Generic Schema of Spatial and Temporal Domains:
The Concepts of SEQUENCE and DURATION

Tomoko Usui
Kyoto University of Education
hitsuji77-lj@infoseek.jp

1. Introduction

Time has been said to be one-dimensional and unidirectional. However, some dimensional adjectives that are not one-dimensional are used as temporal expressions in some languages. I shall examine these examples and attempt to show why these words can be used as temporal expressions. In addition, there are temporal expressions that have only temporal meanings. They do not have spatial meanings either diachronically or synchronically. Lakoff (1993) assumes that our metaphorical understanding of time in terms of space is biologically determined. This, however, fails to explain the existence of these temporal expressions. These pose the problem that the domain of these words is not a space but rather some other concept or thing. Virtually nothing is known about the abovementioned problem. In this thesis, I refer to words with only temporal meanings as "temporal adjectives" and "temporal prepositions", and consider the source domain of these temporal words.

1. 1. Dimension of time

As mentioned above, time is one-dimensional and unidirectional, and this has long been the predominant concept of time. However, in terms of language, some adjectives—called dimensional adjectives—are frequently used as temporal expressions. Not only one-dimensional adjectives, but also two- or three-dimensional adjectives are used as temporal expressions. Obviously, this contradicts the idea that time is one-dimensional. There must be a justification for this usage. One possible explanation, among some that come to mind, is that these adjectives or prepositions have other temporal features in addition to dimension. Time has many features, such as MOTION, SEQUENCE, DURATION, and QUANTITY. In this section, I shall examine the usage of these dimensional adjectives, and clarify why they are not incompatible with the predominant temporal feature of one-dimensionality.

1.2. Dimensional adjectives

It has been said that adjectives such as *high, deep,* or *shallow,* which are said to be two-dimensional adjectives, and *big* or *small,* which are said to be a three-dimensional adjectives, can be used as spatial expressions but not as temporal expressions. It is impossible to use these as temporal words because time is perceived as one-dimensional. One-dimensional adjectives such as *short* or *long* can easily be used as temporal expressions. This may be partially true in English, French, or any other European language, but does not

apply to Japanese or Chinese. In Asian languages such as Japanese or Chinese, there are some exceptions to this usage of dimensional adjectives. In the case of Japanese, two-dimensional adjectives such as *high, deep,* and *shallow* can be used as temporal adjectives; *big* and *small,* which are said to be three-dimensional, are also used as temporal expressions. Below are some examples.

(1) Japanese
  a. toshi-ga   take-ru
     year-NOM   high
     'I am getting older'
  b. aki-ga   fukama-ru
     fall-NOM   deep
      'Autumn is far advanced.'

The expressions in (1) are examples of two-dimensional adjectives in Japanese. Although these expressions do not follow the rule of temporal dimensionality, they can be used this way in Japanese because they have other features of time: Direction and Quantity. Kunihiro (1982) analyzes Japanese dimensional adjectives closely in his research. In his analysis, he divided dimensional adjectives into two groups: those with direction and those without. According to Kunihiro, *takai* (high), *hikui* (short), *fukai* (deep), *asai* (shallow), *tooi* (far), and *chikai* (near) are dimensional adjectives that have direction, whereas *nagai* (long), *mijikai* (short), *futoi* (thick), *hosoi* (thin), *atsui* (thick), *usui* (thin), *hiroi* (wide), and *semai* (narrow) have no direction. In Japanese, *high, deep,* and *shallow* are used as temporal adjectives, even though they are not one-dimensional, because they have the most important feature of time: directionality. Time has many features: UNIDIRECTIONALITY, DIRECTIONALITY, SEQUENCE, MOTION, DURATION, DIMENSION, and QUANTITY. If a word does not express a property of time (such as one-dimensionality), but expresses another property (in this case, temporal directionality), it may then be used as a temporal expression. For this reason, it seems quite probable that there is a hierarchy of temporal features, such as DIRECTIONALITY > DIMENSION.

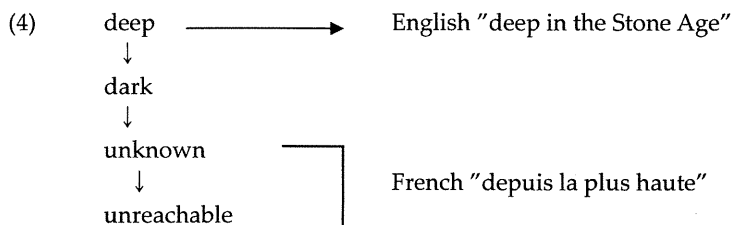There are similar cases in English and French as in Japanese. The following are examples.

