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World Wide Web – Common Communication Language

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WORLD WIDE WEB – COMMON COMMUNICATION LANGUAGE (W3–CCL)

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ABSTRACT

World Wide Web – Common Communication Language

By Mohamed Ali

The purpose for the World Wide Web – Common Communication Language (W3-CCL) is to allow internet users around the world communicate using a single common language. This common language is based on images / symbols and other known communication tactics such as Sign Language, Ancient Egyptian Language, etc. The W3-CCL is to be used in building sites' contents, chatting, sending messages / e-mails, and any information sharing related operations on the internet. The scope of this project is limited to W3-CCL proof of concept via building an e-commerce website for a specific domain; moreover, the W3-CCL usage will be limited to displaying messages, help with form filling, etc. Success of the project is measured by having internet users, with different language backgrounds, be able to browse the website without the need for localization.

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Introduction

Internet socialization has been one of the most developed areas on the web nowadays. It enables people around the world to connect and communicate via the web. Internet socialization has bridged the distance gap and enabled people to get connected with those whom they share with similar interests. However, one remaining area is still un-bridged, the language barrier. The W3-Common Communication Language (W3-CCL) will be the means by which people can overcome the language barrier.

The W3-Common Communication Language is an image / symbol based language that depends on two things; one is the fact that an image is worth a thousand words, which means the human intellect has better understanding and interpretation of images and symbols. Two, using the computer processing power which can help us (humans) transform our ideas and thoughts into a sequence of images and symbols with minimum usage of words. Human language translation and processing is a far from reach goal. However, we enable people to translate their thoughts into sequences of understood images and symbols by which anyone around the globe can understand easily.

1 World Wide Web Communication Problem

The World Wide Web is still suffering from the basic problem of communication among users of different language backgrounds. For example, Italian speakers have Italian localized web pages, Chinese have Chinese localized sites, English speaking users browse English localized pages, etc. A university in Russia most probably builds the university related sites in Russian, or they build separate localized pages for each language in the world (or the most spoken languages)[1]. Moreover, public sites, like msn.com, develop country specific sites which are localized to countries' spoken language and culture[2]. This approach is good if an internet user wishes to stay locked within their language boundary and not get in touch with other cultures. However, in normal situations and based on human nature, people like to explore and discover different cultures. The only way for someone to discover other cultures on the web is to learn that culture's specific language. For instance, if I wish to know what is happening in France and learn about its culture I wouldn't be able to do so unless I learn French (which may not a trivial task) or they (whoever builds France related sites) localize a special site in my mother tongue.

[1] http://www.msu.ru/en/ - this university have localized sites for English, French, Russian and German.
[2] http://www.msn.com/worldwide.aspx

1.1 Localization Problem

Building localized web pages is time and resource consuming. Localization requires development resources, translators, encoding support, and other language specific requirements. In other words, it is a big chunk of the development cycle and may cost significant amount of money to achieve that. Moreover, localization is very dependent on how many languages a website is willing or wanting to support. As a result, it makes sense to think that localization is affordable by big corporations who have the money, time and resources, and who have very good reason to go in that direction. The problem is, most of the web world is not built by large corporations; most of the web pages we browse on the World Wide Web are built for and by a specific community who may not have the means by which they can localize their websites into other languages.

Figure 1 - MSN in Japanese

1.2 Socialization and Chatting Problem

Another related area is socialization and chatting. Internet socialization has become part of many people's daily life. On the one hand, like web pages, chatting world is divided into communities relative to culture and language. Maybe culture doesn't play as big of a role as language because if a user speaks, for example, English, then he/she can chat in American, British or any English speaking community. On the other hand, chatting online is unlike pages because it cannot be resolved by localization but rather *translation*. Translation can be challenging on line since it is very much related to the *phrase* and *context* of conversation than word to word translation. For example, saying "he gave him the cold shoulder" in American English cannot be translated word for word since the "cold shoulder" part of the sentence is rather an expression the speaker wants to imply. As a result, simple translation of words does not work when people try to communicate via online chatting rooms.

In order to resolve the online socialization and allow people around the world to share similar ideas and discuss common issues regardless of language and culture boundaries, one of two solutions is possible; one is create a translator which will translate from one language to another on the fly as users are chatting live. The second solution is to have people communicate and chat using a common language. Either one of the two solutions is a complex task but if solved, the solution can do a great service to humanity and bridge the language burrier. Figure 3 and 4 show the Windows Live Messenger and Google Talk

tools in English version as two of the chatting tools online. Other chatting tools include Yahoo Messenger.

Figure 2 - Windows Live Messenger in English

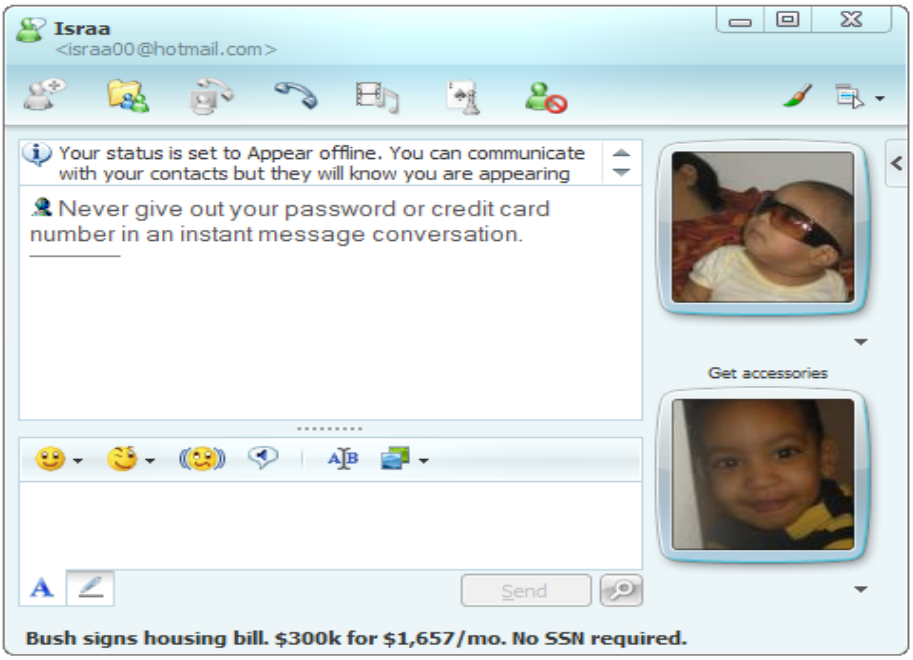


Figure 3 - Google Talk tool for online chatting

2 Writing Systems

Written systems are a part of the human species communication system. There are several communication systems existing in the world. The human been by nature is innovative and tends to adjust and come up with whatever it takes to make communication possible. Communication is divided into two main areas, spoken and written systems. The internet communication is mostly written communication system; nonetheless, the internet also contains spoken communication in the form of video streaming (more or less).

The most common communication system is the modern spoken and written language or languages. However, not all people are capable of speaking and using the spoken language for communication. For example, people with hearing disabilities have their own communication system, which is known as the Sign Language. Moreover, over the ages different eras and locations used different communication systems. The Egyptians had a written communication system that is based on images and symbols. The Chinese have a similar written communication system that is based on building sentences from symbols; each symbols stands for an idea or object. Other written languages consist of letters when combined together they form words and phrases. What matters more for the sake of this research topic is the written communication systems that are based on representing ideas in terms of symbols or images.

2.1 Ideography and Pictography

Ideography is the art of representing ideas in the form of graphic symbols. Likewise, pictography is the art of representing objects, concepts, activities, places and events in terms of images. Pictography is a form of writing in which ideas are transmitted in form of drawings. Pictographs have been used in history and in the contemporary world. In the ancient world the Chinese and Egyptians used symbols to represent ideas and concepts. In the contemporary world, there are standard signs thought out the world agreed upon to have a certain meaning or idea. The next sections will discuss pictography and ideography in the ancient world and the contemporary world.

2.1.1 Egyptian Hieroglyphs[3]

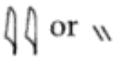
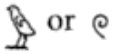
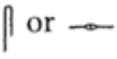
Ancient Egyptians written language was known to be Hieroglyphic. Hieroglyphs are pictures or signs put together to form a sentence or a word. Some signs depict a living object or creature, or their parts, while other signs stand for a letter and a sound. Any sign in the ancient Egyptian language can be either a Phonogram or a Logogram. Another aspect of the ancient Egyptian language is presentation or signs combination rules. The next sections will discuss some aspects of the ancient Egyptian language such as Phonograms, Logograms, propositions, adjectives, etc.

[3] http://www.ancient-egypt.org/ and http://www.ancientegyptonline.co.uk/hieroglyphs-tutorial.html

2.1.1.1 Phonograms

Just like the English letters convey sounds, some ancient Egyptian language signs conveyed sound. The most import set of signs are known as the ***l-constant*** signs. The *l-constant* signs role is similar to the English letters where each hieroglyphic sign stands for a sound. Figure 5 below shows some of the most common phonograms and their mapping to the English letters.

