

A Survey of ASL Tenses

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Abstract

This paper examines tenses in American Sign Language (ASL), which will be useful for the ASL Translation project. In the past, researchers believed that ASL used only Time Adverbials to indicate time. However, new evidence indicates that ASL marks tense grammatically as well. In order to properly analyze ASL tense structure, Aarons, Bahan, Kegal and Neidle identified the Lexical Tense Marker and proposed a notion called "Tense Phrase", which is a very important concept of the ASL syntax. This paper will discuss this Tense Phrase in great detail along with Time Indicator, Time Adverbial and Lexical Tense Marker.

1. Introduction

As a native signer of American Sign Language (ASL), I find that I must often verify the tense of sentences with a sign language interpreter because improper use of the ASL tense can lead to severe miscommunication. For example, in *Legal Ramification of an Incorrect Analysis of Tense in ASL* [1], a deaf plaintiff misunderstood when he was asked "Did you understand when you were signing the paper at [Company A] that you were borrowing money and agreeing to pay it back?" The plaintiff responded, "Yes" because he thought the question asked if he understood at the present time when he was questioned, but was not aware that the question asked if he understood at the time when he was signing the paper. In order to synthesize ASL tense structure properly by using the notions, Tense Phrase and/or Adverbial Time [i] are essential concepts. This paper will discuss these concepts: Tense Phrase, Time Indicator, Time Adverbial and Lexical Tense Marker.

2. Notational Convention

This section describes the notations for the signs, which will be used in this paper [iii]. Most of these notations are widely accepted for transcribing ASL is shown in the next page.

SYMBOL	EXAMPLE	EXPLANATION
-	NOT-YET S-U-E	When more than one English word is needed to gloss an ASL sign, The English words are separated by hyphenation. In addition, when there is hyphenation between all letters such as S-U-E, this indicates a fingerspelling.

#	#WILL	When this symbol is written before a gloss, it indicates the sign is a fingerspelled loan sign. Fingerspelled loan sign do not spell out every letter in a gloss. For example, the #WILL sign spells as W-L instead of spelling out every letter for “W-I-L-L”.
*	* I-GIVE-YOU	When this symbol is written before a sentence in an example, it indicates the syntax is incorrect.
<u>neg</u>	<u>neg</u> NOT	This indicates a negation non-manual signal. This includes a side-to-side headshake, frequently accompanied by a frown, and sometimes a brow squint, a wrinkling of the nose and/or raised upper lip
<u>top</u>	<u>top</u> S-U-E	This indicates a topic marker with a non-manual signal in which the head tilts back as the eyebrows raise. ASL is a topic-prone language. The strategy of topicalization is to place the main focus of a thought at the beginning of the sentence.

3. Computational Linguistics

Translating English to American Sign Language draws upon the specialty in Artificial Intelligence (AI) called Computational Linguistics. Computational linguistics involves computer representation of human language. Problems in Computational Linguistic fall into two areas: *conceptual problems* and *technical problems*.

Conceptual problems pose questions in order to gain a better understanding of how humans communicate by using natural language. This area is shared with theoretical linguistics and psycholinguistics. Technical problems include building intelligent computer systems, such as natural language interfaces to databases, automatic machine-translation system, text analysis, and animations.

This paper surveys and analyzes the conceptual problem of ASL *tenses*. ASL tense is one of many components required for a complete ASL syntax. As in all machine translation systems, it is necessary to have a deep understanding of the syntax of any target language. Until now, no one has investigated the syntax of ASL in the context of creating a machine translator. To survey and identify the conceptual problem in ASL correctly is an essential part for successful completion of a machine translator project.

4. Time Indicator

The time indicator is one of the features that makes language unique as a communication system in that its users are not limited to talking about people, events, or things that are immediately visible or presently occurring [11]. In English for example, we use time indicator morphemes to express tense. For example, we add “s” to indicate present third person, and “ed” bound morphemes to indicate past tense. Unlike English, verbs in ASL do not use bound time indicator morphemes.

Time indicators in ASL are often called time signs. **FINISH**, **WILL**, and **#WILL** are examples of ASL time signs. The **FINISH** sign is used to indicate past tense or actions that have been completed, while the **WILL** and **#WILL** signs are often used to indicate future tense. ASL also uses present time signs such as **NOW** and **TODAY**. Although ASL has time indicator signs, they are not used in every sentence because they are considering redundant. Here is a short example of a sequence of English sentences.

