{D}\boxed{1}\,[\text{food-ingredient}] \\
\text{D-ARG}2 = \text{D}\boxed{2}\,[\text{oven}] \\
\text{TYPE}1: \text{BAKE}(\boxed{1},\ \boxed{2}\text{-}1,\ \text{D}\boxed{1}) \\
\text{TYPE}2: \text{BAKE}(\boxed{1},\ \boxed{2}\text{-}2)
\end{bmatrix} \\[4pt]
\text{DC} = \begin{bmatrix}
\text{bake-act} \\
\text{TYPE}1 = \text{C}\boxed{1}\begin{bmatrix} \lambda e,x,y,z\ \exists w\ [\boxed{1}(x)\wedge\boxed{2}\text{-}1(y)\wedge\ \text{D}\boxed{1}(z)\wedge\text{D}\boxed{2}(w)\wedge \\ \text{bake}(e,x,y,z,w)\wedge\ \text{agent}(e,x)\wedge\text{theme}(e,y) \\ \text{instru}(e,w)\wedge\text{source}(e,z)] \end{bmatrix} \\
\text{TYPE}2 = \text{C}\boxed{2}\begin{bmatrix} \lambda e,x,y\ \exists w\ [\boxed{1}(x)\wedge\boxed{2}\text{-}1(y)\wedge\ \text{D}\boxed{2}(w)\wedge\text{bake}(e,x,y,w)\wedge \\ \text{agent}(e,x)\wedge\text{theme}(e,y)\wedge\ \text{instru}(e,w)] \end{bmatrix}
\end{bmatrix} \\[4pt]
\text{IUC} = \begin{bmatrix}
\text{C}\boxed{1} \Rightarrow \lambda e,x,y,z\ \exists w\ [\boxed{1}(x)\wedge\boxed{2}\text{-}1(y)\wedge\ \text{D}\boxed{1}(z)\wedge\text{D}\boxed{2}(w)\wedge \\ \quad \text{create}(e,x,y,z,w)\wedge\ \text{agent}(e,x)\wedge\text{theme}(e,y) \\ \quad \text{instru}(e,w)\wedge\text{source}(e,z)] \\
\text{C}\boxed{2} \Rightarrow \lambda e,x,y\ \exists w\ [\boxed{1}(x)\wedge\boxed{2}\text{-}2(y)\wedge\text{D}\boxed{2}(w)\wedge \\ \quad \text{changeofstate}(e,x,y,w)\wedge\ \text{agent}(e,x)\wedge\text{theme}(e,y)\wedge\text{instru}(e,w)]
\end{bmatrix} \\[4pt]
\text{SR} = \begin{bmatrix}
\text{C}\boxed{1}{:}\begin{bmatrix} \text{synset} = [\text{bake, ...}] \\ \text{hyperset} = [\textbf{create, make ...}] \\ \cdots \end{bmatrix} \\
\text{C}\boxed{2}{:}\begin{bmatrix} \text{synset} = [\text{bake, ...}] \\ \text{hyperset} = [\textbf{cook, change ...}] \\ \cdots \end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

The above lexical entry shows that the general 'bake-act' denoted by verb *bake* alone is refined into two different baking acts depending on its theme and source arguments: one denotes the act of creating oven-baked goods from food ingredients; the other refers to the act of changing the state of vegetable food such as a potato. What the information given in IUC informs us is that the immediate upper concepts to the concept 'bake' are the concepts 'create' and 'change' which have in common the concept 'in-the-oven'. The additional concept from theme or goal argument turns them into the concept bake.[10] To compare the current way of

---

10. To point out that AGR2 in the lexical entry given in (16) is too specific, a reviewer provided the following sentence. *John baked the cake by mistake.* The reviewer insisted that the above sentence

representing lexical entries for lexical entries such as *bake* with that of Pustejovsky (1995), we do not have to assume an additional rule like Co-composition discussed above. Instead, we can rely only on a normal functional application rule for the composition of a predicate and its complement.

