Devices for Forming Entity-Denoting Signs in Thai Sign Language

Pranee Kullavanijaya and Kingkarn Thepkanjana

Chulalongkorn University

INTRODUCTION

Thai Sign Language (TSL) is a manual/visual language used by the deaf people of Thailand. It is regarded as having the status of a natural language. TSL is not derivative of Thai, which is an oral language of hearing speakers. The aim of this paper is to investigate the underlying devices employed in forming entity-denoting signs in TSL. The formation of signs in TSL is a fascinating issue because of the limitations of the medium imposed on the language. We focus here on the notions of iconicity and arbitrariness, which bear on the formation of signs in TSL.

Since this paper is written primarily for people who may have little or no knowledge of sign language, we will not use any formal notation in representing the formational properties of signs. Rather, we will use natural language to describe their formation. Signs will be named as glosses written in capital letters. If there is more than one manifestation of a gloss, numerals will be inserted after the gloss to refer to each manifestation, for example, COCONUT1, COCONUT2. Some signs denoting fruits that are local to Thailand do not have English glosses, so we use transliterated forms as glosses, such as RAKAM, and LANGSAT. In order for readers with no knowledge of sign language to reach a better understanding, we will give a general background on the fundamental properties of sign language and how it differs from spoken language in the next section. After providing this overview, we will give some information about our informant and the data analyzed, discuss the major devices used in the formation of signs in general, and focus on the devices employed in forming the entity-denoting signs in TSL. We will conclude by discussing the implications of the findings.

GENERAL PROPERTIES OF SIGN LANGUAGES

We provide here a brief description of sign languages in general, so that the reader who has no knowledge of them will have a better understanding of what follows. Only the properties that are common to all sign languages, especially as opposed to spoken languages, will be described. The general properties of sign languages are as follows.

1. Differences between Signs and Gestures

Since signs and gestures are both visual and have the same mode of expression, i.e., the use of body parts in conveying meanings, they are often confused with each other. As Woll and Kyle (1994) point out, signs and gestures are not the same. Gestures refer to varied facial expressions or body movements that accompany speech. Unlike sign

languages, they do not have an internal complex structure. Since signs are manual/visual like human gestures but have more constraints than gestures, signs can be regarded as a subset of gestures in the same way as phonemes are a subset of human sounds. Signs in the sense of sign languages are created to replace speech entirely, while gestures are not. Signs are distinguished from gestures by having an internal structure comparable to speech and their usage is rule-governed.

2. The Body Parts Used in Producing Signs

Sign languages use various body parts in producing signs: hands, arms, torso, different parts of the face including eyes, eyebrows, lips, and cheeks. The most crucial part is the hands. This is why sign languages are sometimes called manual languages.

3. The Simultaneous Nature of Sign Languages

One of the distinctive characteristics of spoken language is its more or less linear nature. That is, an utterance consists of a series of phonemes, which in turn constitute series of morphemes, words, phrases, and sentences, hierarchically. The crucial point is that a construction in each hierarchy is made up of a series of elements. In contrast, sign language is predominantly "simultaneous" in the sense that it allows the simultaneous "articulation" of more than one articulator. For example, a given sign can be articulated by using two hands and facial expression simultaneously. It could be argued that spoken languages are also simultaneous in the same way, since the use of prosodic features in speech is comparable to the use of nonmanual movements in sign languages. However, the simultaneous nature of sign language is far more extensive than in spoken language. Even the manual articulation alone is simultaneous in nature. The manual aspect of a sign can be broken down into four components: the place of articulation, the hand configuration, the hand movement, and the palm orientation. All of these four components are simultaneously present in the articulation of a single sign and each of them can express a particular meaning.

4. The Building Blocks of Sign Languages

Sign languages are similar to spoken languages in that they also consist of a hierarchical structure or "building blocks" comparable to spoken languages. The terminology used in spoken languages is adopted for use in describing the structure of sign languages, namely, phonology, morphology, and syntax. Even though the elements that make up sign languages are entirely different in nature from those in spoken languages, these terms can be used in the multilevel description of sign languages, since they are employed in an analogous way.

5. The Non-Universality of Sign Languages

There is often a misconception that sign languages are largely universal because of their highly iconic properties. The fact that has already been well established is that sign

languages are not universal. Sign languages throughout the world are similar to spoken languages in that all of them have a few modality-specific characteristics that are considered universal, but each sign language does have some specific characteristics of its own. It is unlikely that deaf people throughout the world can understand one another well if they use their own sign languages.

DEVICES FOR FORMING LEXICAL SIGNS

It is well established that one of the modality-specific features that make sign languages distinct from spoken language is that sign languages are closely associated with visual imagery. In other words, sign languages are presumably more pictorial and, therefore, more iconic than spoken languages. This is not surprising, since objects in the external world tend to have more visual than auditory associations. The important role of iconicity in sign languages has been thought to make sign languages distinctive from spoken languages (Woll & Kyle, 1994). Klima and Bellugi (1979) claim that about 50% of basic sign vocabulary appears to be iconic. In the light of this, a few crucial questions arise. Is this characteristic of sign languages in conflict with de Saussure's (1959) claim about the nature of linguistic signs in human languages, which states that the bond between the signifier and the signified is arbitrary? In the case of sign languages, is it the case that the links between the signifiers and the signified are largely motivated rather than arbitrary and conventional? Does the fact that sign languages are pictorial and iconic imply that sign languages are pantomimic in nature? With regard to events, are signs mimes in the sense that they encode events by acting them out? With regard to entities, are signs pure icons in the sense that they crudely represent objects in the external world? These questions can be answered after discussing in detail the devices employed in forming signs in TSL.

It is found that there are two major devices used in the formation of entity-denoting signs in TSL, namely, the use of iconic devices and the use of fingerspelling. An iconic device refers to a type of sign-formation device that is based on pictures or images that signers see or perceive in articulating signs. Mandel (1977) investigates the different iconic devices used in forming signs in American Sign Language (ASL) and proposes a comprehensive theory of basic iconic devices of ASL. According to Mandel's theory, iconic devices can be classified by two criteria. The first criterion, which is based on the work of Battison (1971) and the studies edited by Schlesinger and Namir (1970), involves the nature of the relationship between a sign and its referent. The second criterion is concerned with the manner in which an image comes to be present in a sign. The classifications of sign-formation devices based on these two criteria are discussed below.

Iconic devices can be classified into two major types on the basis of the nature of the relationship between a sign and the sign's referent, i.e. metonymic and nonmetonymic relationships to its referent. These two types of relationship between signs and their referents are defined below.

1. Nature of the Relationship between a Sign and its Referent

a. Metonymic Relationships between Signs and their Referents

A metonymic relationship between a sign and its referent obtains when the sign's picture is not that of the referent itself, but of something associated with it. A sign that is metonymically iconic with respect to its referent uses a picture of an object that is associated in some way with the referent. In other words, a metonymically iconic sign refers to something else that is related to the object referred to; it does not directly refer to the object itself. Some examples of ASL signs with metonymic relationships include THINK, which is signed by touching the extended forefinger to the forehead, and OLD, which is signed by pulling the fist down from the chin. The picture present in the sign THINK is the forehead, which is apparently associated with thinking. As for OLD, the action of pulling the fist down from the chin represents stroking one's long beard, which is naturally associated with an old man. These two signs use the pictures of something else associated with their referents.

b. Non-metonymic Relationships between Signs and their Referents

This relationship between a sign and its referent obtains when the sign's picture is that of the object referred to by the sign itself, not of something else associated with the referent of the sign. In this type of relationship, the transfer of meaning from referent to sign is not mediated by the relation of metonymy. Rather, the meaning of the referent is directly represented by the picture of the referent. In other words, signs with direct relationships to their referents directly represent the pictures of the objects referred to, as in TREE and FOLLOW in ASL. In TREE, the right elbow is placed on the left spread hand with the extended thumb ("B"-hand), the right forearm being held upright with its wrist straight and all the fingers extended, spread out, and wiggling slightly. The sign FOLLOW is articulated by a fist following another fist. In these two examples, the pictures exhibited by the signs directly reflect the pictures of the objects referred by the signs themselves.