Yesterday, I went to the class. I sat on a good chair. I listened to the lecture.

Every sentence above contains a past tense morpheme. A word-for-word conversion would result in a past time indicator in every sentence, which adds too much redundancy and is considered ungrammatical in ASL.

*** YESTERDAY I FINISH GO CLASS. I FINISH SIT GOOD CHAIR. I FINISH LISTEN LECTURE.**

The correct syntax in ASL for these sentences would be as follows:

YESTERDAY I GO CLASS. SIT GOOD CHAIR. LISTEN LECTURE.

If a time is specified in a sentence, then all the events a signer describes are understood as occurring at that time [iii]. This holds true not only for that sentence but also for all subsequent sentences until a new time is specified. Therefore, an English-to-ASL translator system must be robust enough to keep track of the time for events and identify any changes including- present, near past, far past, near future and far future. This will remove unnecessary time indicator signs from sentences when converting from English to ASL. A database also will need to have a field to identify the time attribute for independent lexical time indicators such as **TOMORROW**, **TODAY** and **FROM-NOW-ON** signs. The translating program must also determine correct tenses for embedded sentences. For example in the sentence, “Yesterday she told me that she would call you tomorrow”, the time indicator in the main clause introduces the tense for the whole sentence, and the embedded clause remains as a tenseless complement. Table 1 shows some examples of ASL time signs, grouped by the tenses, which are familiar in English.

Present	Past	Future	Recent
NOW	ONE-DAY-PAST	FEW-DAY-FUTURE	RECENTLY
TODAY	FEW-DAY-PAST	WILL	
UP-TILL-NOW	PAST	FUTURE	
EARLY-MORNING	LONG-TIME-AGO	DISTANT-FUTURE	
	ONCE-UPON-A-TIME	ONE-YEAR-FUTURE	

Table 1: ASL Time Signs

5. Lexical Tense Markers and Time Adverbials

There are two kinds of time signs in ASL: Lexical Tense Markers and Time Adverbials. Lexical Tense Markers are lexically independent time signs, whereas Time Adverbials are time signs that function as adverbs. Most Lexical Tense Markers have corresponding Time Adverbials, which are morphologically related [i]. However not all time signs have two categories. For example, the #EX sign (for ex: ex-husband/ex-worker) is known and has been studied for non-related Adverbial Time. This means #EX sign can't be used as Time Adverbials and it will be used as Lexical Tense Marker only. In ASL syntax, Time Adverbials can appear almost order-independently in a sentence, whereas Lexical Tense Markers can only appear at more restricted positions. There is clear evidence that Lexical Tense Markers and Time Adverbials are distinct. I will discuss Lexical Tense Markers and Time Adverbials in detail in the next sections.

5.1 Lexical Tense Marker

When -TNS is added to the right side of a gloss, it indicates the gloss symbol is a Lexical Tense Marker. The WILL sign has two classifications: FUTURE-ADV or FUTURE-TNS. FUTURE-ADV is the future adverbial, while FUTURE-TNS is the future lexical tense marker. Table 2 shows some examples of ASL Lexical Tense Markers.

FUTURE-TNS	A 5 handshape moving in an arcing motion from the present line of the shoulder to the future timeline.
PAST-TNS	Bent B-handshape tapping (or moving toward) the shoulder.
RECENT-PAST-TNS	Articulated either like the PAST-TNS but with more restrained movement, or else like the sign RECENT; both articulation co-occur with cs (cheek-to-shoulder) face (the facial expression ^{cs} , also found with the adverbial marker 'recently').
UP-TO-NOW	(often glossed SINCE) Articulated with two index fingers, bent at the first knuckle, palm downward, finger points contacting upper shoulder and moving in an arcing motion to palm-up orientation at about chest height in front of the body.
IMMEDIATE-PRESENT-TNS	Similar to the glossed sign for NOW but it is closer to the body. It is co-occurring with a non-manual marker: teeth clenched, lips stretched, mouth corners pulled downward.
FORMERLY-TNS	A 5 handshape moving in a small circular motion with thumb side brushing against collar bone
#EX-TNS	Identical articulation to that of fingerspelled loan sign corresponding to 'ex-husband/wife;

Table 2: The Lexical Tense Markers [i]

5.2 Time Adverbials

ASL expresses information about time with a specific set of signs that are produced in relation to what is called a *time line*, illustrated on the Figure 1 [iii]. The time signs have a relative location on the time line, which agrees with their meaning. In addition to the timeline, the height defines the coordinate system of the sign location. In some cases, height distinguishes tense markers from time adverbials.