(2) deep in the Stone Age

(3) French
    depuis   la   plus *haute* Antiquite
    since   DET   more high Stone Age
    'since the Stone Age'

In English, the two-dimensional adjective *deep* is used to represent *a long, long time ago,* and *haute* (high) in French is used to express the same meaning. To represent this meaning, these two languages use different adjectives: *deep* and *high.* This is very interesting but not surprising, because *deep* and *high* both express an unreachable condition. Lakoff and Johnson use the metaphor "seeing is touching" (1980:50). An opposite metaphor may be: "the unreachable is unknown". In this kind of metaphor, both *deep* and *high*

express the unreachable condition, so in this light these cases are not totally different, but related.

(4)   deep ───────────→ English "deep in the Stone Age"
          ↓
       dark
          ↓
       unknown
          ↓   ┐
       unreachable   ┘   French "depuis la plus haute"

In Chinese, *shen* (deep) and *qian* (shallow) are also used as temporal adjectives.

(5) Chinese
     a. 深秋
        shen   qiu
        deep   autumn
        'in the midst of fall'
     b. 日子浅
        rizi   qian
        span   shallow
        'short time'

The following are some examples of three-dimensional adjectives that are used as temporal adjectives in Japanese, French, and Chinese.

(6) Japanese
     a. baku-*dai*   na   jikan-wo   kake-ta
        very big   of   time-ACC   spend-PAST
        'I spent a very *long* time doing it'
     b. *saishou*   no   jikan de   shori   si-ta
        smallest   of   time with   deal   do-PAST
        'I dealt with it within the *shortest* time'

In English, for example, *long* and *short* are used to express the same meaning as (6a) and (6b) in Japanese, whereas in Japanese the three-dimensional adjectives *big* and *small* are used[1]. Below are further examples from French:

(7) French
     a. Elle m'a fait attendre deux *grandes* heures.
        'She made me wait for two long hours'
     b. une *petite* heure
        'for a *short* time '

In French *grande* and *petit* are used to express temporal quantity, in other words, temporal duration. Furthermore, the French word *grande* has several meanings: big, tall,

great, and large; similarly *petit* has two meanings: short and small. It might be said that in the process of grammaticalization these words have come to be used as temporal expressions. Considering these facts it is natural that the three-dimensional adjectives *grande* (big) and *petit* (small) are used as temporal expressions in French. In Chinese also, *da* (big) and *xiao* (small) are used as temporal adjectives.

> (8) Chinese
>> a. 等的工夫不大
>> deng de gongfu bu da
>> 'We need not to wait for a long time'
>> b. 小字辈
>> xiao zi bei
>> 'a greenhorn'

From a typological point of view, what is common in the above cases is that they all represent a quantity of time. This, if true, provides strong confirmation of the viewpoint that quantity is an important temporal feature. If three-dimensional adjectives are used as temporal expressions, it might be assumed that a CONTAINER METAPHOR is used to express temporal quantity in English and also in many other languages. The following are examples of a container metaphor in English.

> (9)   a. I *put* a lot of time *into* washing the windows.
>   b. Let's meet here *in* three months.
>   c. We have *much* time to do the job.

In the examples above, time is conceptualized as a three-dimensional entity by using the container metaphor. In their Master Metaphor List (1991), Lakoff and his colleagues suggest this temporal metaphor: *Bounded time is a container*. Significantly, this metaphor can be seen in many languages. Consequently, it seems reasonable to assume that three-dimensional adjectives have come to be used as temporal adjectives, even though they do not follow the rule of temporal dimension, because they have a temporal feature: QUANTITY. Certainly, they do not follow the rule of temporal dimension, but they express quantity, and thus three-dimensional adjectives may be used as temporal adjectives. Judging from the above, it may be said that it is possible to map from space to time if a word contains one feature of time, even if that word breaks the usual rules.