Mandel (1977) proposes three terms for naming different aspects of an iconic sign of every type. The object whose picture is associated with the object referred to by the sign, or the object whose picture is described by the sign, is called the "base" of the sign. For example, in the case of the metonymically iconic signs OLD and THINK, the beard and the forehead are the bases of these two signs respectively. The iconic sign itself is called an "icon" and the pictorial value of the base is called the "image."

2. Types of Devices for Forming Signs

Devices for forming signs can be classified into two major types by considering the manner in which a picture comes to be present in a sign. This criterion is concerned with the nature of the relationship between the sign and the base. The two major devices for sign-formation that are classified by this criterion are "presentation" and "depiction," which can be further classified into subtypes as below.

a. Presentation

In this principle of forming signs, the image of the base of a sign is *presented* to the addressee. The presentation is carried out in two ways, mime and indexical presentation.

Mime

A mime is the using of actions to convey the meaning of something. The word "actions" here includes bodily motions as well as states of the body. Some examples of mimes present in ASL are COFFEE, which is signed by moving the fists circularly as if grinding coffee in a hand mill, and WRITE, which is signed by making a wiggling motion on the left palm as if holding a pen. In these two examples, human actions are imitated and presented as the images of the bases of the signs. Mimes are usually used when the bases of signs are actions.

Indexical Representation

An indexical presentation is defined as the presentation of a token of the base by pointing to it. Some examples of indexically presented signs in ASL are NOSE and THINK, in which the signer points to the nose and to the forehead respectively. An indexical presentation is likely to be used when the base of a sign is a presentable object rather than an action.

b. Depiction

Depiction refers to the process of making a picture of the base of a sign or of displaying a picture of the base rather than a token of it. For the process of depiction to apply, the objects that are used as the bases of signs, whether objects, actions, or relationships, must be represented as pictures. Some examples of depicted signs in ASL are HELP, HOSPITAL, and TREE. The sign HELP, exhibiting an image of physical support, is articulated by placing the right palm underneath the left fist and lifting it. HOSPITAL is signed metonymically by making a picture of the cross on the arm. As for TREE, the signer's articulators, the hands and arms, actually become the picture of a tree as described above. Depiction is subclassified into substitutive and virtual depiction.

Substitutive Depiction

In substitutive depiction, the articulator forms the shape of the base or the object being pictured. Some examples of ASL signs resulting from substitutive depiction include TREE and AIRPLANE. The signing of TREE is described in the section on signs with direct relationships to their referents. AIRPLANE is signed by holding the right hand in the thumbspread-horns shape, with the thumb, index finger, and pinky extended, the middle and ring fingers folded down, the palm downward, and moving it forward or right-to-left with the index finger pointing in the direction of motion. In TREE, the articulators form a certain shape that approximates the shape of the base, that is, a tree standing in the ground. In AIRPLANE, the articulators take the form of the airplane shape and move in the signing space like an airplane flying in the air.

Virtual Depiction

In virtual depiction the signer pretends that his articulator leaves a trace of the base object as it moves, and draws the picture with this imaginary trace. An example of ASL sign that results from virtual depiction is HOSPITAL, which is signed by making a cross on the arm. Virtual depiction is subclassified into two subtypes, sketching and stamping.

Sketching. Sketching is a type of virtual depiction carried out through making a picture by moving the articulators, which leave an imaginary trace as they move. In other words, sketching is the process of drawing something in the air or on the surface. Some examples of sketched signs in ASL are HOSPITAL and HOUSE. The sign HOUSE is articulated by placing the tips of the open hands palm-down together and then tracing the form of the roof.

Stamping. Stamping is a type of virtual depiction in which the articulator moves to a place, stops, then retreats, leaving an imaginary trace like a rubber stamp at the place it stopped rather than along its course. The imaginary trace is of the same shape as the front of the implement. An example of stamping in ASL is STAR in which each hand has the index finger extended from the fist pointing ahead and upward, and each hand alternately moves in the direction it is pointing.

The second major device used in forming signs is fingerspelling. Fingerspelling is the representation of a written language by means of a series of hand configurations and movements, which are called fingerspelled, or manual, alphabets. Fingerspelling provides signers with another device for forming signs, especially loan or foreign words. A manual alphabet represents the letters of writing directly. There are a number of manual alphabets in use throughout the world, which represent different written alphabets or syllables. Most manual alphabets are one-handed, as in the American, Swedish, Russian, and Thai Sign Languages. The finger positions in most manual alphabets suggest the form of the letters they represent (Kyle & Woll, 1985).

DATA

Our data used were collected from a Thai deaf informant, Mr. Anucha Rattanasint. He received his primary and secondary education at the Setsathian School, Bangkok, the largest school for the deaf in Thailand. Mr. Anucha was the President of the National Association of the Deaf in Thailand at the time of elicitation. The communication between the deaf informant and the researchers was made via the informant's sister, Ms. Kanitha Rattanasint, who has been working as a professional TSL interpreter for more than ten years. The informant has had a great deal of experience in providing data on TSL to researchers since being involved in the compilation of a Thai Sign Language dictionary (Wrigley, Suwanarat, Ratanasint, Rungsrithong, & Anderson, 1990). He has some difficulty reading Thai. Given this difficulty and his experience in providing data on TSL, we feel assured that data collected from him are free of features of spoken Thai.

Some clarifications should be made at this point regarding the type of signing analyzed. According to Kyle and Woll (1985), distinctions must be made between sign languages that are natural languages used by the deaf and various artificial sign systems, such as Seeing Exact English (SEE), Signed Swedish, signed English used in the UK, the Paget-Gorman Sign System in the UK, and the Makaton Vocabulary. These artificial sign systems have been created for a particular purpose and usually have

certain features of the spoken language. In this study, the data were drawn from TSL, which is the natural sign language actually used in the deaf community of Thailand. This sign language is different from the sign system taught and used by teachers in the Setsathian School. The sign system used in that school was constructed for an educational purpose and contains a large number of features of spoken Thai.

Our data consist of 239 glosses and 261 sign manifestations. These signs can be classified into subtypes by two criteria. The first criterion is the number of devices that are employed in creating signs. Signs can be created by means of only one device or more than one device. The latter is subdivided into the simultaneous combination and the sequential combination of devices. For example, DRINKING GLASS is signed by one device, namely, mime, i.e., the action of drinking from an imaginary glass. BUTTERFLY is articulated by a simultaneous combination of substitutive depiction and mime, i.e., by crossing the spread hands (the "5"-hands) in front with the palms facing the body and the two thumbs locked with each other, and wiggling the fingers. The mime in BUTTERFLY is the imitating of an animal's action, not a human's action. Such a shape and motion represents a fluttering butterfly. BED is signed by means of a sequential combination of sketching and mime, i.e., by moving both hands in such a way that they form an imaginary trace of a table and then by imitating the action of sleeping. In the case of the combination of devices, the images exhibited by the components of the sign represent different characteristics associated either directly or indirectly with the referent denoted by the sign itself.

The second criterion in classifying signs is the morphological as well as lexical complexity of signs, i.e., whether signs are simple, compound, or complex. The definitions of them are analogous to those in the spoken language. The number of simple, compound, and complex signs varies from class to class as discussed below.

DEVICES FOR FORMING ENTITY-DENOTING SIGNS IN TSL

In this section we will examine the devices used in the formation of five classes of entity-denoting signs, i.e., signs denoting colors, animals, man-made objects, food, and fruits and vegetables. We will identify the devices used in forming each of these five classes in separate sections.