Figure 4 - l-Constant signs[4]

SIGN	TRANS-LIT.	SAY	SIGN	TRANS-LIT.	SAY	SIGN	TRANS-LIT.	SAY
	*ꜣ*	a		*m*	m		*š*	sh
	*i*	i/a		*n*	n		*ḳ*	k
 or	*y*	y		*r*	r		*k*	k
	ꜥ	a		*h*	h		*g*	g
 or	*w*	w/u		*ḥ*	h		*t*	t
	*b*	b		*ḫ*	kh		*ṯ*	tj
	*p*	p		*ḫ*	kh		*d*	d
	*f*	f	 or	*s*	s		*ḏ*	j

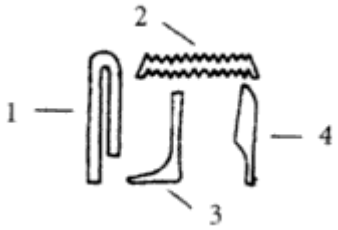
[4] Taken from "*How to Read Egyptian Hieroglyphs"* book; reference no. 9

2.1.1.2 Logograms

Logograms are signs that resemble an entire word. Logograms are also known today as ideograms where they present an idea or concept. Mostly, these Logograms present objects as they look in reality. Nonetheless, some Phonograms are used also as Logograms but with a distinctive sign; this sign is usually a vertical line beneath the Phonogram sign. The following example shows the distinction between the letter R (Phonogram) and the word Eye (Logogram); notice the vertical line beneath the sign.

2.1.1.3 Combining Signs

As stated before, the ancient Egyptian language used combination of signs to build a sentence or a word. Sentences can be structured from left-to-right, right-to-left, top-to-bottom or a combination of two or more. The goal for having different arrangements is to save space and squeeze signs in the smallest space; with that goal in mind, we find that a word in a phrase can be built like a block where read left-to-right and top-to-bottom, as shown below:



Each of the signs above stand for a sound given in *figure 5*; for example, 1 = s and 2 = b; all together form a word. Another more complex example is shown in figure 6 below; the example shows how a sentence in the ancient Egyptian language can be structured in different orientations but still have the same meaning.

Figure 5 - A Phrase in Ancient Egyptian Language

Moreover, if signs are put horizontally then they can be read from left-to-right or right-to-left. How to know which way to read it? The key is to find which way the sign that looks like an animal or human is facing; if the sign faced right then the sentence is read right-to-left, and vise versa. On the other hand, if the sentence was build vertical, then it is always read from top-to-bottom.

2.1.1.4 Propositions

Propositions are words used to link verbs and nouns together. For example, proposition in English can be words like *at, to, for, with,* and *from.* Ancient Egypt used certain symbols as propositions. They were used mainly to indicate direction (i.e. towards), location (i.e. under), accompaniment (i.e. with), and time (i.e. before). Looking at proposition signs in ancient Egyptian are not intuitive to give their meanings. Rather, propositions have to be memorized with its meaning in order to understand it in a sentence. The following are few examples of propositions in ancient Egyptian language.

with	***in***	***from***
		

2.1.1.5 Adjectives

Adjectives are words used to describe nouns. In English, for instance, *good, nice, evil, tall, and big* are adjectives which can be added to nouns to give them more details and description. Ancient Egypt used certain signs and symbols to describe adjectives. These symbols are not related to their meanings; in other words, the word *evil* in Ancient Egypt is written with a combination of symbols and signs rather than a single sign; in addition, these signs by themselves are not related in any way to the meaning of "evil." Therefore, some adjectives have to be memorized as they are to understand their meaning rather than

being driven somehow from signs related to the meaning of the adjective in question. The following are a few adjectives from the ancient Egyptian language.

Evil

Evil Man

Evil Woman

2.1.2 Chinese Writing System

The Chinese Writing System uses symbols to represent sentences. Every word in Chinese is represented with a symbol. In a sense, the Chinese language can be classified as a pictographic language for its graphical and symbolic nature. However, unlike letter based

or phonic languages, the Chinese Writing symbols are not connected in anyway with the spoken Chinese language and how it sounds; in other words, symbols represent concepts and words and not sound. The original Chinese Writing System, from around VII-III centuries BC, represented objects as drawings of these objects as they appeared in real life; for example, a bird is drawn as a *bird* symbol which looked very similar to the real bird. A later on version of the Chinese Writing System developed to be more of symbols driven from the original "close to reality" symbols. The current Chinese writing system doesn't have a direct link between symbols and what they represent. The following example compares between the original Chinese symbols (Top row) verses the more developed Chinese writing system (bottom row)[5].

Interpretation of Chinese symbols above (from left to write)…

1. Ji – chicken
2. Yang – sheep
3. Fu – bat

[5] http://www.logoi.com/notes/symbols.html

4. Gui – tortoise
5. Yu – fish

In order to be able to read in Chinese, the reader must have enough vocabulary or symbols memorized in order to understand the meaning; the average number of symbols to be memorized to be able read a newspaper in Chinese is 3,000 symbols[6].

2.1.3 Contemporary World

The contemporary world uses many different forms of pictography. Some cultures use one form or another of pictography to transmit ideas. Pictography in our contemporary world is mainly used as symbols to represent an idea or a message for those who can't read the language of the country. For instance, if a tourist, Jane, was to visit the U.S. but doesn't understand the English language, then Jane is venerable to not understand the simplest of signs if were all written in English; if Jane was driving from one city to another and on the way she looked for a Gas Station, a sign that reads "Gas Station" means nothing to Jane since she doesn't understand English. However, a sign of a gas station at the exit, such as  , could be understood as Gas Station to whoever sees it. For that very reason, places of interest, where people may search for essential things (i.e. Gas Station, Hospital, or Hotel), have symbols specially designed so that whoever sees it would understand what it means. Nonetheless, these pictographic signs are not intended for sentence building (for the purpose of communication). Sentences are usually complex

[6] http://www.logoi.com/notes/chinese_alphabet.html

and in their simplest form, consist of one or more verb, noun, subject, object or adjective. Representing objects may not be complex as it is already dealt with in pictographs. However, verbs like *walk, buy, or sell* are more complex to present with a simple image or symbol.

The following are examples of some common and agreed on pictographs and symbols from the National Park Service used currently around the world.

Figure 6 - National Park Service sample Pictographs


P
M
H

2.2 Emoticon

Emoticon is the art of showing human emotions in terms of icons. Lately this approach has been used a lot in the chatting world. It initially started as a combination of two or three symbols to show some emotion while chatting. For example, if a person wanted to show that they are happy or laughing then they write ":o)" which is known as the *smiley face*. Later on, this simple combination of keyboard symbols has been substituted with real icons; these icons have become the standard for the world of chatting on the web. The major advantage of emoticon is that it is universal and can be used to replace emotional words. *Table 1* below shows a simpler version of emoticon which is totally typed using the standard keyboard letters and symbols.

Table 1 – Sample Human Emotions as Combinations of Keyboard Symbols

Icon	Meaning	Icon	Meaning	Icon	Meaning
:)	smile, happy	:(	sad, depressed	;)	wink
:D	big grin or laugh	:P	tongue out, happy, or after a joke	(k):p(k)	kiss

Figure 7- Emoticon in Terms of Icons

3 Sign Language

Sign language is the communication system for people with hearing disabilities. Sign languages are country and culture dependent. For instance, in the United States there is a communication system known as the American Sign Language (ASL). Britain developed the BSL or the British Sign Language system. Sign languages are based on hands movements, facial gestures and mouth movements. Normally sign languages are driven from understood gestures from normal life; that is why different countries may have different sign languages; in other words, a hand gesture in one culture may have one meaning while the same hand gesture may have a different meaning in another culture. However, there is one known unified sign language as the standard for all countries. This sign language is known as the International Sign Language or ISL. The International Sign Language is used in international events such as Olympics for the Disabled. One downside of the International Sign Language is that it is very basic and amateur compared to culture specific sign languages. In this section, we will discuss the American Sign Language specifics and applications.

The American Sign Language is a sign language used by the American hearing disabled community. Similar to any sign language basics, the American Sign Language is based on gestures, facial expressions and hand movements to transmit a certain idea or speech. Moreover, the American Sign Language defines certain fist and figure movements to map to each English letter; letters in the sign language are mainly used to spell names, etc. In

general, however, when conversing in the American Sign Language, movements are usually mapped to words and objects rather than letters. There is a certain sentence structure to follow in order to converse properly. Section 4.2 discusses the American Sign Language syntax in more details.

A sentence in English could be composed of a verb, noun, object, subject, adjective, or proposition. The American Sign Language is similar to some extent except that verbs, adjectives, and propositions are communicated in the form of hand movements and gestures rather than words. The following section shows a few examples of different words in the American Sign Language.

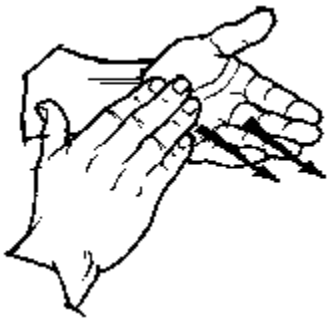
3.1 Examples of American Sign Language[7]

This section shows a few words in the American Sign Language. These signs could differ slightly from one source to another but overall, they are close enough.

3.1.1 English Letters

[7] http://www.lifeprint.com/ - examples are take from this site

3.1.2 Excuse



3.1.3 Please

3.1.4 Name

3.1.5 Above

3.2 Topicalization

Topicalization is the process by which a Sign Language speaker sets a topic for the conversation that is taking place. It is considered a sentence opener prior to conversation. A visual-manual speaker begins with a topic to open the conversation and then proceeds with a question or comment. In a sense, Topicalization is the communicated sentence setter.