As previously stated, three-dimensional adjectives can be used as temporal adjectives because they have the temporal feature of quantity. What about two-dimensional adjectives in English, French, and Japanese? Two-dimensional adjectives are said to have neither direction nor quantity. It may be justifiable to posit that it is impossible to use two-dimensional adjectives as temporal adjectives, because they have no temporal features at all. Examples of two-dimensional adjectives with no direction are: *wide* (English), *spacieux* (French), and *hiroi* (Japanese). Although these words cannot be used as temporal adjectives in these languages, Chinese does give a temporal usage to two-dimensional adjectives that have no direction.

(10) Chinese
    a. 寬限九天
       kuan xian   jiu   tian
       wide limit   nine day
       "Let's extend the deadline for nine days"
    b. 時間　寬裕
       shi jian hen kuan   yu
       time   very wide   rich
       "We have a plenty of time"

Kuan and *guang* both mean *wide* in Chinese. However, other two-dimensional adjectives, such as *zhai* (narrow), *hou* (thick), *bao* (thin), and *ping* (flat), are not used as temporal adjectives. There are two possible reasons for this contradiction. The first reason involves the polysemic nature of the word. The word *kuan* (wide) originally meant *wide*, then *loose*, and finally has come to mean *expand*. Therefore, the word *kuan* also has the meaning of *expand*. The word *expand* is used as a temporal expression in many languages, including English, Japanese, French, and Korean. Considering this process of grammaticalization of the Chinese word *kuan*, we cannot assume that it is an exception to the two-dimensional problem. Although at first glance, in Chinese it seems possible to use a two-dimensional adjective as a temporal one, it is not.

This analysis shows that, because of the temporal feature of quantity, three-dimensional adjectives can be used as temporal adjectives. However, in many languages, two-dimensional adjectives cannot. In the next section, I examine the temporal feature of quantity in more detail.

2. Quantity and duration

In the previous section, I discussed how three-dimensional adjectives can be used as temporal ones because of the temporal feature of quantity. Quantity and the other temporal feature, DURATION, are closely related. In this section, we shall examine the temporal concepts of quantity and duration.

2.1. Quantity and duration of time

Casasanto et al (2004) used a linguistic corpus and revealed that English and Indonesian tend to map duration onto linear distance (e.g., a long time), whereas Greek and Spanish preferentially map duration onto quantity. Moreover, in English and Indonesian, distance metaphors are more frequent than quantity metaphors. The opposite pattern was found in Greek and Spanish. For example, in English it is natural to talk about *a long time*, borrowing a spatial expression such as *a long rope*. Yet in Spanish, the direct translation of *long time—largo tiempo*—sounds awkward to speakers. *Mucho tempo*, which means *much time*, is preferred. According to Casasanto et al, expression of duration of time depends on the languages in which it is being expressed. Duration and quantity are closely related.

In general, previous temporal metaphor works have focused on how time can be expressed in terms of linear space. Linear spatiotemporal metaphors are pervasive in

English, and are used to talk about various aspects of time, including *SUCCESSION*, *MOTION*, and *DURATION*. As I mentioned in the previous chapter, time has many features, of which quantity is one. If time were unidimensional thing, we could not say *"We have much time"*. In English, many temporal phrases are based on the container metaphor, as I mentioned. As a container has a volume, time also has volume: it is three-dimensional not unidimensional. Time is not necessarily conceptualized only in terms of unidimensional space, but is also apparently mapped onto volume.

Therefore, time has two aspects: unidimensional linear time and three-dimensional quantity time. Examples of these two temporal aspects have been shown in languages as above, but according to Casasanto et al (2004) there is a tendency across languages to converge regarding which aspect should be used. They compare the use of 'time as linear' and 'time as a quantity' metaphors across languages. Every language examined so far uses both linear and quantity metaphors, but the relative prevalence and productivity of these appear to vary markedly.

> (11) 1e. long night
> 1g. megali nychta (big night)
> 2e. long relationship
> 2g. megali schesi (big relationship)
> 3e. long party
> 3g. parti pou kratise poli (party that lasts much)
> 4e. long meeting
> 4g. synantisi pou diekese poli (meeting that lasts much)
>
> (Casasanto et al, 2004:3)

In the examples above, 'e' refers to English, whereas 'g' refers to Greek. In examples 1g and 2g, the literal translations might surprise an English speaker, for whom *big night* is likely to mean *an exciting night*, and *big relationship* an *important relationship*. For Greek speakers, however, these phrases communicate duration, expressing time not in terms of unidimensional space, but rather in terms of physical quantity (i.e., three-dimensional space). Most languages have both temporal features: linearity and quantity. Therefore, for English speakers, linear temporal metaphors predominate, while for Greek speakers the quantity temporal metaphor is popular. It can be assumed that there is a cultural difference in the usage of temporal metaphors across languages.