Color Signs

There are 16 color signs in the data, namely, COLOR, WHITE, RED, BLACK, GRAY, ORANGE, LIGHT BLUE, YELLOW, PURPLE, DARK BLUE, BROWN, GREEN, PINK, CREAM, CRIMSON, GOLD. Each color sign has a one-to-one correspondence between meaning and form. That is to say, each sign has only one form. All of the color signs in the data are simple signs and are created by means of single devices. The devices that are found in forming these color signs are as follows.

1. Fingerspelling

Fingerspelling, the only non-iconic device, is the most commonly used device in forming color signs. As many as seven color signs are formed by fingerspelling: LIGHT BLUE, YELLOW, PURPLE, DARK BLUE, BROWN, GREEN, and PINK.

2. Iconic Devices

Six color signs are formed by three iconic devices, namely, indexical presentation, mime, and a simultaneous combination of mime and substitutive depiction. These six signs include COLOR, RED, BLACK, ORANGE, CREAM, and CRIMSON. All of them are found to have metonymic relationships with their referents. The three iconic devices that form these six color signs are discussed below.

2.1. Indexical Presentation
The signs RED, BLACK, and CREAM are formed by means of indexical presentation. RED is signed by pointing to the lips; BLACK, by pointing to the eyebrow; and CREAM, by stroking the right cheek with the right hand. The lips, the eyebrow, and the right cheek, which function as the bases of the signs RED and BLACK, and CREAM, typically exhibit these three colors respectively. These three signs are metonymically iconic in that they use as bases objects that exhibit the same colors as those referred to by the signs.

2.2. Mime
The signs ORANGE and CRIMSON are made by miming. ORANGE is signed by squeezing the right fist under the chin as if squeezing an orange. CRIMSON is signed by drawing the index finger across the neck as if cutting it. These two signs use squeezing an orange and cutting the neck as their bases. The sign ORANGE uses an image of a fruit typically orange in color to convey the meaning. As for CRIMSON, this color resembles that of blood; therefore, that the action of cutting the neck is used as the base of CRIMSON is understandable, since this action results in bleeding. Thus, ORANGE and CRIMSON can be considered metonymically iconic signs.

2.3. A Combination of Mime and Substitutive Depiction
Among all the color signs, the sign COLOR is unique in the sense that it is formed simultaneously by means of mime and substitutive depiction. The spread right hand with extended fingers moves up and down against the left palm as if coloring a wall with a brush. This sign is a mixture of mime and substitutive depiction in that the two hands form the shapes of the objects being pictured and one of them simultaneously imitates a typical movement of one of the objects, namely, the brush, which typically moves up and down in the process of coloring something. The simultaneous use of mime and substitutive depiction is prevalent in forming other classes of signs also.

3. Arbitrary Means

There are three color signs that are apparently formed in an arbitrary manner. They include WHITE, GRAY, and GOLD. Thus, these signs are formed neither by means of

fingerspelling nor by means of any iconic devices. WHITE is signed by touching the left sleeve with the right extended index finger. GRAY is signed by passing the two palm-in spread hands back and forth through the open fingers in front of the signer. It is thus apparent that the sign GRAY is arbitrarily created. It is to be noted that the sign GRAY in TSL is a loan sign from ASL and is identical with its ASL counterpart. Riekehof (1987) speculates about the motivation of the sign GRAY in ASL that the passing of the two spread hands back and forth through the open fingers represents the mixture of colors, which yields gray. GOLD is signed by quickly twisting the right fist with the thumb and the little finger extended. The hand configuration used in GOLD is the same as in YELLOW. Our speculation is that the shaking motion of the YELLOW sign represents the dazzle of gold. Since the foregoing ideas stem from mere speculation, we view these three signs as arbitrary.

It can be concluded that the device that is the most commonly used in forming the 16 color signs is fingerspelling. The iconic devices that are used in forming the remaining color signs are indexical presentation, mime, and a mixture of mime and substitutive depiction. There are three signs whose source is still questionable. Notice that all of the color signs that are iconically formed bear metonymic relationships with their referents. This is motivated by the fact that colors are not entities with well-defined configurations in the real world; therefore, it is hardly possible to create color signs that directly represent their referents.

Animal Signs

There are 34 animal signs in the data. There is only one non-simple sign, WHALE, which consists of the sign FISH and the modifying part realized by means of sketching to represent the expulsion of water from the top of the head. The remaining 33 signs are all simple signs. Of all the collected animal signs, 14 signs are formed by means of single devices and 20 by means of two devices. Fingerspelling is not used to form animal signs. That means that all animal signs are iconically formed. We will discuss the single iconic devices and the combinations of iconic devices used to create animal signs below.

Single Iconic Devices Used in Forming Animal Signs

Three iconic devices are employed in the creation of 13 animal signs formed by means of single iconic devices. Each of these three devices is discussed below.

1. Mime
The only one sign in the data that is created by means of mime is FLY. It is signed by using the right hand to brush off an imaginary fly near the left forearm. This can be considered a typical action for chasing a fly away in daily life.

2. Substitutive Depiction
Eleven animal signs are found to be formed by substitutive depiction, namely, HORSE, TIGER, CAT, MOUSE, SQUIRREL, SNAKE, COBRA, RHINOCEROS, DEER, BUFFALO, and COW. Each one is created by using an articulator such as a hand, an arm, or fingers, to form the shape of a part of the animal referred to by the sign. Notice

that all of these 11 signs bear metonymic relationships with their referents. The articulator forms the shape of only a part, not the whole body, of the animal. It should be noted that the part of an animal that is perceived to be "salient" to our eyes and that is perceived to characterize that animal tends to be selected as the base of the sign. For example, the horn of a rhinoceros, which is regarded as its most prominent part, is selected as the base of the sign and its shape is formed by placing the right fist with the index extended and bent with the palm in (the "X_1"-hand) in front of the nose. In SNAKE, the "V"-hand, i.e., the fist with the index and middle fingers extended, is used to represent the shape of the canine teeth of a snake.

3. Sketching
Two signs in the data are formed by means of sketching, namely, GIRAFFE and ELEPHANT. To recapitulate, sketching is a type of virtual depiction carried out by drawing a virtual picture of the referent of a sign in the air. GIRAFFE is signed by making the long upward movement from the signer's neck with the hand bent and spread with the palm in. The upward movement leaves an imaginary trace of the long neck of a giraffe. ELEPHANT is signed by moving the spread right hand palm down from the mouth downward to leave an imaginary trace of the elephant's trunk.

Combinations of Two Iconic Devices Used in Forming Animal Signs

Twenty-one animal signs are formed by means of combinations of two iconic devices, which are in turn subdivided into simultaneous combinations and sequential combinations.

1. Simultaneous Combinations of Two Iconic Devices
Fourteen signs are found to be formed by means of simultaneous combinations of the two iconic devices of substitutive depiction and mime. They are FISH, CRAB, SHRIMP, OCTOPUS, SHELL, MUSSEL, CHICKEN, DUCK, GOOSE, BEAR, ANT, BUTTERFLY, DRAGONFLY, and SHARK. These signs are formed by using an articulator to form the shape of an animal or a part of an animal. In addition, the articulator simultaneously imitates the typical movement of the animal or of the part. For example, CRAB is signed by placing the clawed hands in front and making wiggling motions. BUTTERFLY is signed by crossing the spread hands in front with the palms facing the body and the two thumbs locked with each other, and wiggling the fingers. The shape and motion represent a fluttering butterfly. CHICKEN is signed by placing the index finger and thumb in front of the mouth to represent the bird's beak, opening and closing it many times.