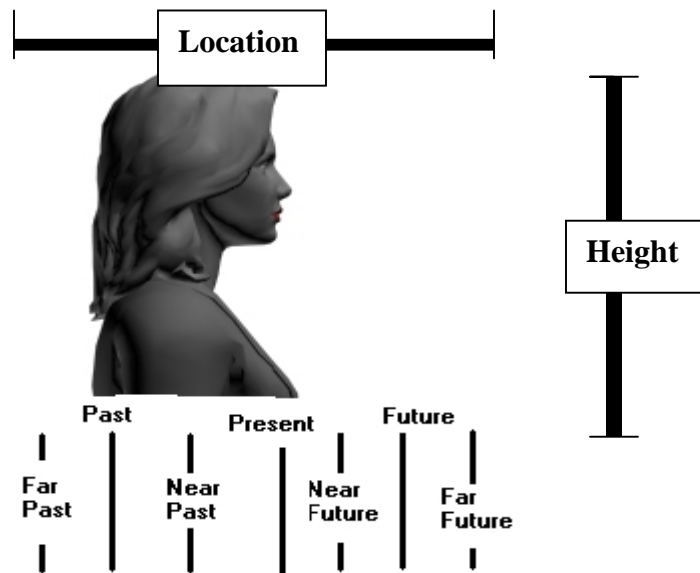


Figure 1: “Time line” [iii]

The timeline is indicated on the illustration above as starting from Far past, Past, Near Past, Present, Near Future, and Far future respectively with the vertical lines from left to right.

According to Cogen [^{iv}], the articulation of time adverbials has been described relative to an imaginary time line that divides the signing space, with the signer’s body representing the plane of the present, the space in front of the signer representing the future, and the space behind representing the past. The signs for such adverbials are articulated with a movement in either a forward or a backward direction corresponding to future or past, respectively. The path of these signs extends further in space either forward or backward to express greater distance in time either in the future or the past.

The two future time indicators in Table 3 use height as well as the time line in their movement. The WILL sign can be expressed as a lexical tense marker (FUTURE-TNS) or as a time adverbial (FUTURE-ADV). In notation, the time adverbials are indicated with –ADV to the right

of the gloss. The FUTURE-TNS has a fixed form using the WILL sign. The FUTURE-ADV has various forms that use the WILL sign depending on the location timeline.

SIGN GLOSS	From Location	To Location	From Height	To Height
FUTURE-TNS	“Present” timeline	FIXED (A few inches away forward from the face)	Cheek	Chin
FUTURE-ADV	“Present” timeline	Variable depending on the semantic and according to the timeline	Forehead	Cheek

Table 3: Future Time Signs

The FUTURE-TNS is a lexical tense marker and always has a fixed path length. The fixed path length for the FUTURE-TNS starts moving from the location of present to somewhere between Near Future and Future on the time line with B-handshape oriented palm-sideward in forward extension.

- 1) [FUTURE-TNS] I GO SCHOOL.
‘I will go to the school.’
- 2) [FUTURE-ADV] I GO SCHOOL.
‘In the near future, I will go to the school.’
- 3) [FUTURE-ADV] I GO UNIVERSITY.
‘In the far future, I will go to the University.’

Unlike lexical time markers, the time adverbials have no fixed path length. The length of the path is dependent on semantics. In (2) above, FUTURE-ADV starts moving from the location of present to the near future space, whereas in (3), the FUTURE-ADV sign starts moving from the location of present to the far future space.

SIGN GLOSS	From Location	To Location	From Height	To Height
PAST-TNS	“Present” timeline	Fixed (near the shoulder)	Cheek	Shoulder
PAST-ADV	“Present” timeline	Variable depending on the semantic and according to timeline	Cheek	Shoulder

Table 4: Past Time Signs

- 4) [PAST-ADV] I STUDENT GALLAUDET.

‘In the past, I was a student at Gallaudet.’

- 5) **[PAST-TNS] I STUDENT GALLAUDET.**
‘I was a student at Gallaudet.’

Another example of time signs for the past time indicator is given in Table 4, which lists the movement from the location to the next location and the height level. It is similar to the future time signs. The only difference is that the signing movements are in the backward direction.

Finally, in the next sections discuss on how and why the lexical tense markers and time adverbials are distinct.