3. Temporal Adjectives and Temporal Prepositions

Some languages have adjectives that have temporal meanings only. For example, the English words *previous*, *earlier*, and *later* have no spatial meanings. In Japanese, also, *nochi*, which means *later / after*, has only a temporal meaning. This raises the questions of where these words come from and what is their source domain.

It is widely recognized that time is conceptualized spatially in a broad range of languages and cultures; all the languages so far examined take their vocabulary of time primarily from that of space. Previous theories have held that most temporal expressions come from spatial usage, and that it is impossible to conceptualize and describe time without a spatial concept. In such previous studies, the source domain of time has always

been space. There is room for further research in this area. The question of the origin and source domain of these temporal adjectives and temporal prepositions, which have no spatial usage, remains unanswered. The generalization that we cannot recognize time without space cannot, however, be applied in all cases. Unfortunately, previous studies lacked satisfactory analyses. In this thesis, I shall assume that not all temporal expressions come from the spatial domain or a spatial concept. Some of these come from other concepts that are closely related to both time and space. This thesis will, it is hoped, contribute to a better understanding of what has previously been written about one-way mapping from space to time.

3.1. The concept of sequence

Consider these four words: the English *previous, earlier, later,* and the Japanese *nochi.* All these words are used as to express temporal sequence. It seems reasonable to suppose that sequence is not a concept subordinate to space but rather is a concept independent of space. For instance, consider a sequence of music or a sequence of smells; there is no need to think of space when recognizing these sequences. Of course sometimes it is necessary to think of space to recognize a sequence, such as in a sequence of lines or objects. To recognize these sequences, people unconsciously employ a spatial domain, and then use spatial expressions to express temporal images because of their similarities. Haspelmath (1997:63) wrote: "In an number of languages the temporal anterior adposition is based on the ordinal number *first* (or perhaps "former"): Italian *prima di* (based on the adverb *prima* "at first, earlier", from *primo* "first"); Punjabi *pailaa* (<*prathila-* "first", a suffix variant of Old Indic *prathama-* "first"; Latvian *prims* "before; earlier" (< *pirmis,* an adverbial form based on *pirmais* "first"); Kannada *modalu* "before; first"." He reported that all these words are used as temporal expressions, and their source domain is not space but the ordinal number *"first".*

(12)   a. I'd only seen him the *previous* day.
    b. He came here *earlier* than me.
    c. I'll do it *later.*

(Haspelmath 1997:63)

From these examples, it is natural to assume that sequence is a very important feature and that the hypothesis of one-way mapping from a spatial to a temporal domain is inadequate. As Haspelmath reports, we need to advance a new theory that takes greater account of the sequence feature.

3.2. Generic schema above the spatial and temporal domains

To explain these temporal adjectives and prepositions (see section3.3.) a one-way mapping model from space (source domain) to time (target domain) is insufficient. To clarify the problem, it is necessary to posit a generic schema above these two domains, and make a proposal that sequence might be one of the features of the generic schema encompassing the spatial and temporal domains. The generic schema forms a higher concept above these independent domains. Those words (temporal adjectives and

prepositions) that do not have spatial meanings either diachronically and synchronically might come from this generic schema. It might be represented in the following way.
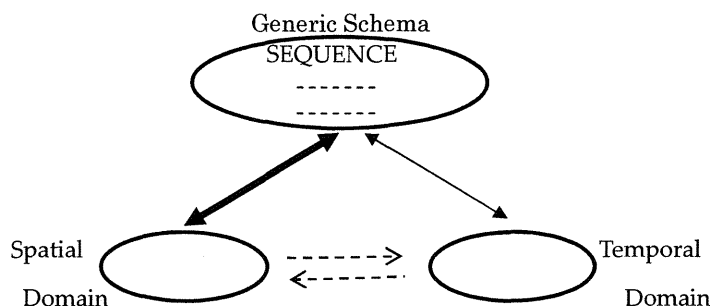
Generic Schema

Figure 1: Generic Schema of Spatial Domain and Temporal Domain 1

This figure shows that originally space and time each had its own domain, and due to the similarities between these domains people have come to use spatial expressions to explain temporal concepts. Sequence is one of the features of this generic schema. To test this hypothesis, it is necessary to confirm the existence of the generic schema and whether it has any other features. In the next section, I shall examine the problem in detail.