2. Sequential Combinations of Two Iconic Devices
Six signs in the data are articulated by means of different sequential combinations of two iconic devices. They are DOG, BIRD, OSTRICH, ZEBRA, MOSQUITO, and WHALE. DOG is signed by a combination of two mimes, patting the right leg and snapping the fingers. These two actions are considered typical of what is done with a pet dog. BIRD is signed by placing the index finger and thumb in front of the mouth, opening and closing it, and flapping the arms. The first action represents the opening and closing of the bill of a bird, while the second one represents the flapping wings. OSTRICH is signed by means of substitutive depiction for the first sign followed by a

simultaneous combination of substitutive depiction and mime for the second sign. In OSTRICH the first part is realized by using the right arm and the right hand to form the shape of the neck of the ostrich, and the second one is realized by placing the two spread hands in front with the palms down and the fingers pointing outward and moving the hands alternately outward to imitate the walking of an ostrich. ZEBRA is signed by placing at the side of the head the "3"-hand, i.e., the fist with the thumb, the index finger, and the middle finger extended, representing an ear of the zebra, and subsequently making a movement from the left shoulder to the right waist leaving an imaginary trace representing a stripe of a zebra. It is thus obvious that ZEBRA is signed by means of substitutive depiction and sketching. MOSQUITO is created by means of a combination of substitutive depiction and mime for the first part and mime alone for the second, by touching the back of the left hand with the tips of the thumb and index finger to represent a mosquito bite and then slapping the hands to represent the killing of a mosquito. The last sign, WHALE, is created by means of substitutive depiction and mime for the first part and sketching for the second one. That is, WHALE is signed by imitating the swimming of a fish and then by moving the right fist upward from the top of the head to represent the forcing of water from the blowhole on the top of the head. Because the first part is a sign for FISH, WHALE is thus a nonsimple sign.

There are only seven animal signs that bear direct relationships with the referents. These signs represent the overall shape of the animals directly either by substitutive depiction or virtual depiction. They include FISH, SHRIMP, SHELL, MUSSEL, BUTTERFLY, DRAGONFLY, and WHALE. Notice that all of these signs, except for WHALE, are articulated by means of single devices. The animals denoted are either water animals or insects. The animals denoted by all of these signs, except for WHALE, are relatively small in size. The small size of these animals facilitates the formation of signs expressing them by means of direct representation.

To summarize, all of the animal signs except for one in the data are simple signs having one-to-one correspondences between form and meaning. About one-third of the animal signs are articulated by means of single devices. All devices employed are iconic. Fingerspelling is not used at all in creating animal signs. Fourteen signs are formed by single devices, while 20 signs are formed by combinations of devices. Among the single iconic devices used, substitutive depiction is the most commonly employed in forming animal signs. Mime and sketching are each used as a single device in forming only one animal sign in the data. Notice that the animals that are denoted by the signs formed by single iconic devices are relatively not small in size. It is noted that only some parts of these animals are used as the bases of the signs. On this basis, the animals that are relatively large in size tend to be metonymically represented in signs. On the other hand, there are twice as many signs articulated by means of simultaneous combinations of iconic devices as the number of signs articulated by means of sequential combinations of devices. The simultaneous combinations of iconic devices, which give rise to 14 animal signs in the data, all consist of substitutive depiction and mime. The animals that are small in size are likely to be substitutively depicted in a direct way, while those that are relatively large tend to be depicted in a metonymic way. Lastly, mime in animal signs can be of three types: imitating a human's typical action done to an animal, e.g., FLY, imitating an animal's typical motion, e.g., OSTRICH, and a combination of both, e.g., MOSQUITO.

Man-Made Object Signs

There are 87 man-made object signs in the data, 75 of which are simple ones and 12 of which are non-simple ones. Most non-simple signs are complex ones. There is only one non-simple sign that can be considered to be a compound sign, PENCIL, which is signed by a sequential combination of mime, i.e., virtual writing in the signing space, and indexical presentation, i.e., pointing to one of the eyebrows, which is black. A combination of the meanings of these two signs gives rise to the meaning 'pencil,' which is not the sum of the meanings of its components. All of the signs in this class have one-to-one correspondences between form and meaning. Out of the 87 signs 40 are created by means of single devices and 47 by means of combinations of more than one device. The single devices and the combinations of devices that are used in forming man-made object signs are discussed in separate sections below.

Single Iconic Devices Used in Forming Man-Made Object Signs

As mentioned above, 40 out of 87 man-made object signs are articulated by means of single iconic devices. Four iconic devices are found to be employed in creating these signs: mime, indexical presentation, substitutive depiction, and sketching.

1. Mime
Twenty-eight signs are articulated by means of mime. They are BOARD ERASER, TOWEL, TUBE SKIRT, LOINCLOTH, RING, COMB, HAIRBRUSH, CAR, MOTORCYCLE, BICYCLE, TOOTHBRUSH, WASHBOWL, DRINKING GLASS, SPOON, CAMERA, BROOM, KEY, CIGARETTE, CLOTHES IRON, SOAP, SHAMPOO, TOOTHPASTE, BRUSH, SAW, FINGERNAIL CLIPPER, HAMMER, TYPEWRITER, and FACE POWDER. Notice that these objects have specific functions and are used in specific ways by human beings. The actions that are the bases of the signs are therefore the types of actions that human beings typically do with these objects. All actions that are performed in articulating these signs are considered virtual actions. For example, HAIRBRUSH is signed by imitating the action of brushing; DRINKING GLASS by mimed drinking; CIGARETTE by mimed smoking; CAR by mimed driving, etc.

2. Indexical Presentation
There are three signs that are articulated by means of indexical presentation, namely, SHIRT, SHORTS, and EARRINGS. Notice that the referents denoted by them are objects that we wear on our bodies. In articulating these signs, the signer either points to the referent denoted by the sign in question, as in SHIRT for example, or points to the part of the body that the referent is normally associated with or attached to, as in SHORTS and EARRINGS for example. SHORTS is signed by tapping the upper two legs with the little-finger edges of both spread hands, and EARRINGS is signed by pointing to one of the earlobes.

3. Substitutive Depiction
Four signs are found to be formed by means of substitutive depiction, namely, BRACELET, PLATE, BOWL, and CUP. It is obvious that these four signs have well-defined configurations that facilitate signing by substitutive depiction. For example,

BRACELET is signed by placing the left wrist between the bent thumb and index finger of the right hand facing downward. The bent thumb and index finger with the palm facing downward form the shape of a bracelet around a wrist. PLATE, BOWL, and CUP are signed by using similar hand configurations; all of them are formed by placing the spread right hand with the palm facing upward in front of the signer. They are different in the shape of the fingers. In PLATE, the fingers are extended straight; in BOWL, they are bent; in CUP, they become more bent. The shapes of the hands used in articulating these three signs iconically represent the shapes of the referents of the signs.

4. Sketching

Five signs are made by means of sketching: TABLE, HANDBAG, UNDERSHIRT, SKIRT, and NECKLACE. The signer can draw a virtual picture of either only a perceptually salient part of the referent, or of an overall configuration of the referent. An example of the former type is HANDBAG, which is signed by drawing the right palm-in hand downward from the right shoulder to the waist to represent the strap of a handbag going over a shoulder. An example of the latter type is NECKLACE, which is signed by drawing the index fingers of both hands from the neck at both sides down to the middle point on the chest to represent a necklace.

Combinations of Iconic Devices Used in Forming Man-Made Object Signs

Forty-seven man-made object signs are found to be formed by combinations of iconic devices. There are only a few signs in the data that are formed by combinations of more than two devices. Among the 47 signs formed by more than one iconic device, 24 are created by means of simultaneous combinations and 23 by means of sequential combinations of devices.