3.3 American Sign Language Syntax

Sentence structure in a language is known as the language syntax. Syntax studies focus on the rules that govern building a valid sentence in a given language. The American Sign Language (ASL) sentence structure is governed by different rules. In general, a speaker is supposed to set the topic for the conversation in the very beginning, as mentioned before. Then, to continue the conversation, certain rules must be applied. The following are a few American Sign Language sentence structures[8].

- TOPIC + COMMENT where topic is Topicalization and comment can be a statement, question, or predicate. This type of syntax is also known as SUBJECT + PREDICATE. As example, *she likes to speak Spanish.* The word "she" is the subject of the sentence and "likes to speak Spanish" is the predicate or comment.
- TIME + SUBJECT + PREDICATE or TIME + TOPIC + COMMENT are syntaxes where TIME is added to the sentence (i.e. yesterday, tomorrow). For example, *yesterday*

[8] Taken from the following site…http://www.handspeak.com/tour/grammar/index.php?byte=syntax

he went running. "Yesterday" is the TIME, "he" is the subject and "*went running*" is the predicate.

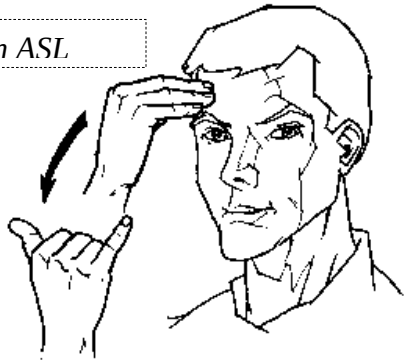
- SUBJECT + ACTION + OBJECT or SUBJECT + OBJECT + ACTION syntactical statements depend on the spatial, temporal, and kinetic structures of the subject, object and direction. TIME can also be added to this type of sentence in the form TIME + SUBJECT + ACTION + OBJECT or TIME + SUBJECT + OBJECT + ACTION.
- Question type sentences:
    - Yes-No Questions: yes-no questions are communicated by an upward movement of brows, widened eyes and forward-tilted head (as shown in the picture below).

- WH-Questions: these types of statements are known to start with either *why, what, how, when, where, or who.* These types of questions are communicated with downward brows before or after the sentence depending on the nature of the sentence. The picture below resembles a WH-Question type sentence.

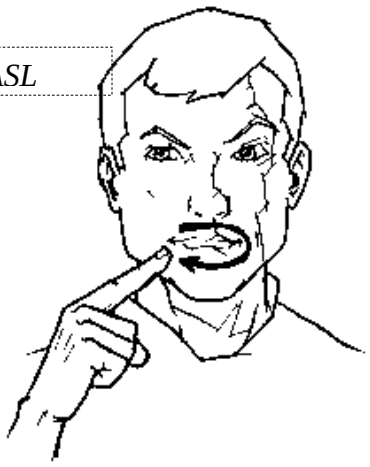
- In addition to the brows movements described above, the WH-Questions are communicated in different hands movements' for each specific question type as shown in the pictures below.

WHEN hand movement in ASL

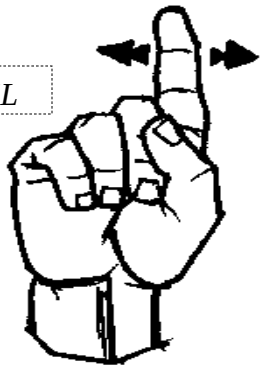
WHY *hand movement in ASL*



WHO *hand movement in ASL*



WHERE *hand movement in ASL*



3.4 Adjectives

Adjectives are words put in a sentence to give description to a noun in the sentence. For example, *tall, short, good, bad, and nice* are adjectives in the English language. *That tall man is running fast;* the adjective in the previous sentence is *tall* which describes the height of the man mentioned in the statement. The American Sign Language uses some meaningful gestures to communicate adjectives. Normally one hand is used to set the norm while the other shows the adjective relative to the norm (the first hand setting). The following examples are a few adjectives taken from the American Sign Language.

TALL *in ASL*

BIG *in ASL*

BIGGER *in ASL*

4 W3 – Common Communication Language

This section is the meat of the project. The World Wide Web-Common Communication Language (W3-CCL) is the framework and infrastructure for a language to be used on the World Wide Web (internet) as the common way for exchanging and sharing information. The W3-Common Communication Language is based on symbols, images, and animations, and takes advantage of computer power and technology to present an understandable language across the world. This W3-CCL shall be the main way of building websites content or material presentation (and not the language to develop the web pages). Instead of using one language or another that is understood only by speakers of one specific language and culture, the W3-CCL would be one unified way for internet users across the world to communicate regardless of spoken language and culture.

The W3-CCL language will take advantage of the already existing communication forms discussed in earlier sections. For instance, the ancient Egyptian Language contains great details on how to build statements from symbols. Also, emoticon can be used as a way to present feelings and emotions in terms of icons; and the American Sign Language (ASL) can be used as a source for some verbs, adjectives, etc, since it is already well developed and uses intuition as the main guide line for the language as it developed. Moreover, the W3-Common Communication Language will have a syntax and structure based also on the American Sign Language. The main idea behind W3-CCL is to have intuitive symbols and icons when put together they form a meaningful sentence which can be

understood worldwide. Moreover, the learning curve must be minimum compared to other languages.

The W3-Common Communication Language will be built and drawn based on four existing methods…

1. Predefined Sentence Types
2. Images and Animations
3. American Sign Languages / Ancient Egyptian Language
4. Mathematical Signs

The following sections will go over the details of each of the W3-Common Communication Language dependencies. Then the W3-Common Communication Language specifications will be discussed in details. Lastly, the main project, which implemented the W3-Common Communication Language concept, shall be discussed in details.

4.1 Quick Overview of W3-CCL Dependencies

The following are some of the pros and cons of the W3-Common Communication Language dependencies or areas of interest, as mentioned in section 4. Details of how each of the dependencies will contribute to the building of the W3-Common Communication Language will be given in the next section. The plus sign (+) preceding an item means it is a positive and the dash sign (-) means it is a negative.

- American Sign Language

  + Well structured

  + Contains verbs (buy, help, make, spend, etc)

  + Contains feeling expressions (mad, angry, happy, sorry, etc)

  + Syntax and grammar

  + Communication language

  - Country and culture dependent

  - Difficult to memorize tons of signs representing objects, etc.

  +/- contains motion (maybe equivalent to animated images).

- Ancient Egyptian Language

  + Image based

  + Uses combination of images to transmit an idea

  - Not well studied and not sophisticated – built for writing rather than communication.

- Mathematical Languages / Algebra

  + Good use of signs (i.e. parentheses, &, |) to imply grouping, conditions, etc.

+ Perfect for mathematical operations.

+ Common signs and well known by any culture

- Not a communication language

- Can be challenging and confusing if used in a context other than mathematical

4.2 Sentence Types

The W3-Common Communication Language is based on the four known sentence types, Declarative, Imperative, Interrogative, and Exclamatory.

- **Declarative**

A declarative sentence "declares" or states a fact, arrangement or opinion. Declarative sentences can be either positive or negative. A declarative sentences ends with a period (.).

Examples…

Your changes have been saved successfully.

The system will be shut down for 5 minutes.

Invalid username / password.

This item is available in stocks.

- **Imperative**

An imperative sentence is of commands or requests nature. The imperative takes no subject as 'you' is the implied subject. The imperative form ends with either a period (.) or an exclamation point (!).

Examples…

Please fill the required fields.

Enter full name

Create your profile

- **Interrogative**

The interrogative asks a question. In the interrogative form the auxiliary verb precedes the subject which is then followed by the main verb (i.e., Are you coming ....?). The interrogative form ends with a question mark (?).

Examples…

How would you like your items shipped?

Would you like to continue?

What color would like?

- **Exclamatory**

The exclamatory form emphasizes a statement (either declarative or imperative) with an exclamation point (!).

Examples…

Your data entry is incorrect!

Good morning John Johnny!

4.3 Syntax and Sentence Structure

This section lays the guide lines and rules that govern the W3-Common Communication Language sentence structure. As discussed before in section 3.3, a sentence structure is meant to set and guide lines for the language syntax. The syntax is composed of rules that govern building a valid sentence in a given language. The W3-Common Communication Language will use an existing language's structure, that's mainly "not to reinvent to wheel." The most appropriate language to copy the syntax from is the Sign Language in general and the American Sign Language (ASL) in specific. In general, a sentence topic must be set in the very beginning. Then, the rest of the sentence is a comment or predicate that says something specific about the topic. The following are a few American Sign Language sentence structures[9].

- TOPIC + COMMENT where topic is Topicalization and comment can be a statement, question, or predicate. This type of syntax is also known as SUBJECT + PREDICATE. As example, *she likes to speak Spanish.* The word "she" is the subject of the sentence and "likes to speak Spanish" is the predicate or comment.

- TIME + SUBJECT + PREDICATE or TIME + TOPIC + COMMENT are syntaxes where TIME is added to the sentence (i.e. yesterday, tomorrow). For example, *yesterday he went running*. "Yesterday" is the TIME, "he" is the subject and "*went running*" is the predicate.

[9] Taken from the following site…http://www.handspeak.com/tour/grammar/index.php?byte=syntax

- SUBJECT + ACTION + OBJECT or SUBJECT + OBJECT + ACTION syntactical statements depend on the spatial, temporal, and kinetic structures of the subject, object and direction. TIME can also be added to this type of sentence in the form TIME + SUBJECT + ACTION + OBJECT or TIME + SUBJECT + OBJECT + ACTION.