3.3. Sequence as a feature of generic schema

Many words that refer to temporal sequence have only temporal, but not spatial, meaning, either diachronically or synchronically. It is clear that these words do not come from the spatial domain, so where do they come from? I now modify the ordinal metaphor theory of mapping from space to time. This is justifiable if we consider that there is a generic schema above the spatial and temporal domains, and that sequence might be one of the features of the generic schema. Some might comment that sequence itself can be a source domain of time. This hypothesis may be roughly diagrammed as follows.
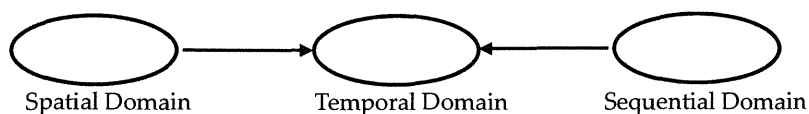

Figure 2: Sequence as a Domain

To posit this hypothesis, we need to demonstrate that the sequence is qualified to be a source domain. According to Lakoff (1987:278) a source domain should be: (a) pervasive in experience, (b) well understood because it is pervasive, (c) well structured, (d) simply structured, and (e) emergent and well demarcated for these reasons. A sequence would fulfill (a) and (b), but it is hard to think that sequence is well structured (c) or simply structured (d). It may be a mistake to assume that sequence is a domain.

One of the benefits of positing a generic schema is that we can explain the origin of

these temporal adjectives or prepositions. Boroditsky (2000) argues the question of metaphoric structuring. Metaphoric structuring is another way of saying that abstract domains such as time are indeed shaped by metaphorical mapping from more concrete and experiential domains such as space. Lakoff and Johnson (1980) wrote that metaphorical or abstract concepts are understood and structured through metaphorical mappings from a small set of fundamental experiential concepts[2], while Boroditsky (2000) comes to the conclusion, based on some experiments, that spatial schemas were not necessarily accessed in solving temporal prime questions and that people did not use primed temporal schemas to think about space. They are related and have similarities, but abstract concepts such as time are not understood and structured through metaphorical mapping. A concrete concept such as space does not have the power to generate or structure abstract concepts such as time. Both concrete and abstract concepts have their own domains, originally separate, and people then came to use the same expressions for both space and time because of their structural similarities.

A metaphor is just a conceptual tool to relate two domains; it does not have the power to generate or structure a new domain. Without doubt, space and time share conceptual similarities beyond similarities in language; however, in this thesis I shall propose the hypothesis that both domains originally existed separately and share their similarities through a generic schema. To postulate the existence of this generic schema we can easily understand the roots of the temporal adjectives and the relationship between the spatial and temporal domains.

Next we need to clarify the structure of the generic schema. Does it have any other features except sequence? In the next section, I shall examine the temporal prepositions that have no spatial usage, and discover the other features of the generic schema.
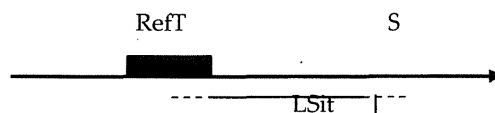
3.4. Duration as a feature of the generic schema

In some languages, words that express durativity have only temporal usage, either diachronically or synchronically, but no spatial usage. These words precisely express simultaneous durativity, posterior durativity, and anterior durativity. Haspelmath (1997) overviews these three kinds of durativity and represents these as follows.

(13) a. Simultaneous durativity   *during*
      b. Posterior durativity   *until*
      c. Anterior durativity   *since*

(Haspelmath 1997:30)

(14) Anterior durativity

RefT

(15) Posterior durativity

RefT
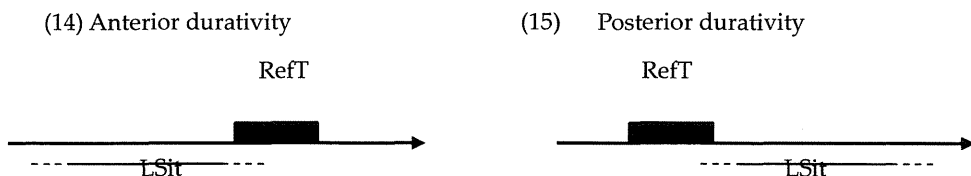
(16) Since (Posterior present perfect)

$$\text{RefT} \qquad\qquad\qquad S$$

(diagram with timeline, labeled LSit)

The prepositions *since, till/until,* and *during* have only temporal meanings, and have no spatial meaning at all diachronically. Henceforth in this thesis I call these prepositions temporal prepositions. French and Portuguese also have temporal prepositions that represent simultaneous durativity, posterior durativity, and anterior durativity. In many languages, there are not only temporal prepositions but also temporal conjunctions that indicate duration. Table 1 sets out some prepositions and conjunctions that have only temporal usage.