6. Tense Phrase

Tense Phrase is a notion proposed by Aarons, Bahan, Kegal and Neidle [i]. It is a phrase (or clause), which has a tense indicator. A tense phrase has a hierarchical structure and is depicted by a tree which is rooted by the “Tense Phrase” node and which has the “Tense” node, as shown in Figure 2.

Either modals or lexical tense markers may appear in the Tense node [i]. Modals in ASL include CAN, MUST, SHOULD and HAVE-TO. Modals and lexical tense markers may occur in no other syntactic position. The Tense node in a tense phrase is found between the subject Noun Phrase and the Negation Phrase (if the phrase is a negation) or the Aspect Phrase, which contains a Verb Phrase. The Tense node is the head of the ASL tense clause structure, indicated by T’ in Figure 2. Negation such as NEVER and NOT and the adverbials may appear to the right of Tense, followed by the Verb Phrase. This structure applies to almost all sentence types in ASL, such as Yes/No question, WH-question, declarative statements and etc. The non-manual signals, which include facial expression and/or body movement, can easily classify the sentence type.

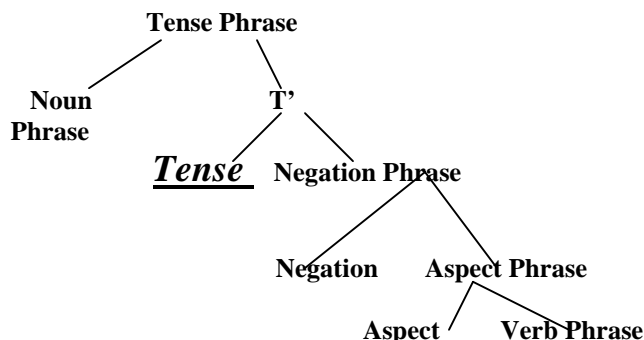


Figure 2: ASL Tense Clausal Structure [partially from i]

The comparison between the lexical tense markers and time adverbials in terms of placement in the ASL syntax list as follows [i]:

LEXICAL TENSE MARKERS

TIME ADVERBIALS

Necessarily occur to the right of the Noun Phrase	May occur in several positions in the sentence but not in the position occupied by modals and tense markers
Necessarily occur to the left of negation	Do not appear in the position immediately to the left of negation
May contract with negation	May not contract with negation
Necessarily occur to the left of lexical aspect markers	

Table 5: Comparison of Lexical Tense Marker and Time Adverbials [partially from i]

A modal or a lexical tense marker occurs only under the Tense node. It has been shown that lexical tense marker patterns with modals are therefore distinguishable from time adverbials in terms of the syntactic position in which they occur [i]

- 6) **TOMORROW** S-U-E BUY HOUSE.
‘Sue will buy a house tomorrow’.
- 7) S-U-E BUY HOUSE **TOMORROW**.
‘Sue will buy a house tomorrow’.
- 8) S-U-E **TOMORROW** CAN BUY HOUSE.
‘Sue can buy a house tomorrow’
- 9) -----TOP-----
TOMORROW S-U-E BUY HOUSE.
‘Sue will buy a house tomorrow’
- 10) * S-U-E BUY **TOMORROW** HOUSE.
‘Sue will buy a car tomorrow.’

A Time adverbial such as **TOMORROW** may appear in any of the following positions: in the beginning of the ASL clause shown in (6), or at the end of the ASL clause shown in (7), or between the subject of Noun Phrase and Tense as shown in (8). Note that a modal such as **CAN** could co-occur with time adverbials and is acceptable in any positions where a time adverbial can occur. Also the time adverbial can appear in the topic position at the beginning of the sentence as shown in (9). However, the time adverbial cannot appear between a verb and its object as shown in (10). Note that a lexical tense marker may appear at other positions in a sentence. However, this issue is outside the scope of this paper and will not be discussed.

Whenever a negation occurs in the syntax, it is ungrammatical to use time adverbials. Using the lexical tense marker is a proper way to deal with it. A negation such as **NEVER** and **NOT** may appear to the right of Tense. The Tense Phrase is between the Noun Phrase of the surface subject and Verb Phrase. In the (11), (12) and (14), (15), the **FUTURE-ADV** must be a lexical tense marker and it is placed under a Tense node. Due to the negation statement, the possibility for tense marker placement is restricted. See examples (11) through (15).