4.4 Syntax Details

Due to the immaturity of the W3-Common Communication Language, the language will follow a strict and limited form. The following points are the major rules that govern and W3-Common Communication Language…

4.4.1 Language Restrictions

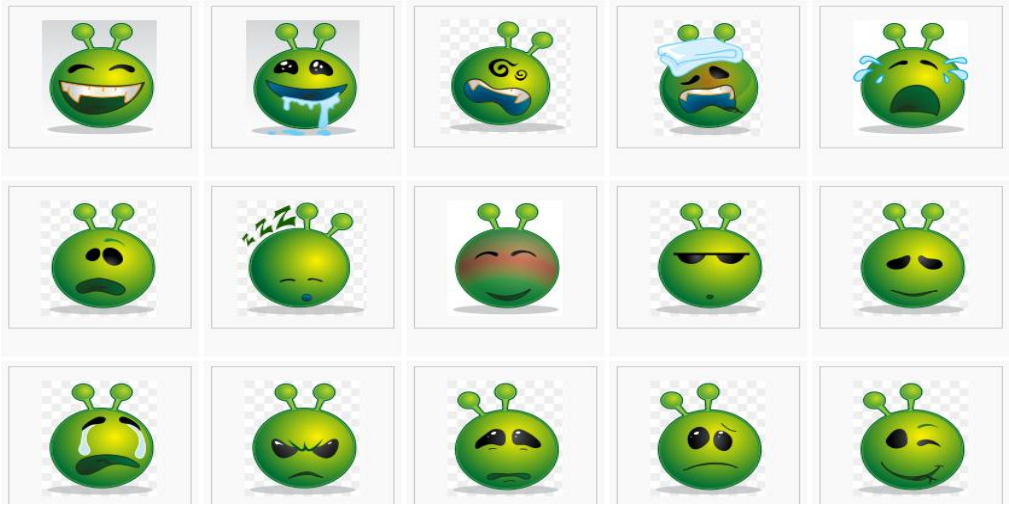
1. The W3-CCL language supports only four sentence types, declarative, interrogative, imperative and exclamatory (please refer to section 4.2).
2. The W3-CCL language structure and syntax strictly supports two syntactical rules taken directly from the American Sign Language syntax, TIME + SUBJECT + PREDICATE, and SUBJECT + PREDICATE (please refer to section 4.3 for more information).

4.4.2 Feelings and Emotions

Feelings and Emotions are very essential to the human been communication. People express their inner feelings via visible emotions. Normally feelings and emotions are expressed in terms of facial expressions and body gestures. In fact, feelings are usually expressed in terms of emotions. Moreover, emotions are common across different cultures; in other words, emotions are built-in characteristics since we're born rather than acquired over time from the surrounding environment and culture. For examples, a crying face emotion normally indicates sad feelings. Laughter indicates feeling of happiness and pleasure.

In today's world and with the existence of internet chatting, emoticon existed as well. Emoticon is icon based and resembles different human emotions. For example, :o) is known to mean smile or laughter. For more information about Emoticon please refer to section 2.2.

The Common Communication Language will use Emoticon to reflect emotions and feelings. The following are commonly used emoticons found on the web. Different websites use different styles but in the end, they're all very close and understandable.



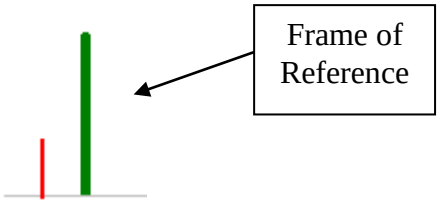
4.4.3 Adjectives

Adjectives are descriptions for nouns. For example, in the sentence "*he is a tall man,*" *tall* would be the adjective because it gives description of the man's height. Time related adjectives are words like *later, earlier, etc.* The Common Communication Language will use two different approaches to describe objects and nouns, the American Sign Language and the Frame of Reference approaches.

a) *The American Sign Language:* Use the American Sign Language way to describe objects or time. For example, the American Sign Language "speak" the word *later* (which can be used for time related sentences) by holding one hand vertical and with the other hand take a finger and position it against the other hand to look like a clock; then move the pointing fingers in the forward position as "*later*," as shown next[10].

Figure 8 - Later in American Sign Language

b) *The Frame of Reference system*: Show adjectives by comparison. To say, for example, *short* the idea must be given by comparing two different vertical lines. One vertical line would be the frame of reference, which is the norm, and the other vertical line would be what we're trying to say. The next image shows the word *Short* in the Common Communication Language.



[10] Taken from http://www.lifeprint.com/

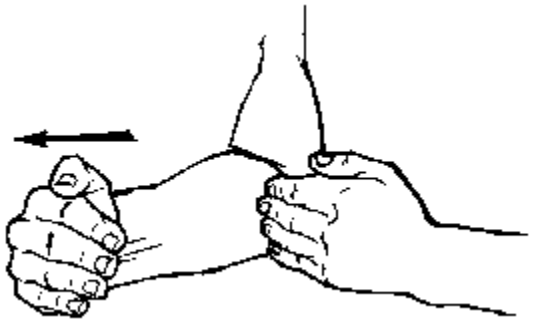
If you notice, the frame of reference is thick and green. The word to be said (*short* in this case) is thin and red. The frame of reference will always be in green and thick whereas the target adjective would be in green and thin.

There is a learning curve in this situation but the rules are clear. Once users start using the system, they shall capture the concept quickly and would be able to reference any adjective easily. The American Sign Language also uses hand signals and gestures to state things like *tall, short, etc,* but their understanding learning curve is much longer and there is no standard way to describe these words.

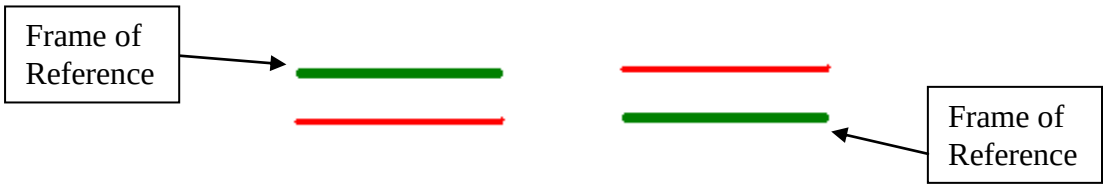
4.4.4 Location References

What meant by locations here is words that describe objects relative to another object. Example words are *above, below, after* and *in front of.* The Common Communication Language will use the American Sign Language and the Frame of Reference approaches together. Some American Sign Language gestures are clearer and easier to understand and, therefore, they will be used. For example the word *after* is gestured as follows in the American Sign Language…

Figure 9 - After in American Sign Language



For words like *below* and *above,* the Frame of Reference approach would be more appropriate, as shown below.



The general rule is, if the word requires hand motion or any kind of motion then the American Sign Language would be used. Otherwise, the Frame of Reference approach would be used to describe the location of an object relative to the frame of reference.

4.4.5 People References[11]

Usually in two way conversations a person may want to reference to *you, me, them, these, we, etc.* For the most part the American Sign Language will be used in place of references. The American Sign Language is more intuitive and common to use around the world. Here are a few examples of references…

[11] All the American Sign Language references are taken from http://www.lifeprint.com/

ASL 1 – YOU

ASL 2 - ME

ASL 3 - THEY - A smooth sweeping movement

ASL 4 - THESE

4.4.6 Possession[12]

Frequently people need to reference possession of an object. This more commonly used in the internet world when, for example, a user makes an order and the website would need to reference the purchased item possession. For instance, a phrase like "*Your item will be delivered in 5 days"* is commonly used in commercial websites; the word "*your"* indicates that the referenced object is owned by the user. Other common possession words are *mine*, *your*, *his*, *hers*, *ours*, *etc.* The American Sign Language will be used to reference possession. Next are a few examples of possession word in the American Sign Language.

ASL 5 - YOUR

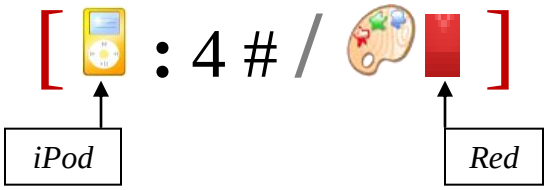
ASL 6 - HIS / HERS

[12] All the American Sign Language references are take from http://www.lifeprint.com/

ASL 7 - OUR

4.4.7 Objects Characteristics

Sometimes objects need to be described with certain characteristics, such as color, count, etc. The Common Communication Language will use **Square Brackets [ ]** and columns to describe an object. The first position after the opening bracket is the object to be described followed by **Columns**. Then, the object's characters and descriptions should be given separated by **Forward Slashes.** The general format can be seen the following formula [Object **:** desc1 / desc2 / … / descN]. The next line is an example of saying "*4 Red iPods*" in the Common Communication Language.