Table 1: Temporal Prepositions and Conjunctions

	ENGLISH	FRENCH	PORTUGUESE	CHINESE
DURATION	During (t)	Pendant / durant (t)	Durante (t)	Zai···.zhizhong(t)
START	Since (t)	Depuis (t/s)	Desde (t/s)	Zicong (t)
END	Till / until (t)	Jusque (s/t)	Ate (s/t)	Zhidao (t)
DURATION (Conj)	While (t)	Pendant que (t)	Enquanto (t)	Dang (t)

The abbreviation (t) means the word has only a temporal meaning, (s/t) means it has both spatial and temporal meanings, while (t/s) means it has both meanings, but that the temporal meaning is predominant in usage. These examples offer more evidence that the temporal feature of duration is a feature unique to the temporal domain. The concept of duration is not a spatial concept, but purely a temporal concept.

As previously stated, temporal words representing simultaneous durativity, posterior durativity, and anterior durativity exist in many languages. In analyzing these linguistic examples, it is important to define the concept of duration is important here. According to Haspelmath (1997:68), the concept of duration is one of beginning-to-end constructions; the order is obligatorily iconic, i.e., posterior durative expressions precede anterior durative expressions, and the two are preferably adjacent.

An impressive amount of scholarship has been devoted to the problem of concept duration. All researchers agree that the concepts of duration and sequence (in Section 2.1.1) are very important when we think of time. From a psychological point of view, Piaget (1927) concluded that in a child's conception of time the sequence of events and duration are the two most elementary features. From a typological point of view, Haspelmath (1997) stated that sequence and sequential durativity play an extremely important role in time cognition. Also, many philosophers have believed duration to be very important, for example, Bergson's *duree*, as a succession of present moments in time. In the field of linguistics, Evans (2003) held that the duration sense constitutes the central sense in the semantic network of time as follows.
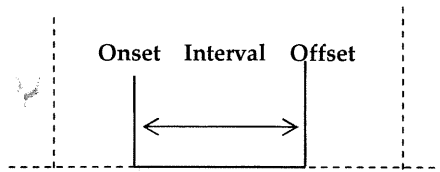
Figure 3: The duration sense of time (Evans 2003:108)

As the following figure shows, Evans (2003) believed that the duration sense is the root of all the other temporal senses.
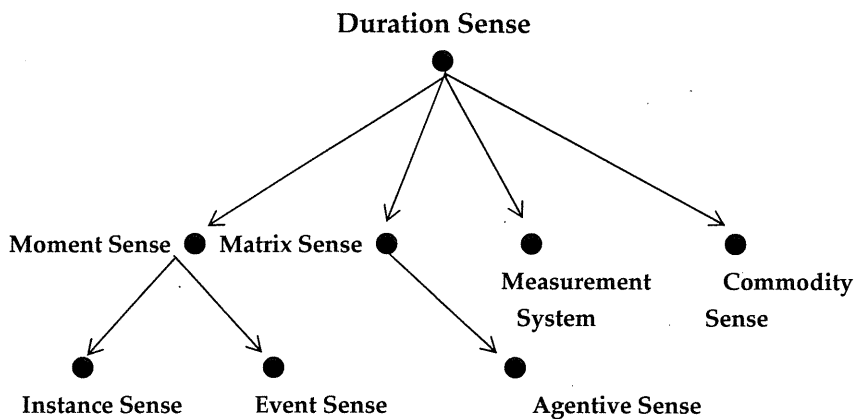

Figure 4: The semantic network of time   (Evans 2003:120)

The concept of duration is, like sequence, a very important concept of time cognition. A closer examination of this concept is necessary.

Temporal duration is always associated with physical length. In thinking of simultaneous durativity, posterior durativity, and anterior durativity as the background of these words we postulate a spatial Source–Path–Goal schema. "The Path Schema" (Johnson 1987:114) is one of the fundamental and important image schemata as many cognitive linguists have pointed out. It consists of three elements: a source, a goal, and a path. As many cognitive linguists have pointed out, the Source–Path–Goal schema is a very important one.