The simultaneous combinations of iconic devices employed to form 24 signs are uniformly combinations of substitutive depiction and mime. These 24 signs include CHAIR, SOCKS, SHOES, FORK, LADLE, COCKTAIL FORK, KNIFE, PANTS, RUBBER ERASER, PENCIL SHARPENER, REVOLVING PENCIL SHARPENER, WRITING PAD, PAPER, WRIST WATCH, ELECTRICITY, ELECTRIC SOCKET, ELECTRIC SWITCH, SLIDING DOOR, HEADBAND, AIRPLANE, HELICOPTER, BOAT, SCISSORS, and ELEVATOR. In articulating signs such as CHAIR, SOCKS, SHOES, KNIFE, one or both hands form the shape of the referent and at the same time imitate the typical motion of that referent. For example, SOCKS is signed by placing the index fingers side by side with the palms down in front of the signer, and moving them back and forth alternately many times. SHOES is also signed in the same manner as SOCKS. The former is different in that the fists are used instead of the extended index fingers. In these two examples, the extended fingers and the fists represent socks and shoes, respectively, and also imitate their motions when they are worn by people. Another example is SCISSORS, which is signed by moving the index and middle fingers of the right hand in such a way as to imitate the cutting motion of scissors. Such a shape of the hand with a scissor-like motion results from a simultaneous combination of substitutive depiction and mime. The motions of all of these signs are actually instigated and controlled by people, but they are pictorially represented in signs as if occurring on their own. In other examples, one hand forms the shape of an entity while the other imitates an action done to the other hand. For example, RUBBER ERASER is

signed by rubbing the thumb many times against the palm of the left hand. The left palm represents a piece of paper, and the rubbing of the thumb is an imitation of erasing a word on paper.

Twenty-three man-made object signs formed by sequential combinations of two or more devices. These signs include BOOK, NOTEBOOK, NAIL, PEN, BUDDHA IMAGE, DETERGENT POWDER, PENCIL, HANGING CLOCK, ALARM CLOCK, FLUORESCENT STRIPLIGHT, EYEGLASSES, T-SHIRT, HANDKERCHIEF, SCARF, SILK SHIRT, GOLD NECKLACE, SILVER NECKLACE, COOKING POT, BED, COMPUTER, MIRROR, GRANDFATHER CLOCK, and BUTCHER'S KNIFE. The sequential combinations of devices are different from one another in kind and order. Some examples of these combinations are substitutive depiction and mime, indexical presentation and mime, mime and mime, sketching and fingerspelling, sketching and mime, substitutive depiction and sketching, etc. Most sequential combinations have mime as one component.

Twenty-eight of all man-made object signs bear direct relationships with their referents. These signs are BRACELET, PLATE, BOWL, CUP, WRITING PAD, SOCKS, SHOES, FORK, COCKTAIL FORK, KNIFE, BUTCHER'S KNIFE, PENCIL SHARPENER, TABLE, SKIRT, NECKLACE, PAPER, SLIDING DOOR, HEADBAND, SCISSORS, ELEVATOR, BOOK, NOTEBOOK, NAIL, FLUORESCENT STRIPLIGHT, EYEGLASSES, COOKING POT, BED, and MIRROR. Notice that most of these signs are relatively small in size and have well-defined configurations. These two properties facilitate the direct representation of referents by means of substitutive depiction and sketching.

To sum up, approximately 85% of all man-made object signs are simple signs. Like color signs and animal signs, all man-made object signs have one-to-one correspondences between forms and meanings. About 45% of all signs in this group are formed with single devices, and about 55% with more than one device. The single devices employed in creating the signs are mime, indexical presentation, substitutive depiction, and sketching. Mime is the most commonly used of all these four devices. As in animal signs, fingerspelling is not used in forming the signs in this group. Among all the signs that are formed by combinations of more than one iconic device, approximately equal numbers are formed by simultaneous combinations and sequential combinations. The simultaneous combinations of iconic devices are uniformly substitutive depiction and mime. The sequential combinations of more than one iconic device vary considerably both in type and order of devices. Only one-third of all man-made object signs bear direct relationships to their referents and are formed by means of either substitutive depiction or sketching. The referents of these directly formed signs tend to be small and configurationally well defined. The most striking feature that is found with regard to the formation of man-made object signs is the extensive use of mime both as a single device and as a combined device.

Food Signs

Food signs in this study refer to signs that denote edible entities except for vegetable and fruit signs, which are saved for discussion in the next section. Unlike the first three groups of signs, some food signs have one-to-many relationships between meanings and forms. That is, there are 52 glosses and 60 forms in the data. Eight glosses are realized by two sign forms, namely, STICKY RICE, JASMINE RICE, SALT,

VINEGAR, FRIED RICE, CAKE, CORN, JAMROLL. Therefore, we will use the term "sign form" instead of "sign," which was earlier used in the paper, in order to distinguish it from "gloss," since some signs in this group have one-to-many mappings between meanings and forms. It is also found that 25 sign forms are simple, while 35 are non-simple.

It is notable that the number of sign forms that are created by single devices is very small, i.e., six signs. These six signs include RICE, RICE SOUP, PORK, OMELETTE, NOODLES, and ICECREAM CONE. The single device that is used in forming all of these signs is mime. For example, RICE is signed by snapping the right thumb against the tip of the right little finger, which imitates the snapping of a tiny thing like a grain of rice from the hand. RICE SOUP is signed by imitating the action of eating rice soup from an imaginary bowl. OMELETTE is signed by beating an imaginary egg in an imaginary bowl.

A total of 54 sign forms or 90% of all sign forms in this group are formed by means of combinations of more than one iconic device. The ratio of simultaneous combinations to sequential combinations of iconic devices is 12:42. It is noted that there are only two simultaneous combinations of devices employed in forming sign forms. The first simultaneous combination is a simultaneous use of two mimes. The second one is substitutive depiction and mime. In the former case, one might wonder how two mimes can be simultaneously carried out. Some examples will help illustrate this point. There are two signs that are formed by simultaneous mimes, PEPPER and TOFFEE. PEPPER is signed by imitating the motion of shaking pepper over the food and by simultaneously imitating the action of sneezing. TOFFEE is signed by unwrapping a toffee near the mouth and simultaneously opening the mouth to eat the toffee. It can thus be seen that the two mimes can be simultaneously performed if they are carried out by different parts of the body, such as the two hands and the mouth. Ten sign forms are formed by the second combination of iconic devices, i.e., subtitutive depiction and mime. They include FISH SAUCE, TEA BAG, COFFEE, SOFT DRINK, EGG, ICE CREAM, ICECREAM BAR, BREAD, and CORN (two forms). The formation of these two sign forms is carried out in two ways. In the first one, one hand forms the shape of an object and simultaneously moves in imitation of the typical motion of that object. For example, FISH SAUCE is signed by forming the right "Y"-hand, i.e., the fist with the thumb and little finger extended, with the palm facing outward, representing a bottle of fish sauce, and by imitating the action of shaking the bottle to add some fish sauce to the food. The second way of forming signs by means of simultaneous combinations of substitutive depiction and mime is by using two hands, one of which forms the shape of an object while the other imitates a typical action done to the object represented. For example, COFFEE is signed by imitating the action of stirring coffee in a cup by making a circular motion of the right index finger, which is pointed downward in the left "O"-hand, which forms a circle with the thumb and other fingertips touching.

As mentioned above, of all the 54 sign forms created by means of combinations of more than one iconic device, as many as 42 or 77% are formed by sequential combinations of more than one device. These sequential combinations vary considerably in both type and order of the devices that are combined. We will not go into detail about these sequential combinations; however, it should be noted that 35 out of 60 sign forms are non-simple. That is, they contain at least one lexical sign as a component. The fact that some of these sign forms are non-simple is understandable inasmuch as their English glosses are also non-simple words, such as FRIED RICE, which comprises the signs RICE and FRY, and SALAD, which consists of the signs

LETTUCE, STICKY, and VEGETABLE associated with the concept of salad dressing. On the other hand, it is interesting that some signs that correspond to single concepts or are glossed as single words in the spoken language, are broken down into more than one component. For example, MILK is signed by imitating the action of drinking and the action of milking a cow; SALT is composed of the signs for TINY and WHITE; and SUGAR consists of the signs SWEET and TINY. It can be hypothesized at this point that sign languages make an extensive use of the process of compounding, at least in the repertoire of entities-denoting signs. For future research, it will be interesting to examine what types of entities tend to be lexicalized as simple signs and what types tend to be linguistically realized as non-simple signs. The devices that are employed in combination to form each of these signs serve to highlight different characteristics of the sign. The characteristics of the signs are not necessarily physical. For example, the first component of the sign OVALTINE expresses the concept of being strong.