4.4.8 Complex Words

Complex words are words that involve process. For example, the word *Order* is a complex word since an order involves product selection, checking-out, payment and

maybe shipment. The Common Communication Language will use **Braces { }** to group all the icons resembling the process and separated by vertical lines |. For instance, the word ***Order*** would be presented in the form…

***ORDER* = { Shop | Select | Fill | Pay | Ship }**

4.4.9 Common Words

Use these signs in place of the following common words…

- And +
- Or OR
- Not

4.4.10 Algebraic Signs

Use of algebraic signs for…

- Number next to an image to mean "*multiple of*"
  - 4s
    4 iPods
- Parentheses **( )** to group items

- (2 + 3)

  2 women and three men

- ((2 + 3) or ( ))

  2 women and three men, or no men

- Brackets for giving a description of some object (use *forward slash "/"* to separate between the object to be described and its descriptions [object : desc1 + desc2,…, descN]; use constructed images (i.e. red on top of the pencil image)

  - [: 4]

    4 *Red iPods*

- Star sign "*" to mean multiple number but undefined or "*many*"

  - * s +

    many women and no men

- Power sign to mean *Strength* and *Power*
- Equal sign "=" to mean *Equal*
- Tilde sign "~" to mean *Almost*
- Sharp sign "#" to mean *Count*

4.4.11 Sentence Elements

a) Language supports only the previously mention sentence types

   i. Declarative / general sentence

   ii. Imperative / command

iii. Interrogative / question

iv. Exclamatory

b) Defined and undefined objects (i.e. **you** *vs.* **someone**, **the** *vs.* **a**)

i. Use colored objects and icons to indicate defined objects

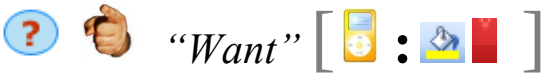
 *You*

ii. Use ***gray*** objects to show undefined objects

 *Someone*

c) Sentence type/mode is to be set prior writing the sentence

i. Use this question mark sign  to begin an interrogative / question type sentence. The next lines are examples of interrogative phrases.

 *"Want"*

Do you want a red iPod?

What is the time?

ii. Use this sign  to start a declarative sentence

iii. *Imperative* and *exclamatory* are still unresolved.

d) Use *American Sign Language* or *animations* for verbs

e) Use *clock* and *calendar* images combinations for timing references

HOUR

DAY

MONTH

5 Project (An Illustrating Website)

This section discusses the main implementation project that reflects the use of W3-Common Communication Language in a real world commercial site. The illustration website is specific for selling laptops and shoes. The commodities the website sells are unrelated (i.e. Laptops and Shoes); the purpose of having two different and unrelated domains sold by the website is to show that the W3-CCL concept would work for different domains.

The Illustration website will be entirely based on the W3-Common Communication Language. There is still going to be a few English words here and there but it is to be at minimum. The used English words are either domain specific or world-wide common words (i.e. yes, no). Success of the project is measured by that fact that anyone can navigate, search, select and buy laptops or shoes through the website regardless of the user's background, language, or culture.

Technology-wise, the Illustration website was built using ASP.NET 2008. All pages and images are hardcoded for demo purposes. However, the same data could have been taken from the database in a more dynamic matter. This issue is beyond the scope of this project.

5.1 Website Structure

The Illustration website is composed of different pages and forms. The main categories are Laptops and Shoes. The main page gives the user the ability to toggle between the different categories. From the main page the user can select an item to view its details. From the details page the user can add to the shopping cart and ascend to other pages. The different functions and pages supported by the Illustration website are…

- Laptops Selection Page
- Laptops Details Page
- Shoes Selection Page
- Shoes Details Page
- Checkout Page
- Payment Form
- New User Form
- Confirmation Page
- Shopping Cart

5.1.1 The Main Page

The bottom screenshot (Figure 9) shows the main page for the *Illustration* website. The navigation bar is composed of images only and no text. The main page defaults to the laptops area.

Figure 10 Main Page

5.1.1.1 Categories Navigation Page

The bottom screenshots shows the Navigation Bar where the user can pick a product group to find more details, brands, prices, etc. For example, if the user clicked on the *laptop* he/she would get a page with more categories related to laptops (i.e. Manufactures). The same logic applies to the shoes category.

Figure 11 Laptop Category Selected

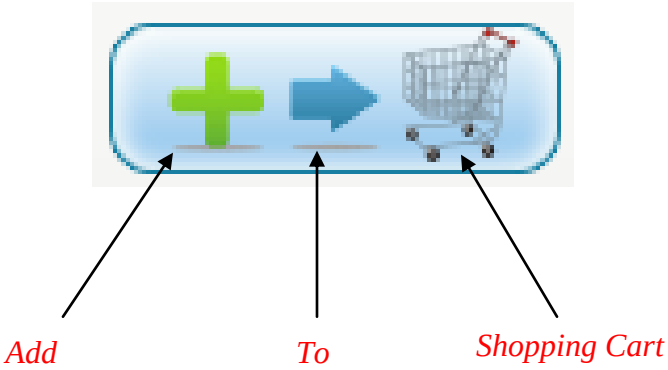
Figure 12 Shoes Category Selected

5.1.1.2 Laptops Category

Figure 11 below shows partial details for laptops. The laptops partial details section contains many three phrases, Add to Shopping Cart, Add to My Favorites and Details.

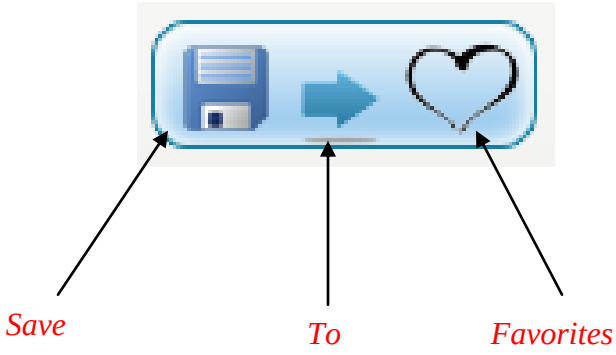
Figure 13 Laptop Category Detail

Add to Shopping Cart



The above image/button resembles the Add to Shopping Cart phrase. The plus sign stands for the word "Add." The plus sign (+) is well known by everyone to mean adding numbers; nonetheless, in this context it stands for adding the shown item to something else. The right arrow could have many meanings, such as NEXT, TO, etc. In this context it gives the meaning of adding something "TO" something. The shopping cart image has a straight forward meaning, which is "Shopping Cart." Putting all the images together implies adding the shown item to the shopping cart.

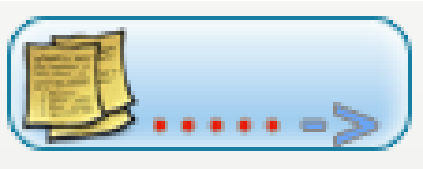
Save to Favorites



The above image/button means "Save to Favorites." The Disk icon stands for Save. It could have different meanings; it could be Noun in which case it would be interpreted as Disk. Or it could be a verb and which case it is read as Save. How do distinguish which is which? In this context the disk icon means Save for many reasons; one reason is it is found in a button like background. Another reason is it proceeds the TO icon and it is in the beginning of the sentence. The Heart icon could have different meanings; it could mean a human heart, resemble love, favorites, etc. The meaning of an icon is taken within

the context of the phrase being read. If we assume the Heart icon means human heart then the sentence would make no sense. If it means “love” then the sentence also makes no sense. The one meaning that may make sense is Favorites because when put together with the other icons the whole context of the page, the phrase would make sense.

More Product Details



The button above contains icon of scattered pages, red dots and an arrow pointing to the right. Understanding this button and icons combination is somewhat challenging; it is not too intuitive to understand that the scattered pages stand for product details or details in general. However, this is where the standardization of the W3-CCL language comes into play. In other words, it is understandable there is a learning curve to the W3-CCL, but the learning curve is at minimum because once the user has been introduced to this combination of images to mean “More Details” then the brain immediately maps this sequence of images to the phrase “More Details.” Next time the user sees the same combination of images the brain will right away have a hit and would interpret the images correctly.