- 11) S-U-E **FUTURE-TNS** -----NEG-----
NOT BUY HOUSE OR
S-U-E -----NEG-----
NOT BUY HOUSE **FUTURE-TNS**
‘Sue will not buy the house ’
- 12) **FUTURE-TNS** S-U-E -----NEG-----
NOT BUY HOUSE

- 'Sue will not buy the house '
- 13) * S-U-E **FUTURE-ADV** _____
NEG
NOT BUY HOUSE
'Sue in the future (will) not buy a house'.
- 14) S-U-E **UP-TO-NOW-TNS** _____
NEG
NOT BUY HOUSE
'Sue has not bought a house up to now'
- 15) S-U-E **PAST-TNS** _____
NEG
NOT BUY HOUSE
'Sue did not buy a house'.

The lexical tense marker does not occur in infinitival complements [i]. For example, sentences (16) and (17) have an infinitival complement clause “to buy” for the verbs “want” or “prefer” . ASL does not have an overt marker corresponding and to the infinitive (like “to”) in English. Modals also cannot occur in infinitival complements as shown in (18) and (19).

- 16) S-U-E WANT BUY HOUSE.
'Sue wants to buy a house.'
- 17) S-U-E PREFER BUY HOUSE NEXT-YEAR.
'Sue prefers to buy a house next year.'
- 18) * S-U-E PREFER FUTURE-TNS BUY HOUSE.
'Sue prefers will buy a house.'
- 19) * S-U-E- PREFER CAN BUY
'Sue prefers to be able to buy

7. Time Non-Manual signals

In addition to time indicators, non-manual signals play an important role in specifying tense in ASL. Non-manual signs in ASL incorporate facial expressions and/or body movement. Without it, a statement will be meaningless regardless of whether the syntax is in the proper order. To demonstrate their importance, consider the fact that ASL does not use different syntax structure for various sentence types. Instead, ASL relies on non-manual signals to convey the difference between declarative, imperative and interrogative sentences. This paper focuses on non-manual signal tense markers only.

Facial expression and other non-manual behaviors can indicate time in ASL [iii]. The notation for non-manual signals uses an extended line over the section of a sentence where the non-manual signals occur. Sometimes the non-manual signals can appear with verbs such as “ARRIVE”. The various non-manual signals are summarized in Table 6 in the next page

Notation	Description	Non-manual signals	Examples
<u>cs</u>	“closeness to the present time space”. It called as cheek-to-shoulder	Raising and moving the shoulder forward and raising the cheek and side of mouth toward that shoulder	VERY RECENTLY JUST NOW JUST ARRIVED
<u>intense</u>	Awfully far away in time space	Teeth clenched, lips stretched, and mouth corners pulled downward and sideward movement of the head	AWFULLY LONG TIME AGO AWFULLY FAR IN THE FUTURE
<u>past</u>	This can be incorporated with tense non-manual signals without having to add a lexical marker or time adverbial sign	Upturn of the corner of mouth, as well as slight backwards and sideward movement of the head	BREAK ARRIVE
<u>fut</u>	This could be incorporated with e tense non-manual signals without having to add a lexical marker or time adverbial sign	A slight forward head lean and a different mouth position.	BREAK ARRIVE
<u>immediate.pres</u>	Immediately present marker	Teeth clenched, lips stretched, and mouth corners pulled downward	NOW

Table 6: Non-manual signals [i,iii]

8. Conclusion

The English to ASL translator system must be robust enough to keep track of the time for events and identify any changes in time including references to present, near past, far past, near future and far future. This system should be able to make a correct decision to address any tenseless complements. Since the Tense Phrase is the head clause of the ASL syntax, the translator system will likely start by resolving the ASL tense issues. This program would need to incorporate pattern matching to replace words with the equivalent ASL gloss. For example consider the sentence, “In the far future, I will go to the University”. The program should be able to convert “In the far future” into FUTURE-ADV and set the path length from the present to the far future timeline along with puffed-cheek non-manual signals. Then it should be able to delete the redundant word “WILL”.

Often entire phrases in English can be replaced with one sign. (It would be a good idea to have a separate table that uses the time sign to reduce the amount of time for searching the database). This paper only examines and gives some guidelines on how to use ASL tense properly in term of syntax positions and non-manual signals. Obviously, this translator program will make use of a rule system to select a lexical tense marker or time adverbial. We currently have enough facts from previous research to make it possible to develop some strategies for converting English tenses into ASL tenses for use in the ASL Translator project. These strategies will be used as essential conceptual information when developing implementation strategy for computer representation of ASL tenses. As a next step This will be addressed as a technical problem in computational linguistics.

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