We will now consider how many of the food signs bear direct or metonymic relationships to their referents. Almost all food signs bear metonymic relationships to their referents. All of the six simple sign forms are created with mime, which is the imitation of actions typically associated with the referents. It is thus obvious that all of the six simple sign forms are metonymically created. The remaining sign forms are non-simple ones consisting of embedded signs as their components. It is very unlikely that non-simple sign forms will bear direct relationships with their referents, since their sign components convey different properties associated with the sign forms.

This section can be summarized as follows. The number of food sign forms that are created by means of single devices is notably very small, i.e., six. All six are created by mime. About 90% of all food sign forms are created by means of combinations of more than one iconic device. The sequential combinations of devices are used many times more frequently than the simultaneous ones. The iconic device that is used the most extensively in both types of combinations of devices is mime, which is the imitation of either eating a particular type of food or the process of acquiring or preparing a particular type of food for eating. Unlike the first three groups of signs, some of the food signs have one-to many relationships between meanings and forms. Most sign forms in this group are structurally non-simple; that is, they incorporate at least one lexical sign form in them. The lexical sign forms that are incorporated as subparts of food sign forms serve to bring out different prominent characteristics of the referents of the relevant sign forms. It is also found out that almost all food sign forms bear metonymic relationships to their referents.

Vegetable and Fruit Signs

Like food signs, some vegetable and fruit signs have one-to-many relationships between meanings and forms. It is found that ten vegetable and fruit signs have this kind of relationship: FRUIT, GROUND CHILLI, POMELO, LYCHEE, CHINESE DATE, LANGSAT, GRAPES, COCONUT, SUGARCANE, and BELIMBING. We will thus use the term "sign form" instead of sign in referring to the forms of glosses as we did in describing the food signs. According to our informant and our interpreter, the referents of these signs are realized as more than one form because deaf people in many groups or in different regions might find different properties of referents to be salient in and represent them in the signs expressing these referents. For example, LYCHEE can be realized in two non-simple forms. The second parts of the two forms are identical;

they express the concept of a small and round thing. On the other hand, the first parts are different. The first part of one form expresses the concept of good taste, while the one of the other expresses the red color. Both concepts are considered properties of lychees. Which one is selected as the first part of the sign depends on what is considered "salient" by the deaf. In short, it is found that there are 50 glosses and 63 sign forms of vegetable and fruit signs in the data. There are 26 simple sign forms and 37 non-simple ones. However, the division between simple and non-simple sign forms seems to be arbitrary at this point.

Fourteen out of 63 sign forms are formed by means of single devices: mime, sketching, and fingerspelling. These 14 sign forms include VEGETABLE (2 forms), LIME, FRUIT1, ROSE APPLE, LANGSAT, COCONUT (2 forms), SUGAR CANE (2 forms), BELIMBING2, APPLE, GUAVA, and TAMARIND. Mime is the most frequently used as a single device; it is employed in nine sign forms: VEGETABLE2, LIME, LANGSAT2, SUGAR CANE (2 forms), COCONUT (2 forms), APPLE, and GUAVA. These signs imitate typical actions that people do to their referents. For example, LIME is formed by squeezing an imaginary piece of lime; LANGSAT2 is formed by splitting open this imaginary fruit; both sign forms of SUGAR CANE involve the imitation of eating a sugar cane in different ways. The single device of sketching is used in forming three sign forms, namely, ROSE APPLE, BELIMBING2, and TAMARIND. Notice that the referents of these three sign forms obviously have unique physical shapes, which facilitate the representation in sign form through sketching. The last single device, fingerspelling, is used in forming only two signs in this group, VEGETABLE2 and FRUIT1. VEGETABLE2 is created by moving up and down the middle finger of the fingerspelling "V"-hand, i.e., the right fist with the index and middle fingers extended and spread, which is adopted from ASL. On the other hand, FRUIT1 is signed by placing the tips of the right "F"-hand into the right cheek and twisting. The "F"-hand, which is formed by placing the thumb and the index finger together to form a circle with other fingers extended straight, is also adopted from ASL.

It is found that 49 out of 63 sign forms in this group are created by more than one device. The 49 combinations of devices comprise 12 simultaneous combinations and 37 sequential combinations. All of the 12 simultaneous combinations contain substitutive depiction as one component, which co-occurs with one of the following three devices: mime, sketching, and stamping. Substitutive depiction uniformly serves to represent the shape of the referents of these signs. Co-occurring mime largely expresses the typical action that is done to the referents, as in BANANA, which is signed by imitating the peeling of a banana, substitutively depicted by the left index finger extended up, and CHERRY, which is signed by using the right hand to imitate plucking a cherry, substitutively depicted by the left fist. A combination of substitutive depiction and sketching is used in RAMBUTAN, which is signed by using the left fist to represent a rambutan and by moving up the tips of the "O"-hand from the left fist many times to form a picture of the hair of a rambutan. Stamping, the last device which is combined with substitutive depiction, is involved in the formation of KAFFIR LIME, which is signed by touching all the fingertips of the right hand on the left fist with the palm down, representing the rough skin of a kaffir lime.

As in the food sign forms, the type of device that is used the most in the formation of vegetable and fruit sign forms is the sequential combining of devices; these sequences vary in type and order of components. A few observations should be made at this point with regard to the sequential combinations of devices. There are four devices that are much used in the sequential combinations of devices: substitutive depiction,

mime, sketching, and fingerspelling. Substitutive depiction is involved in forming 21 non-simple sign forms. The referents of these 21 sign forms are found to have specific physical properties; they are either small and round, such as garlic, red onion, lychee, longan, mangosteen, cherry, and strawberry, or small and long, such as chilli and banana. The former is created by making a small, spherical handshape in palm-up orientation with the bent fingers separated representing a small and round object. As for the latter, the chilli is formed by extending the thumb and the index finger from the right palm-out fist with a small distance between them representing the length of the chilli. The banana is formed by extending the index finger upward from the left fist, representing a banana in a vertical position. The second device that is used very much in sequential combinations of devices is mime, which appears in 16 sign forms created by sequential combinations. There is a wide range of mimed actions used in forming these signs, such as plucking a cherry, splitting a durian in half, splitting open a langsat, shaking a Chinese date tree, and mincing a garlic clove. Sketching, the third device used in combination with another device, is involved in the formation of 13 sign forms. The referents of these 13 sign forms have specific physical properties; they are either large and round, such as pumpkin, cabbage, and watermelon, or long, such as gourd, spring onion, eggplant, carrot, and long bean. Fingerspelling, which is the last combined device, is used in forming VEGETABLE1, FRUIT, RED ONION, SAPODILLA. Notice that there are six non-simple sign forms that incorporate VEGETABLE as one component. Even though there are three sign forms of VEGETABLE, the one used to form other sign forms is the fingerspelled one. The sign forms VEGETABLE1 and FRUIT are adopted from ASL. On the other hand, the fingerspelled parts of RED ONION and SAPODILLA denote the colors red and brown, which are their characteristic colors, respectively. It is also found that most sign forms that are created by simultaneous as well as sequential combinations of devices make use of either substitutive depiction or sketching in combination with another device. These two signs serve to iconically describe the shape as well as size of the referents. That is tantamount to saying that, in most cases, the shape and/or size of vegetables and fruits are crucial parts of the sign forms denoting these referents.

To summarize, a number of vegetable and fruit signs have one-to-many relationships between meanings and forms. This is due to the fact that deaf people regard different properties of the same objects as being salient and that they subsequently select different bases to be used in the formation of signs. Most of the vegetable and fruit sign forms are of the non-simple type. It is found that most sign forms in this group are created by means of combinations of more than one device, most of which are sequential combinations. The device that is used the most frequently in forming vegetable and fruit sign forms is mime. Most combinations of devices employed in forming the signs in this group are found to be made up of either substitutive depiction or sketching as one component, each of which iconically describes the shape and size of the referents.