5.1.1.3 Shoes Category

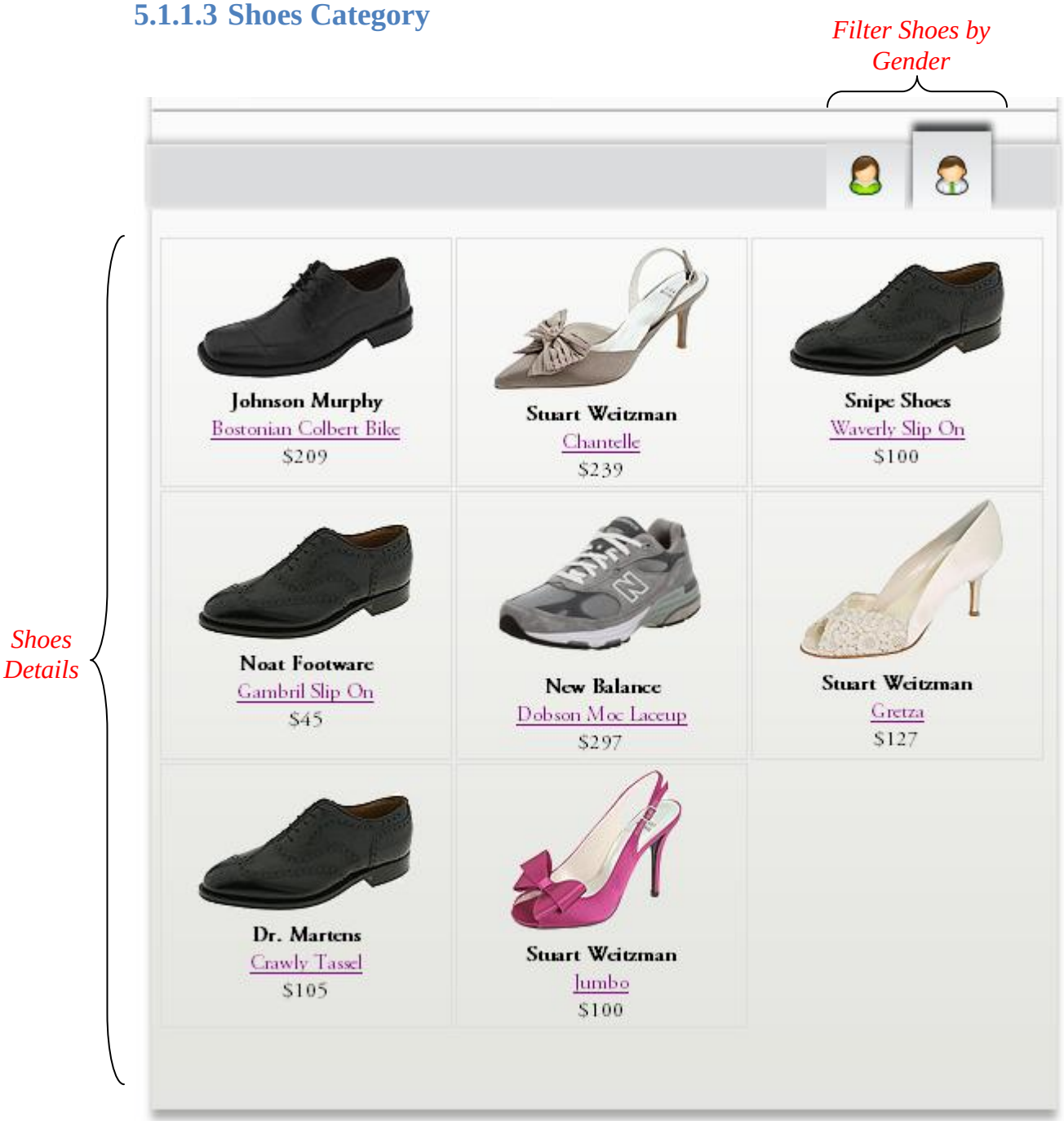


Figure 14 Shoes Category

5.1.2 Laptop Details Page

Figure 15 Laptop Product Details

Figure 12 above shows the laptop product details. The left top side shows the selected product image. Under the image there are two icons, Add to Shopping Cart and Save to Favorites. You notice the Save to Favorites image/button is a bit different this time. This is for nothing but to show that the same meaning could be given via different sequence of images. For the "Add to Shopping Cart" button please go back to the previous section for discussions. The right side of the page shows the actual details of the product. Each of the icons stands for a laptop specification. For example, the first image is a screen icon which means the details of the product screen (i.e. size, resolution, etc). The second to last

images is the laptop battery. The last image is the webcam images and it means whether the laptop contains an integrated webcam. Each item's details are given in English since these descriptions can't be translated into different languages. Moreover, these descriptions are standard and as long as the user can read the English letters and are familiar with the domain (laptops in this case) he/she will be able to understand each of the items. If the user is familiar with laptops then he/she will understand DVD, 3GB, Intel, etc, because these are commonly used words in the laptops world.

5.1.3 Shoe Details Page

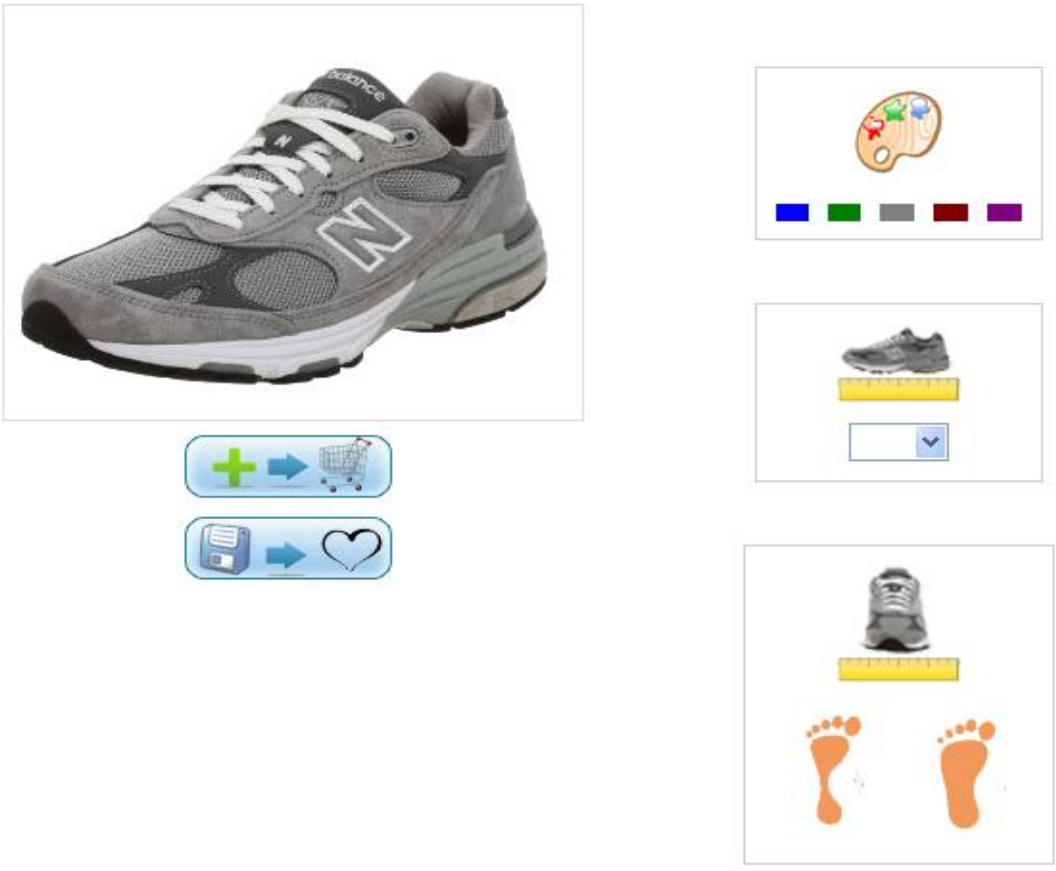
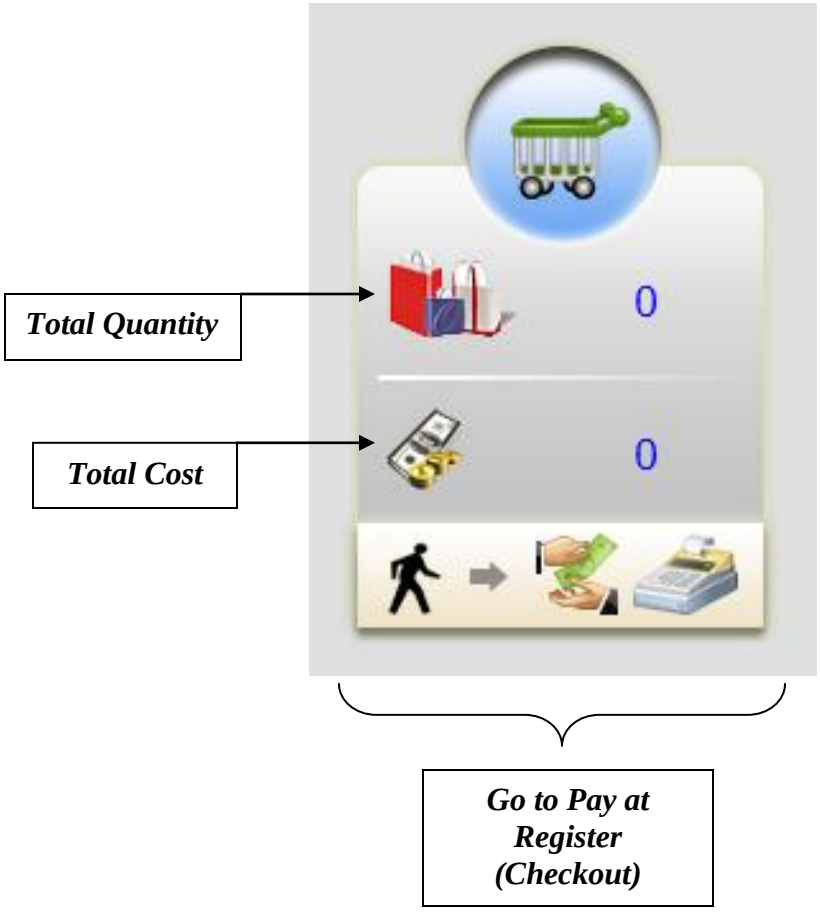


Figure 16 Shoe Details Page

The above snapshot shows the shoes details page. The top left area shows an image of the shoe which the user has selected. The first square at the top right is for the user to select from the available shoe colors. Usually the image  stands for color or color plate. The small color squares underneath the color plate are the available colors. The second square under the colors square is the shoe length or size. The shoe image with a ruler underneath  means the length and size of the shoe. Normally a rule gives the impression and meaning of measurement. Putting the ruler on the length side of a shoe would be understood as the shoe length or size. If still not understood then the dropdown list with different shoe sizes should give the shoe size understanding of the image. Likewise, a ruler being put on the front side of a shoe  should be understood as "shoe width." There are two known width types, normal width and wide width; this is given by the two choices as follows  . One challenge here is which is which! In other words, which one is the normal width and which is the wide? In this situation a third icon implying the Frame of Reference would be used (refer to section 4.4/2.b for more about Frames of Reference). So the user would look at the frame of reference and choose based on that comparison.