Does the duration sense come from a path schema based on the space domain? In English there are other words that represent simultaneous durativity, posterior durativity, and anterior durativity: *for, from,* and *to.* These words have both spatial and temporal usages, as follows.

(17)   a. I walked *for* two miles.
          b. I stayed at her house *for* two months.

(18)   a. I came *from* London.
            b. I'll be on holiday *from* August 1.

(19)   a. I stayed on the train *to* Kyoto
            b. It is 2 weeks *to* the holidays.

It is probably correct to suppose that the words *for, from,* and *to* come from the source–path–goal schema in the spatial domain. However, *for, from, to* and *during, since, till/until* are not entirely the same despite their similar usage. In some cases, the substitution is impossible. For instance, it is necessary to put a specific time after *during,* whereas after *for* there has to be an unspecific time.

(20) This street is very noisy {*during*/**for*} the day.

Since cannot be used in a future tense, whereas we can use *from* in any tense.

(21) I have been here {since/*from} 5 o'clock.
(22) I'll be on holiday {from/*since} August 1.

When expressing movement on a path to a goal clearly, *until* cannot be used because it does not include a path, but represents only a goal, whereas *to* represents a path.

(23) It is 2 *weeks* {*until/to} the holidays.

Considering the different usage between the words *for, from, to* and *during, since, until,* one would not derive their meanings from a source–path–goal schema whose base is space. It is natural to assume that these words derive from the temporal concept of duration. Duration has a close relationship with and structural similarities to the spatial source–path–goal schema; however, the concept of duration does not come from the spatial domain but was originally a temporal concept. These two, source–path–goal schema and duration, are closely related in construction, but were totally independent concepts originally.

     Postulating the generic schema as an upper level of a temporal and spatial domain, in contrast to previous theories, enables us to examine where temporal adjectives and prepositions come from. These words do not derive from the spatial domain (this is clear because they do not have spatial meanings diachronically and synchronically), but rather they come from a generic schema. In the generic schema, there are features such as sequence, motion, dimension, direction, and quantity, but these are totally different from the other feature of duration. Duration is unique to the temporal domain. It might be represented as follows.
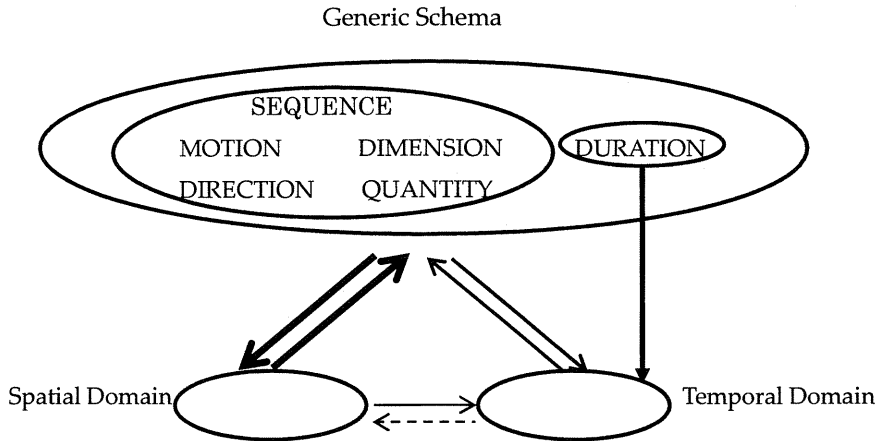
Generic Schema

Figure 5: Generic Schema of Spatial and Temporal Domain 2

One-way mapping from the spatial domain to the temporal domain is therefore not adequate to explain temporal construction. Rather, a generic schema exists above these two domains, and we propose that the temporal prepositions and adjectives with only temporal durational meanings are derived from this schema.