Thirdly, let us see how the current analysis can account for the incongruities observed with such metonymically polysemous words in English and Korean as is presented in (1), (2) and (4)[11]

Let us firstly compare the lexical entry for *book* given in (13) and that of (17) in the framework of GLT.

(17) Lexical Entry for *book*

$$
\begin{bmatrix}
\textbf{book} \\
\text{ARGSTR} = \begin{bmatrix} \text{ARG}1 = \textbf{x: information} \\ \text{ARG}2 = \textbf{y: physobj} \end{bmatrix} \\
\text{QUALIA} = \begin{bmatrix} \textbf{information\cdot physobj\text{-}lcp} \\ \text{FORMAL} = \textbf{hold(y,x)} \\ \text{TELIC} = \textbf{read(e,w,x,y)} \\ \text{AGENT} = \textbf{write(e',w,x,y)} \end{bmatrix}
\end{bmatrix}
$$

As the two facets of *book*, 'information' and 'bundle of paper' are retrievable in both entries. Such information retrieval in GLT is only possible with the help of a particular type coercion rule[12] But it is just possible in the present analysis since the DC specifies a book as a concept which consists of its sub concepts 'bundle of paper' and 'written information,' and furthermore these two concepts are represented as BASE elements. This means that the two concepts are so equally available that it doesn't matter which type the governing expression requires.

---

can be interpreted either as having a creation sense or a state-change sense. In contrast, most English native speakers substitute *rebaked* for *baked* so as to convey the sense of 'state-change'. Otherwise they judged it to sound awkward. Furthermore, but for the final phrase *by mistake*, they always have the reading of 'creation'. Even if the sentence John *baked the cake* can convey the sense of creation, it is not devastating to the current analysis because any food ingredient cannot be thought of as the source of the cake in the state-changing event. Of course, in such a case, ARG2 is too specific. A replacement of the concept 'vegetable' with a more general concept such as 'cookable physical object' might be a solution to this problem.

11. Metonymically polysemous data can be divided into two groups: One includes lexical items whose polysemous behavior is explicable in terms of the information encoded in their entry. All the data given in (1), (2) and (4) belong to this group. The other contains data like the following examples whose polysemy we cannot account for in terms of the information in their entries alone.

    a. The ham sandwich is at table 7.

    b. That french fries is getting impatient.

    c. Yeats did not like to hear himself in an English accent.

    d. Ringo squeezed into a narrow space (at a parking lot)

Here, these data will not be touched upon because they are definitely beyond the scope of the current analysis. See Nunburg (1996) for more discussions on these data.

12. (Pustejovsky 1995:150) calls the coercion rule Dot Object Subtyping Rule, Θ and defines it as follows: γ: $\delta1\cdot\delta2$, $\Theta[\delta1\leq \tau, \delta2\leq \tau]$:$\delta1\cdot\delta2 \to \tau/\Theta\{\delta1\leq \tau, \delta2\leq \tau\}(\gamma)$: τ

The above type inference rule states that given an expression γ of type $\delta1\ \delta\ 2$, which is a dot or complex object, there is a subtyping relation possible between the dot object and a type τ, just in case τ is the least upper bound of both of the dot elements $\delta1$ and $\delta2$; coercion furthermore allows the dot object to pass in an environment normally typed for τ.

Meanwhile, GLT specifies lexical items like *magazine* and *newspaper* as a complex type which is composed of three subtypes. 'organization,' 'information,' and 'physical object' as the following matrix shows:

(18) lexical entry for *magazine* in English

$$
\begin{bmatrix}
\textbf{magazine} \\
\text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \textbf{x: org} \\ \text{ARG2} = \textbf{y: info·physobj} \end{bmatrix} \\
\text{QUALIA} = \begin{bmatrix} \textbf{org·info·physobj-lcp} \\ \text{FORMAL} = \textbf{y} \\ \text{TELIC} = \textbf{read(e2,w,y)} \\ \text{AGENT} = \textbf{publish(e1,x,y)} \end{bmatrix}
\end{bmatrix}
$$