DISCUSSION

In this section, we will give a general summary by comparing and contrasting the characteristics of the five classes of signs examined and will discuss the implications of the characteristics that they do and do not have in common. It is found that the five classes of signs cluster differently with respect to different characteristics. However,

some of our comments with regard to certain characteristics of the signs are mere observations and speculations and need further research in order to verify them.

The five classes of signs are subdivided into two groups on the basis of their structural complexity. Color signs, animal signs, and man-made object signs form one group, since most of the signs in each group are simple signs, i.e., they do not incorporate another sign in their lexical structure. Food signs and vegetable and fruit signs form the other group, since most of the signs in each group are non-simple. That is, they consist of at least two lexical signs. One implication is that colors, animals, and man-made objects are likely to be conceptualized by the Thai deaf as single, basic concepts, while food, vegetables, and fruits tend to be conceptualized as non-basic concepts that are derivative of a few other basic concepts, which are in many cases drawn from other semantic domains.

Color signs are isolated from the other four classes of signs, since most color signs are highly non-iconic, while the remaining four classes are highly iconic. That means that the former are mostly formed by means of fingerspelling, while the latter are largely formed by means of iconic devices. Furthermore, color signs are formed with single devices but the other four groups with combinations of devices. Among the four groups of non-color signs, three—man-made object signs, food signs, vegetable and fruit signs—have one property in common. The iconic device that is the most frequently used in these three groups is mime. As for animal signs, the most frequently used device is substitutive depiction. Notice that man-made object signs, food signs, and vegetable and fruit signs, which make extensive use of mime, commonly denote the kind of referents that have direct effects on people. In other words, they express the entities that people either use or eat in their daily lives. It is thus obvious that people have to do something to these entities in order to use them or eat them. The typical actions normally done to the entities denoted by these three classes of signs are used as the bases of these signs, since they are aspects that are considered the most closely associated with this kind of referent. On this basis, mime is the most effective device in forming signs the referents of which serve human beings' purposes in some way. Notice that the mime used in the signs denoting food, vegetables, and fruits can be the imitation of eating these objects in a particular manner or the imitation of preparing these objects for eating in some manner, such as peeling a banana, splitting open a durian, squeezing a lime, and stirring coffee.

As mentioned above, animal signs make the most extensive use of substitutive depiction. This fact is also well motivated. Compared to man-made object entities, food, vegetables, and fruits, animals are less beneficial to human beings and are not regarded as entities for human use or consumption. Therefore, mime is not so frequently used in the formation of animal signs as in the other three groups of non-color signs. Rather, substitutive depiction, in which the articulator forms the shape of a part of an animal or the shape of the whole animal, is the most widely used in forming animal signs. Notice that the whole animals are substitutively depicted if the animals are relatively small, such as molluscs and fish. If the animals are relatively large, such as elephants, cows, and deer, only the salient parts of the animals are represented in the signs. The combination of devices that is the most commonly used in forming all the signs in the data is found to be the simultaneous combination of substitutive depiction and mime. With regard to animal signs, the mime that occurs in combination is subdivided into two types. The first is the imitation of the typical action human beings do to an animal, as in brushing off a fly, and slapping the right hand on the left one to kill a mosquito. The second type is the imitation of a typical motion of an animal or a

part of an animal, as in the swimming of a fish, the fluttering of a butterfly's wings, and the opening and closing of a bird's bill.

Some important observations can be made with regard to color signs. According to Wierzbicka (1996), color is not a universal human concept. People in all cultures do not necessarily isolate color as a separate aspect of their visual experience. Rather, the language of "seeing" is claimed by Wierzbicka to be universal and rooted in human experience. It is an interesting fact that most of Berlin and Kay's (1969) basic color terms are found to be formed by means of fingerspelling. This preference for fingerspelling for basic color signs seems to be explained by the non-universality of color concepts, as claimed by Wierzbicka. However, the formation of non-fingerspelled color signs, such as BLACK, RED, CRIMSON, and CREAM, reflects a universal feature of the human discourse of seeing postulated by Wierzbicka, i.e., the universal concept of comparison or "like" in human visual experiences. Wierzbicka claims that color perceptions are described with reference to visually salient features of the "macro-environment," such as the night, the sky, the sea, etc., as well as with reference to locally salient referents. In the case of non-fingerspelled color signs, they are created with reference to different parts of the human body, which can be considered locally salient referents, such as one eyebrow, cheek, lips, and blood. The iconic device that serves to create signs with reference to locally salient features is indexical presentation.

It is evident that the five groups of entity-denoting signs in TSL exhibit a high degree of iconicity. Iconicity is claimed to be a feature that makes a sign language unique as a natural language. The fact that sign languages are highly iconic does not exclude conventionality (Mandel, 1977). An element of language, whether signed or spoken, can be both conventional and iconic. In the case of sign languages, an iconic sign is conventional in the sense that its form exhibits a certain image agreed upon by convention. There might be several pictorial aspects of an entity or an action that can be represented or imitated in the process of sign-formation, but a certain aspect is selected by the deaf community to form a certain sign. In other words, the base of a sign can vary from language to language. This explains why sign languages contain features that are culture-specific even though they are highly iconic. It can be concluded that sign languages can be iconic and conventional at the same time.

In short, it is found that mime and substitutive depiction are the most widely used devices in the formation of the signs studied in this paper. Fingerspelling, sketching, and indexical presentation are used in the formation of a smaller number of signs, while stamping is rarely used. Since one type of mime is the imitation of human actions as described above, it is speculated that it is more culture-bound than the other devices. People of different cultures may behave in different conventional manners toward certain objects they normally use in their cultures. For example, they may have different ways of calling dogs and cooking noodles. However, this needs to be verified in future research.

There are a few interesting issues related to the formation of signs that can be investigated in future research. The first issue is concerned with the use of the compounding process in the formation of complex signs. The use of compounding seems to be as prevalent in sign languages as in spoken languages. This is attested by the fact that there is a large number of non-simple signs in the data of this study. The second issue involves the increasing influence of spoken and/or written languages on sign languages. It should be noted that sign languages increasingly incorporate features of spoken languages. This is attested by the use of fingerspelling in the formation of color signs. Fingerspelling can be said to be invented on the basis of the alphabets of

written languages. Another related issue worth investigating is the types of signing system in use in different sign languages. Sign languages share a feature with written languages in that they are visual. While most written languages in the world have moved from pictorial representation, which is considered as the ultimate form of iconicity, to conventional symbolization with alphabetic script as the principal type of writing system, sign languages predominantly contain pictorial icons with only a few fingerspelled signs. It is interesting to study whether sign languages are moving in the same direction as written languages with regard to the type of signs used. The particular semantic domains that are influenced more than others in sign languages by spoken or written languages are also worth examining in future research.

CONCLUSION

We have presented a survey of research on the devices used in the formation of five classes of lexical entity-denoting signs in Thai Sign Language: color signs, animal signs, man-made object signs, food signs, and vegetable and fruit signs. It is found that the signs in each class are distinguished from one another by the devices used in sign-formation and the major kinds of visual imagery that the signs in each group exhibit. Even though the lexical signs in TSL examined in this study make use of the same set of sign-formation devices as those in other sign languages, TSL has some language-specific features. For example, some forms are loans from other sign languages, notably ASL; some forms are bound to the Thai culture or even to certain deaf communities in Thailand. There are some other interesting issues arising from this study which should be investigated in future research on TSL, such as the process of compounding, which is widely used in the formation of signs, especially in the class of food, vegetables, and fruits, as well as the formation of non-basic color signs other than those examined in this study, and the formation of signs denoting actions that are closely associated with man-made object signs.