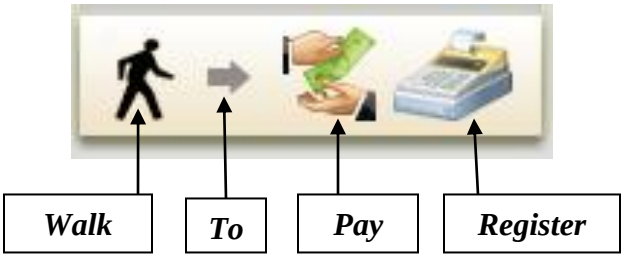
5.1.4 Shopping Cart

Figure 17 Shopping Cart Summary



The shopping cart is the area where the user can see the number of items they have selected so far and how much they cost. The shopping cart is usually visible throughout the site at all times, except when the user starts the checkout process. Figure 15 below shows the shopping cart for the website. The top ball like area with a shopping cart in the middle is the main indicator that this is the shopping cart section. The next two sections

are the quantity and cost sections. Quantity is resembled by a few shopping bags  which imply number. The dollars and coins  icon implies cost and dollars. The lowest area is the checkout area. Checkout had to be given in the form of a sentence or phrase composed of a few words. It is challenging to find a single icon that means "Go to Checkout." The phrase we used here is "Walk to Pay at Register."



5.1.5 Add New User Form

The form below is the Add New User form. The form is split into three sections. The top most section is the user's detail. The most challenging area is the user's name area. It is not clear how to put an icon to state first name and last name. The best way is to show an icon of a user (as first name) and a family. This more of figuring out the name by contrasts. In other words, when the user sees the family picture  , he/she would guess by default it is the family name and, by contrast, the other box is the user's first name textbox. The second part is the user's birthday date. The new baby's icon and the calendar next to it would imply by default the Date of Birth  . If that is not clear enough for the icons combination then the dropdown lists would imply so.

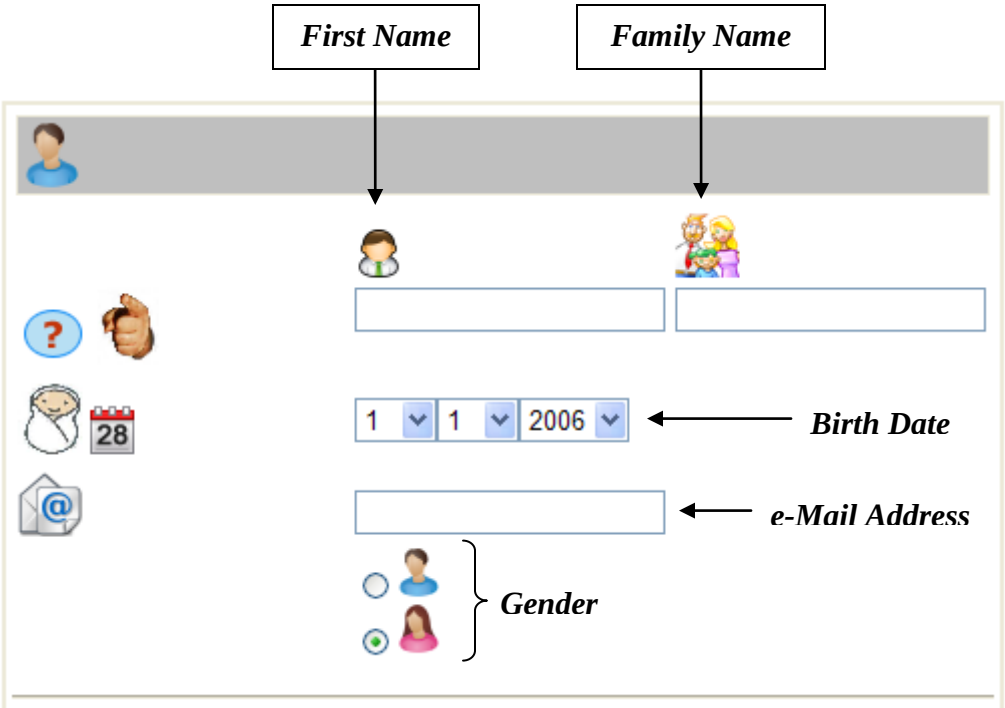


Figure 18 - User Information

The second section (figure 17) is the user's home address. The user icon and next to it a home or house icon would be read as "User Home"  . Going into the home address section, it starts from the Country  , the City  and then the street address  (read "Home/House Address"). That way the city can be narrowed down from the country list rather that going the other way around.

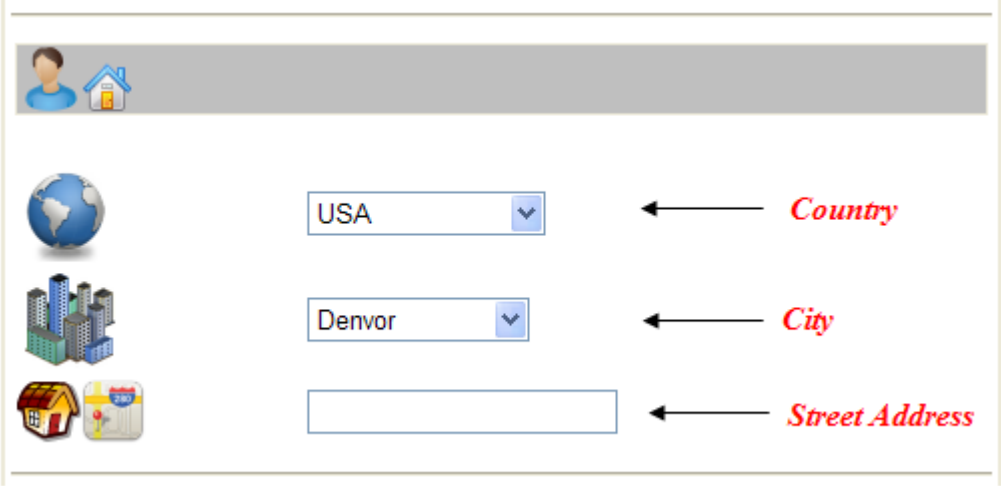


Figure 19 - Home Address

The third section (figure 18) is about the user login information. The most challenging area in this section is the User ID textbox. User ID is not too intuitive to present. One way is to show an ID icon  . ID icons are known to mean ID and because it is located in a section that has to do with website security then the user would understand it

to be the user's website ID. Password is represented in terms of keys  , which are normally used to represent security code or something unique to unlock something else. The "Retype Password" is rather simpler since the refresh  icon can be used in the place or "retype."

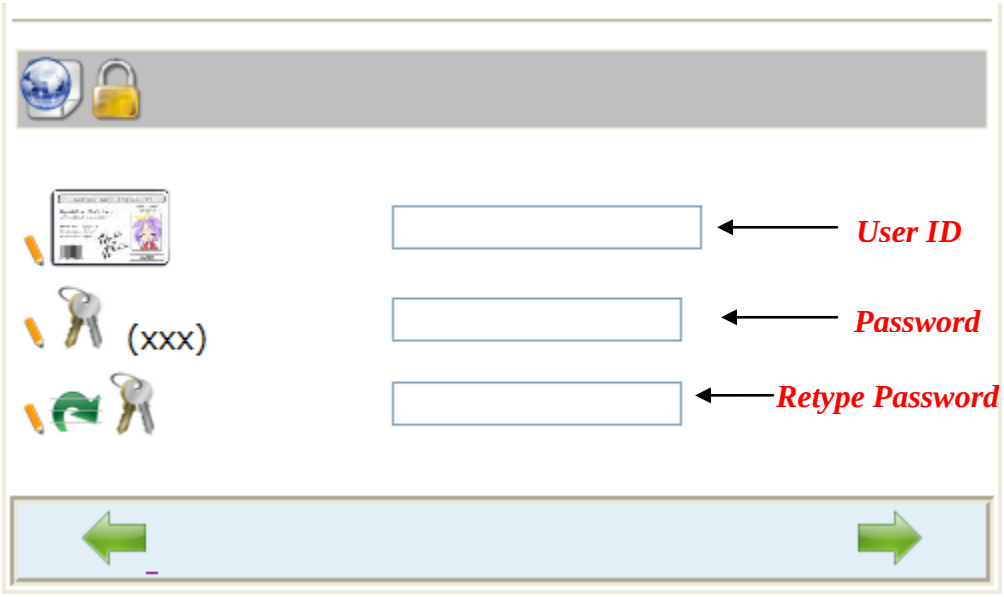


Figure 20 - User Login Information

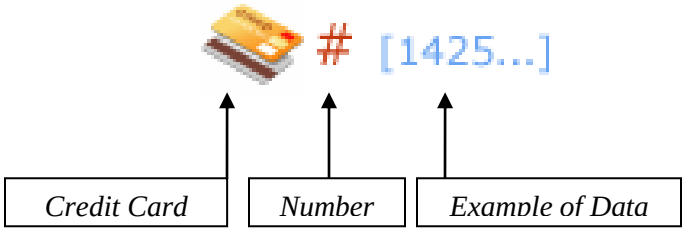
The arrows at the bottom of the User Login Information screen are to navigate to the next and previous pages. These are common and standard icons for navigation.