However, the current analysis would like to specify the lexical entry for *capci* 'magazine' to account for why (4c) sounds ungrammatical or deviate as follows:

(19) lexical entry for *capci* in Korean

$$
\begin{bmatrix}
\textbf{잡지} \\
\text{LC} = \begin{bmatrix} \textbf{orthophone} = [\text{잡지}] \\ \text{CAT} = \textbf{[+N, -V]} \end{bmatrix} \\
\text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \boxed{1} \ \textbf{[bundle-of-paper]} \\ \text{ARG2} = \boxed{2} \ \textbf{[written-info]} \end{bmatrix} \\
\text{DC} = \begin{bmatrix} \textbf{magazine}' \\ \lambda x \exists y \ [\boxed{1}(x) \wedge \boxed{2}(y) \wedge \textbf{hold}(x,y) \\ \wedge \textbf{regularly-published}(y)] \end{bmatrix} \\
\text{IUC} = \begin{bmatrix} \textbf{1:} \ \lambda x \ [\boxed{1}(x)] \\ \textbf{2:} \ \lambda x \ [\boxed{2}(x)] \\ \text{BASE} = \textbf{1, 2} \end{bmatrix} \\
\text{SR} = \begin{bmatrix} \textbf{synset} = [\text{잡지}, ...] \\ \textbf{hyperset} = [\text{정기간행물}, ...] \\ \cdots \end{bmatrix}
\end{bmatrix}
$$

The only difference in DC between the lexical entries for book and capci 'magazine' in Korean is that the DC for *capci* 'magazine' has the property or concept 'being regularly published'. The lexical entry for magazine in English shows that the concept of 'magazine' contains the concept 'organization' while the Korean counterpart doesn't. This difference is responsible for the polysemous incongruity observed in (1-iib) and (4iii). As shown in section 2.1., a bound morpheme *-sa* 'company' is required to attach to the end of capci so as to carry the meaning of a magazine company. In traditional Korean dictionaries, *capci+sa* is registered as an independent word. Hence, *capci+sa* in Korean is conceptually similar to the concept of 'magazine' given in (18). Therefore, the lexical entry for *capci+sa* can be given as follows:

(20) lexical entry for *capci+sa* in Korean

$$
\begin{bmatrix}
\text{잡지사} \\
\text{LC} = \begin{bmatrix} \textbf{orthophone} = [\text{잡지사}] \\ \text{CAT} = [\textbf{+N, -V}] \end{bmatrix} \\
\text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \boxed{1}\ [\textbf{magazine}] \\ \text{ARG2} = \boxed{2}\ [\textbf{organization}] \end{bmatrix} \\
\text{DC} = \begin{bmatrix} \textbf{magazine-company} \\ \lambda x,y \exists e\ [\boxed{1}(x) \wedge \boxed{2}(y) \wedge \textbf{publish}(e,y,x) \\ \wedge \textbf{regular}(e) \wedge \textbf{agent}(e,y) \wedge \textbf{theme}(e,x)] \end{bmatrix} \\
\text{IUC} = \begin{bmatrix} \textbf{1:}\ \lambda x\ \big[\boxed{1}(x)\big] \\ \textbf{2:}\ \lambda x\ \big[\boxed{2}(x)\big] \\ \text{BASE} = \textbf{2} \end{bmatrix} \\
\text{SR} = \begin{bmatrix} \textbf{synset} = [\text{잡지사, ...}] \\ \textbf{hyperset} = [\text{출판사, ...}] \\ \cdots \end{bmatrix}
\end{bmatrix}
$$

The main difference between the lexical entries given in (18) and (20) is that in the former, three concepts (e.g. 'organization,' 'information,' 'physical object') are all equally available through Type Coercion and Dot Object Subtyping Rule while in the latter only the concept 'organization' is available because it is represented as the only BASE IUC. This difference prevents *capci+sa* in Korean from being interpreted as the content of the magazine or the magazine itself, the physical object as the following data show:

(21) a. *John- nun capcisa-lul   ilk-ess-ta.
        -Top magazine co.-Acc read-pst-Dec
     Intended Interpretation: 'John read the magazine.'

    b. *John- nun capcisa-lul   kkalkoanc-ass-ta.
        -Top magazine co.-Acc sit on-pst-Dec
     Intended Interpretation: 'John sat on the magazine.'

    c. John- nun capcisa-lul   kopalhay-ess-ta
        -Top magazine-co.-Acc accuse-pst-Dec
     Intended Interpretation: 'John accused the magazine.'