ACKNOWLEDGMENT

REFERENCES

Battison, R. (1971). *Some observations on sign languages, semantics, and aphasia.* Unpublished M.S. thesis, University of California, San Diego.

Berlin, B., & Kay, P. (1969). *Basic color terms: Their universality and evolution.* Berkeley: The University of California Press.

Klima, E., & Bellugi, U. (1979). *The signs of language.* Cambridge: Harvard University Press.

Kyle, J.G., & Woll, B. (1985). *Sign language. The study of deaf people and their language.* Cambridge: Cambridge University Press.

Mandel, M. (1977). Iconic devices in American Sign Language. In L.A. Friedman (Ed.), *On the other hand: New perspective on American Sign Language.* (pp. 57–107). New York: Academic Press.

Riekehof, L. L. (1987). *The joy of signing.* Springfield: Gospel Publishing House.

Saussure, F. de (1959). *Course in general linguistics* (W. Baskin, Trans.). New York: Philosophical Library (Original work published 1916).

Schlesinger, I. M., & Namir, L. (Eds.) (1978). *Sign language of the deaf: Psychological, linguistic, and sociological perspectives.* New York: Academic Press.

Wierzbicka, A. (1996). *Semantics. Primes and universals.* Oxford: Oxford University Press.

Woll, B., & Kyle, J.G. (1994). Sign language. In R. E. Asher & J. M. Y. Simpson (Eds.), *The encyclopedia of language and linguistics.* (pp.3890–3912) Oxford: Pergamon Press.

Wrigley, O.P., Suwanarat, M., Ratanasint, A., Rungsrithong, V., & Anderson, L. (1990). *The Thai Sign Language dictionary, revised and expanded edition.* Bangkok: The National Association of the Deaf in Thailand.

APPENDIX A

Glosses of Signs Analyzed in the Study

I. Color Signs

COLOR	PURPLE
WHITE	DARK BLUE
RED	BROWN
BLACK	GREEN
GRAY	PINK
ORANGE	CREAM
LIGHT BLUE	CRIMSON
YELLOW	GOLD

II. Animal Signs

ELEPHANT	DUCK
HORSE	GOOSE
TIGER	OSTRICH
CAT	RHINOCEROS
MOUSE	DEER
SQUIRREL	BUFFALO
DOG	COW
SNAKE	ZEBRA
COBRA	GIRAFFE
FISH	BEAR
CRAB	ANT
SHRIMP	BUTTERFLY
OCTOPUS	FLY
SHELL	DRAGONFLY
MUSSEL	MOSQUITO

BIRD   WHALE
CHICKEN   SHARK

III. Man-Made Object Signs

BOARD ERASER   HEADBAND
CHAIR   COMB
TABLE   HAIR BRUSH
BOOK   CAR
NOTEBOOK   MOTORCYCLE
WRITING PAD   BICYCLE
PEN   AIRPLANE
PENCIL   HELICOPTER
RUBBER ERASER   BOAT
PENCIL SHARPENER   TOOTHBRUSH
REVOLVING PENCIL SHARPENER   WASHBOWL
PAPER   DRINKING GLASS
WRIST WATCH   PLATE
HANGING CLOCK   BOWL
GRANDFATHER CLOCK   CUP
ALARM CLOCK   SPOON
ELECTRICITY   FORK
FLUORESCENT STRIPLIGHT   LADLE
ELECTRIC SOCKET   COCKTAIL FORK
ELECTRIC SWITCH   KNIFE
HANDBAG   BUTCHER'S KNIFE
EYEGLASSES   CAMERA
SHIRT   COOKING POT
UNDERSHIRT   BED
T-SHIRT   BROOM
SILK SHIRT   KEY
PANTS   SCISSORS
SHORTS   CIGARETTE
SKIRT   CLOTHES IRON
SOCKS   DETERGENT POWDER
SHOES   SOAP
HANDKERCHIEF   SHAMPOO
SCARF   TOOTHPASTE
TOWEL   BRUSH
TUBE SKIRT   SAW
LOIN CLOTH   FINGERNAIL CLIPPER
NECKLACE   NAIL
GOLD NECKLACE   HAMMER
SILVER NECKLACE   ELEVATOR
BUDDHA IMAGE   TYPEWRITER
SLIDING DOOR   COMPUTER
RING   MIRROR
BRACELET   FACE POWDER
EARRINGS

IV. Food Signs

RICE	POACHED EGG
RICE SOUP	FRIED EGG (2 forms)
FRIED RICE	OMELETT
STICKY RICE	STEAMED EGG
JASMINE RICE (2 forms)	A HUNDRED-YEAR-OLD EGG
SHRIMP PASTE	SALTED EGG
FISH SAUCE	FRIED BOILED EGG IN SWEET SAUCE
SALT (2 forms)	NOODLES
GRANULATED SUGAR	EGG NOODLES
PALM SUGAR IN SOFT CAKES	SAUSAGE LINK
PEPPER	BEAN SPROUT
VINEGAR (2 forms)	PORK MEATBALL
PORK SAUSAGE	BEEF MEATBALL
PORK	ICE CREAM
CHINESE TEA	ICE CREAM CONE
TEA BAG	ICE CREAM BAR
COFFEE	BEAN THREAD
RED SWEET DRINK	BUTTER
SOFT DRINK	BREAD
DRINKING WATER	CAKE (2 forms)
OVALTINE	COOKIE
SALAD	CORN (2 forms)
MILK	POPCORN
SWEETENED MILK	TOFFEE
EGG	CHOCOLATE
BOILED EGG	JAMROLL

V. Vegetable and Fruit Signs

VEGETABLE	LYCHEE (2 forms)
PUMPKIN	LONGAN
TOMATO	CHINESE DATE (2 forms)
TURNIP	LANGSAT (2 forms)
CHINESE LEAFY VEGETABLE	GRAPES (2 forms)
CABBAGE	RAKAM
CHINESE CABBAGE	MANGOSTEEN
LETTUCE	COCONUT
EGGPLANT	WATERMELON
LONG BEAN	SAPODILLA
CARROT	CHERRY
CHILLI	STRAWBERRY
GROUND CHILLI (2 forms)	SUGAR CANE (2 forms)

BIRD PEPPER
ONION
RED ONION
SPRING ONION
GARLIC
LIME
KAFFIR LIME
GOURD
FRUIT (2 forms)
BANANA
POMELO (3 forms)
ROSE APPLE

YAM BEAN
STAR GOOSEBERRY
MARIAN PLUM
BELIMBING (2 forms)
DURIAN
APPLE
MANGO
PINEAPPLE
PAPAYA
GUAVA
RAMBUTAN
TAMARIND

Appendix B

1. Examples of Simple Signs Classified According to Two Parameters

Relationship	Device	Presentation			Depiction	
						Virtual
		Mime	Indexical	Substitutive	Sketching	Stamping
ICONIC Metonymic	SINGLE	ORANGE (color), CIGARETTE, RICE, LIME, FLY	RED, BLACK, CREAM (color)	TIGER, SNAKE, RHINOCEROS, HORSE	HOUSE, GIRAFFE, HANDBAG, TAMARIND	
	NON-SINGLE	DOG (two mimes), SCISSORS, COLOR, MOSQUITO		SCISSORS, COLOR, MOSQUITO	ZEBRA (sub depict and sketching)	
ICONIC Non-metonymic	SINGLE		SHORTS, SHIRT, EARRINGS	AIRPLANE, TREE, PLATE, BRACELET	CAMERA	
	NON-SINGLE	BUTTERFLY, SHRIMP, RUBBER ERASER		MIRROR, OSTRICH, RAMBUTAN		KAFFIR LIME
NON-ICONIC fingerspelling		YELLOW, PURPLE, PINK, GREEN, FRUIT$_1$, VEGETABLE$_2$, RED ONION				

2.   Examples of Complex Signs

WHALE, PENCIL, STICKY RICE, JASMINE RICE, SALT, VINEGAR, COIN, JAMROLL