4. Conclusion

In this thesis, we examined the three main important temporal features: sequence, quantity, and duration. Sequence and duration have especially significant meanings in metaphor. Temporal expressions come from the more concrete spatial domain, however, and in fact map the process from space to time. It has been said that all words that express only temporal sequence and temporal duration do not in fact do so. It is natural to believe that there are generic schema above these two domains and that temporal adjectives and prepositions are derived from this upper schema of both domains. In previous research, unidirectional mapping from space to time was predominant, but this hypothesis cannot explain the existence of the temporal adjectives and prepositions. We propose that space and time were originally independent domains, and due to the similarities between these domains people came to use spatial expressions to explain temporal concepts. We suppose that there is a hyper class above the two dependent domains, a generic schema. Some words (temporal adjectives and prepositions) that do not have spatial meanings might derive from this generic schema. The feature of duration is especially different from the other features. According to my research, this is an intrinsic feature of time and of the words that mean duration , such as during, since, until, and a while in English. In addition, words in French, Portuguese, and Chinese show the same consequence. In this thesis, I propose another mapping process to the temporal domain, and in future research I shall attempt to discover whether there is another process in the temporal domain or not.

Notes
1. Japanese also uses "long" and "short" as temporal expressions much as in other

languages.

2. A small set of fundamental experiential concepts are a set of basic spatial relations (e.g., up/down, front/back), a set of physical ontological concepts (e.g., entity, container), and a set of basic experiences or actions (e.g., eating, moving).

References

Alverson, Hoyt 1994. "Semantics and experience: universal metaphors of time in English, Mandarin, Hindi, and Sesotho." Baltimore: The Johns Hopkins University Press.

Boroditsky, Lera 2000. "Metaphoric structuring: Understanding time through spatial metaphors." *Cognition.* 75: 1-28.

Bowdle, B. and Gentner,D 2005. *The career of metaphor. Psychological Review,* 112(1): 193-216.

Casasanto, Daniel et al 2004. "How deep are effects of language on thought? Time estimation in speakers of English, Indonesian, Greek, and Spanish." *Paper Presented at the 26th Annual Conference of Cognitive Science Society*, Chicago.

Comrie, Bernard 1985. *Tense.* Cambridge: Cambridge University Press.

Evans, Vyvyan 2003. *The structure of time.* Amsterdam: John Benjamins Publishing Company.

Fauconnier, Gilles and Eve Sweetser (eds.) 1996. *Spaces, Worlds, and Grammar.* Chicago: The University of Chicago Press.

Fillmore, Charles 1997/1971. *Lectures on deixis.* Stanford: CSLI Publications.

Gentner, D. and Boroditsky, L. 2001. "Individuation, relational relativity and early word learning." In: M. Bowerman and S. Levinson (eds.) *Language acquisition and conceptual development.* Cambridge, England: Cambridge University Press.

Grady, Joseph 1997. *Foundations of meaning: primary metaphors and primary scenes.* University of California at Berkeley doctoral dissertation.

Haspelmath, Martin 1997. *From space to time: temporal adverbials in the world's languages.* München: Lincom Europa. [Lincom Studies in Theoretical Linguistics 03]

Piaget, Jean 1927. *The child's conception of time.* New Youk: Ballantine books.

Kunihiro, Tetsuya 1982. *Imiron no houhou.* Tokyo:Taishukan

Lakoff, George 1987. *Women, fire, and dangerous things.* Chicago: University of Chicago Press.

Lakoff, George 1990. "The invariance hypothesis: is abstract reason based on image schemas?" *Cognitive Linguistics.* 1: 39-74.

Lakoff, George and Mark Johnson 1980. *Metaphors we live by.* Chicago: University of Chicago Press.

Lakoff, George and Mark Johnson 1999. *Philosophy in the flesh: the embodied mind and its challenge to Western thought.* New York: Basic Books.

McTaggart, J.M.E. 1927. *The Nature of Existence.* Volume2. Cambridge: Cambridge University Press.

Moore, Kevin 2006. "Space-to-time mappings and temporal concepts." *Cognitive Linguistics* 17: 199-244.

Núñez, R., Motz, B., and U. Teuscher. 2006. "Time after time: The psychological reality of the Ego- and Time-Reference-Point distinction in metaphorical construals of time." *Metaphor and Symbol.* 21: 133-146.

Svorou, Soteria 1994. *The grammar of space.* Amsterdam: Benjamins

Usui, Tomoko 2003. "Kuukan kara Jikan: ato no ninchigenngogakuteki kousatsu." *Proceedings of the Second Annual Meeting of the Japanese Cognitive Linguistics Associations.* 3: 63-73.

Yamanashi, Masa-aki 2000. *Ninnti Genngogaku Gennri.* [Principles of Cognitive Linguistics.] Tokyo: Kuroshioshupan.