In sum, the concept of 'magazine' in English and that of *capci* in Korean are not completely identical. However the concept of *capci+sa* is much different from that of 'magazine' in English in that the former categorizes the set of magazine companies while the latter covers three categories, namely magazines as physical entities, information contained in the magazines, and magazine companies simultaneously. Such incongruities in concept and lexicalization between two languages result in the different polysemous behaviors. That is, rarely does *capci* in Korean carry the sense of a magazine company. This task is taken care of by the independent lexical item *capci+sa* in Korean. The same logic can apply to all the cases given in (4). Again, in the current analysis we don't have to assume so-called generative mechanisms of Pustejovsky (1995) .

3.3 Lexicalized Conceptual structures: mapping between lexical items and concepts

So far we have discussed the structures of polysemous lexical entries and tried to account for their different behaviors in English and Korean. The design of lexical entries is motivated by two factors, easy employment by computational applications and a faithful representation of a mental lexicon. In addition to these motivations, it is based on the idea that meaning resides in concepts. Furthermore, adopting the ideas of Bartsch (1998) and Keil (1989) , the current analysis assumes that concepts are representations of properties of things and situations, which we are conscious of, and they can be divided into two classes: one includes 'experiential' concepts which we acquire at first hand by perceiving events, actions, or individuals in terms of similarity and regularity. The other consists of 'theoretical or formal' concepts which are derived through integration of experientially based concepts. DC and IUC in the lexical entry correspond roughly to experiential and theoretical concepts, respectively. Such bifurcation of the semantic part of a lexical entry in the current analysis is to reflect this fact. Ontologically speaking, concepts are hierarchically structured. The IUCs of a concept are ones that are immediately higher concepts to the concept in such a hierarchy. In terms of the formal definition of concept by Priss (1998) and Ganter and Wille (1996)[13]

the IUCs of a concept are its immediately super-concepts. The following hierarchical figures, whereconcepts with an asterisk stand for BASE IUCs for the concepts written in bold and italic fonts, exemplify this:

(22) a. Conceptual Structure for *magazine* in English

---
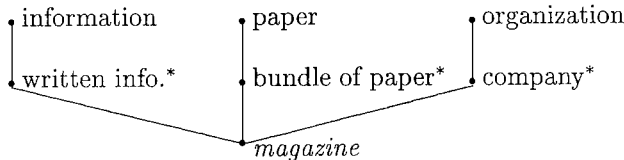
13. They define the formal notion of concept and the subconcept relation as follows:

a. $\forall X, Y[X \subseteq Obj \wedge Y \subseteq Att \wedge [X = \varepsilon Y \vee \iota X = Y] \rightarrow \langle X, Y \rangle \in CON]]$. Here Obj and Att stand for the set of objects and the set of attributes given in the context, respectively. And εY and ιX are defined as $\{x \in Obj: \forall y[y \in Y \rightarrow R(x, y)]\}$ and $\{y \in Att: \forall x[x \in X \rightarrow R(x, y)]\}$. CON refers to the set of concepts.

b. sub-concept relation ($\leq$): $c1 \leq c2$ iff $Int(c2) \subseteq Int (c1)$ or $Ext(c1) \subseteq Ext (c2)$, where Ext (c) and Int(c) correspond to the sets of objects and properties of concept c.