5.1.6 Payment Page

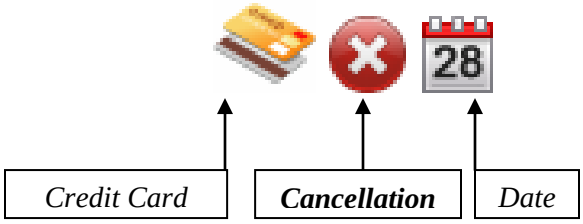
This section discusses the Payment page, which is used typically in entering Credit Card and Billing Address information. The next image below is a snapshot of the Payment page from our project website. Following the image we will discuss the page details.

Figure 21 - PAYMENT Form

The payment form is very much standard across different websites. The Payment page contains two sections, the credit card and user information, and the billing address information. The top section is the credit card and user information. The credit card icon is always read as it appears  . The credit card area contains phrases of three icons or words at most. The top most entry box is for the credit card number. This is shown and explained as follows…

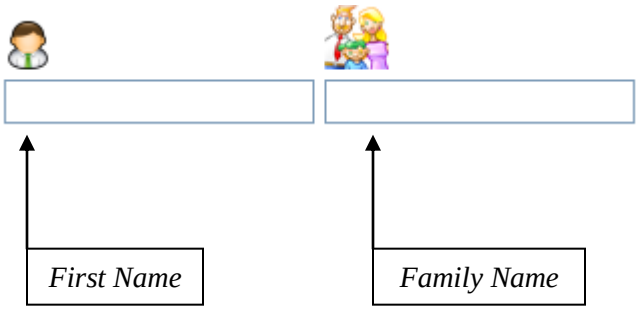


The sentence is read from left to right as simply "*Credit Card Number.*" The credit card cancellation date is a little more involved. The phrase should typically read *"Credit Card Cancellation Date."* In the Payment form this is communicated with the following sequence of icons…



Again, the phrase is read from left to right "*Credit Card Cancellation Date.*" Normally the icon  is used to mean *Cancel, Remove, Delete, etc.* Understanding which one is meant in this case is depending on looking at the form and the phrase as whole and then

inferring from the *context* of the page what was meant by the  sign. Inference and context are very import concepts for understanding the Common Communication Language. The same logic is applied to the last icon in this phrase, the calendar  . Similarly, from the context of the form, the phrase, and the text-boxes aligning with this phrase, we can infer that what is meant by this calendar icon is the *Date.* The last required information in credit card information section of the Payment form is the credit card holder information. This is very straight forward and we have seen it before in the Add New User Form (review section 5.1.5). The only different is in this case we show the credit card icon next to the user image to imply *Credit Card User/Holder.* The family icon  above the second textbox stands the *Family Name.* If second textbox is the Family Name then the first textbox with a person's icon above it must be the *First Name.*



5.2 Long Sentences

The previous sections contained pages and forms which communicated short sentences (composed of at most three images). There are pages which contained longer sentences and composed of more than three images. The example in this page contains a conditional statement (an *If* statement) and animations. The animation is taken directly from the American Sign Language and they stand for a single word.

5.2.1 Example 1

CCL 1 – "FREE SHIPPING if You Spend $25.00 or More"

The phrase above is a conditional sentence with *If* statement. The phrase interpretation is in plain English is "*Free Shipping if You Spend $25.00 or more.*" According to the Common Communication Language syntax the TOPIC is set at the beginning of the sentence. In this sentence Shipping is the topic and that is why we see the shipping truck in the very front of the sentence. Next is the cost information ($0). Following the cost information is the condition to get this cost value. In this case we use the English word *if.* The condition for the *If* statement starts with the subject of the phrase, which is *you* (resembled with the pointing figure). The meat of the *If* statement is the word *Spend;* this word, *Spend,* is a verb and according to the Common Communication Language rules

the American Sign Language gestures are used for verbs. The figure below shows the word *Spend* in the American Sign Language[13].

ASL 8 - SPEND

This *Spend* sign is done with one hand and it stands for and simulates "Spending Money" hand gesture. It is done by rubbing the tips of your one hand fingers together as if you are spending some cash.

[13] Taken from http://www.lifeprint.com/

5.2.2 Example 2

Figure 22 - "You Package will be shipped After Five Days"

In this example we see an informative type statement. In plain English, the phrase is read "*Your package will be sent after 5 days."* The phrase implements two styles of the Common Communication Language. The next two paragraphs will discuss each style in details.

The first style is the phrase structure; the phrase structure is based on the TIME + TOPIC + COMMENT style. The portion encapsulated between the brackets **{ }** is TIME. TIME is discussed in more details in paragraph two below. The TOPIC in this phrase is the *Package.* The boxes icon  stands for *Package*. The icon could be understood as *boxes* as well, but the context of the website and phrase would most probably be understood as *package.* This statement comes into existence in our website once the user completes the order. For that reason alone the context of the phrase would be understood as *package* rather than boxes. An animation precedes the *package* icon to reflect possession. The package belongs to the website user. The word to be used in this case is *Your.* In other words, the TOPIC would be *Your Package.* To communicate the word

"*Your"* we use the American Sign Language. Refer to the figure below for the word *"your"* in the American Sign Language.

ASL 9 - YOUR

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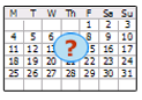
The last portion of the phrase is the COMMENT about the TOPIC. The COMMENT in this case is the *Shipment* issue. Shipment is communicated in form of the DHL shipping truck icon  . Again, from the general context of the phrase the reader should be able to infer that the message is about the shipment rather than truck.

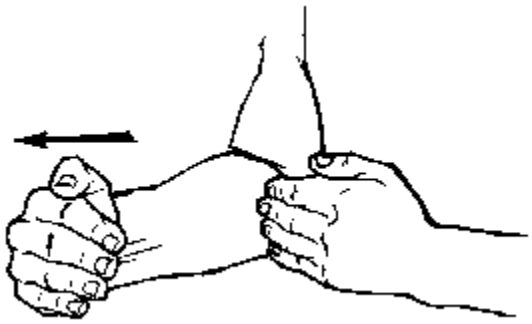
The second style used in this phrase is the TIME details. We are trying to say "*5 days." Day* is the object and 5 is the description of the subject. Therefore, we use the style in section 4.4.7 (Object Characteristic). The *day* icon  is built as a month calendar with a question mark in the center to mean "*which day*." Following the day icon are the columns ":" then the description, 5 later/after. For the word *later* or *after,* we use the American Sign Language gesture. The image below describes the word *later*[14].

[14] Taken from http://www.lifeprint.com/

ASL 10 - LATER

The word *later* is communicated with the clockwise figure movement as shown above. In this case the time description would be "*5 days later."*

ASL 11 - AFTER



The other option to use is the word a*fter* as shown above in the American Sign Language. In this case the time description becomes "*after 5 days."*

6 Challenges

This section discusses some of the major challenges to developing a common communication language for the web. In this section we discuss each challenge and the possible solutions.

6.1 Misinterpretation

As we mentioned before, interpretation of some of the main components could be an issue. The main source of misinterpretation is the American Sign Language. Sign languages are culture dependent. One sign in one culture could give a different meaning under another culture. The only way to resolve this issue is via learning, time and practice. If a W3-CCL user learns one sign to mean a specific meaning then that meaning will stick to the mind as it is, even if it contradicted with a similar cultural sign. The human brain has the capability to store a single sign or gesture with more than one meaning and apply the appropriate meaning based on the sentence context.

6.2 Webpage Real-estate

One of the W3-CCL components is animations. In order to show animations in a page it takes quite some space of the page. Some W3-CCL phrases involve animations and it takes space as shown with the *red* arrow below. This version of the W3-CCL is very immature. We could think of it as computers in the fifties, where a computer could take up an entire room; nowadays computers are as small as a laptop. This "shrinking" of

computers happened overtime and as the area took the attention of experts. Likewise is the W3-CCL; overtime, we expect such issues to be resolved as more experts from different fields give their input on the subject.

6.3 Learning Curve

Like any other language, there is a learning curve to the W3-CCL language. As the language matures, we expect the learning curve to be reduced. The biggest learning curve is learning and remembering the meanings for the American Sign Language gestures and signs. Nonetheless, we try to reduce the amount of usage of the American Sign Language to reduce the learning curve as well. As people begin to use the W3-CCL and overtime, the W3-CCL signs and gestures will be common terms worldwide.

7 Future Work

Future work will be focused on the following areas of research and work…

- More research in the field of languages in general, but specifically, in the Sign Language field. Already existing languages might be of great help to build the W3-Common Communication Language.
- Solutions need to be found yet regarding presentation of verbs on the web. Some of the Sign Language gestures are meaningful and helpful while others are not as intuitive.
- There is still unclear picture regarding how to distinguish between question type sentence, specifically how to distinguish between *how, which, what, etc.*
- Complete the W3-Common Communication Language structure and syntax.
- Complete the *Computer World* project as a proof of concept for the W3-Common Communication Language.

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[12] http://www.ancientegyptonline.co.uk/hieroglyphs-tutorial.html A website that provides tutorials for the Ancient Egyptians Hieroglyphic system.

[13] http://www.handspeak.com/tour/grammar/index.php?byte=syntax handspeak.com is a website developed to help learn the American Sign Language rules and syntax. The website contains dictionary for many American Sign Language words and how their illustration.

[14] http://www.lifeprint.com/ A website that contains a library of words in the American Sign Language. The website gives very good illustration of many words and guide you through the hands movements process in steps.