b. Conceptual Structure for *capci+sa* in Korean

information   paper   organization

written info.   bundle of paper sa^*('company')

capci('magazine')   **capci+sa**('magazine company')
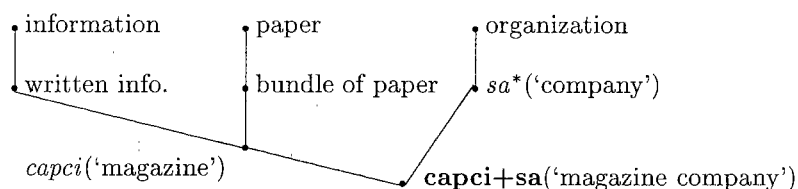
In the above figure, the IUCs of magazine in English consists of properties (or concepts), 'written information,' 'bundle of paper,' and 'company,' while its Korean counterpart lacks the property of 'company' or 'organization'. However, the concept 'capci+sa' in Korean has the concepts 'magazine' and 'company' as its IUCs. Of the two IUCs, the concept 'company' is the only BASE element. This means, in turn, that the sense of 'company' is only available for 'capci+sa' in Korean as (21) shows. The above structures show that *magazine* in English and its Korean counterpart are different from each other conceptually as well as in the way of lexicalizing concepts. We have observed that such mismatches result in different behaviors of polysemous lexical items in both languages.

Even though concepts can be structured in the form of a lattice, a real ontology which reflects our complex world should look more complex. Accordingly, a lexicon or mental dictionary, a collection of lexical entries, which names elements of the ontological structure, also looks more complex than the above mentioned conceptual lattice. As Aitchison (1994: 82-94) points out, it is almost impossible to delineate the real picture of a lexicon. However, we try to put forth a fragmental picture of a lexicon based on Sowa's (1993, 2000) way of representing concepts in the form of graphs, and on the view of connetionists (i.e., Kohonen 1984) that a lexicon is in a form of a web where lexical entries are connected or closely grouped together under various types of similarity (viz., orthographic, phonological, and semantic similarities). Consider the following conceptual graph around the concept 'bake'[14]:

---

14. In this graph, solid arrows with a number in the square stand for the subconcept relation and thematic roles, respectively. For example, a solid arrow with ⑤ means that two connected concepts (i.e 'create' and 'bake') stand in the subconcept relation. the solid arrow with ② between the two concepts 'create' and 'pastry' refers to the theme role of the latter to the former. Meanwhile, the dotted arrows with a circled number mean relations of lexical concept or sense relations. For instance, the dotted arrow with ② between the linguistic concept of bake in the dotted oval and the concept of bake in the solid oval stands for the orthographic relations between them. Particular ways of representing such relations do not matter. However, what is important is to remain consistent in he use of these notations.

(23) conceptual graph around the concept of bake
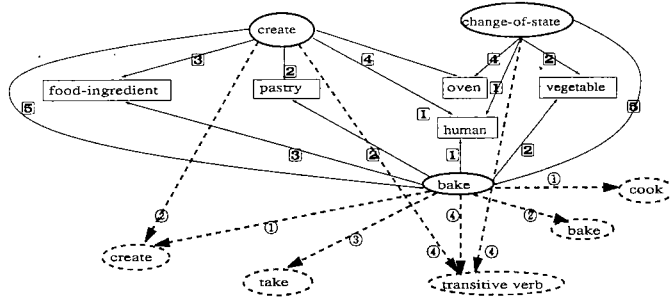
The above conceptual graph has yet, of course, to be elaborated to a suffi-cient extent so as to represent the lexicon around the lexical entry of bake. Such elaborations have to be left to further research.

4. Concluding Remarks

So far we have proposed an alternative way to that of the GLT of Pustejovsky (1995) of representing lexical items, especially for polysemous lexical items. In the current framework, lexical entries contain information about lexical concepts, the denotational concept with its immediate upper concepts and sense relations. This way of designing lexical items is motivated by two factors; ease of being employed by computational applications, and a faithful representation of a lexicon. It is observed that the current way of representing lexical entries is better than that of the GLT in the sense that the former is more effective in accounting for different behaviors of polysemous lexical items in English and Korean. As for a real and overall picture of a lexicon, it still awaits more comprehensive future work.

References

Aitchison, J. 1994. *Words in the Mind*. Blackwell., Oxford.

Bartsch, R. 1998. *Dynamic Conceptual Semantics*. CSLI Publication, Stanford.

Blutner, R. 1998. Lexical pragmatics. *Journal of Semantics*, 15(12):115–162.

Chomsky, N. 1965. *Aspects of the Theory of Syntax*. MIT Press.

Chomsky, N. 1981. *Lectures on Government and Binding*. Kluwer Academic Publishers, Dordrecht.

Copestake, A. and T. Briscoe. 1996. Semi-productive polysemy and sense extension. In Pustejovsky et al., editors, *Lexical Semantics: The Problem of Polysemy*. Clarendon Press., Oxford, pages 69–108.

Fodor, J. and E. Lepore. 1998. The emptiness of the lexicon: Reflections on James Pustejovsky's "the generative lexicon". *Linguistic Inquiry*, 29(2):269–288.

Ganter, B. and R. Wille. 1996. *Formal Concept Analysis: Mathematical Fundation*. Springer, Berlin.

Grimshaw, J. 1990. *Argument Structure*. MIT Press, Cambridge, Massachusetts.

Keil, F. C. 1989. *Concepts, Kinds and Cognitive Development*. MIT Press, Cambridge, Massachusetts.

Kwon, J-I. 1999. Representation of an electronic dictionary of predicates. In *Proceedings of 1999 Winter Conference on Linguistics*, page 1023. sponsored by The Linguistic Science Society.

Lakoff, G. 1987. *Woman, Fire and Dangerous Things:What Categories Reveal about the Mind.* Chicago University Press, Chicago.

Lakoff, G. 1993. The syntax of metaphorical roles. In J. Pustejovsky, editor, *Semantics and the Lexicon.* Kluwer Academic Publishers, Dordrecht, pages 27–36.

Langacker, W. R. 1998. Cognitive grammar: A basic introduction. Handout read at Cognitive Linguistics Conference at KNU.

Lee, K-D. 1987. A study on meaning descriptions in traditional dictionaries. In *Humanities 57.* Yonsei University.

Lim, J-R. 1996. Cognitive semantic properties of polysemous words. *Enehak*[Linguistics], 18:229–261.

Meyer, D. E. and R. W. Schvaneveldt. 1976. Meaning, memory, structure, and mental process. *Science,* 192:27–33.

Nunburg, G. 1996. Transfers of meaning. In Pustejovsky et al., editors, *Lexical Semantics: the Problem of Polysemy.* Clarendon Press, Oxford, pages 109–132.

Partee, B. and M. Rooth. 1983. Generalized conjunction and type ambiguity. In Bäuerle et al., editors, *Meaning, Use, and interpretation of Language.* Walter de Gruyter, Berlin, pages 361–383.

Pollard, C. and I. Sag. 1994. *Head-Driven Phrase Structure Grammar.* University of Chicago Press, Chicago.

Prasada, S. 1999. Names of things and stuff: An aristotelian perspective. In R. Jackendoff et al., editors, *Language,Logic and Concepts.* MIT press, Cambridge, Massachusetts, pages 119–146.

Priss, U. E. 1998. The formalization of wordnet by methods of relational concept analysis. In Christiane Fellbaum, editor, *Wordnet: An Electronic Lexical Database.* MIT press, Cambridge, Massachusetts, pages 179–196.

Pustejovsky, J. 1995. *The Generative Lexicon.* MIT press, Cambridge, Massachusetts.

Shin, H-S. 1991. Meaning analysis of contact verb tayta. In *Kwukeuy ihaywa insik*[Understanding and Recognition of the Korean Language]. Hankwukmunhwasa, Seoul, pages 267–287.

Sowa, J. 1993. Lexical structure and conceptual structure. In J. Pustejovsky, editor, *Semantics and the Lexicon.* Kluwer Academic Publishers, Dordrecht, pages 223–262.

Sowa, J. 2000. *Knowledge Representation: Logical, Philosophical, and Computational Foundations.* Brooks/Cole, London.

Weinreich, U. 1964. Webster's third: A critique of its semantics. *IJAL,* 30:405–409.