Introduction to Clyr's Ymage Technology

(Document W001)

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1   Introduction

I have some ideas rattling around inside of my head, and I'd like to activate copies of those ideas in your mind; in fact, that activation has already started. It was easy. All I had to do was write down the alphabetic forms that are linked to the notions that I wanted to trigger (such as "activation" and "trigger"), and then I just sat back and waited for you to do the rest. When you read these words, their forms elicited the same thoughts in your mind that were active in mine. We established mental contact, in the sense that both of us came to share the same kinds of active mental images.

Conversations work the same way, except that the activation is distributed among many minds, and forms tend to be spoken or signed rather than written. The participants in a conversation all nurture mental images that are representative of the *meanings* that the word forms evoke. These images blend together like the pages of a flip book, creating a kind of movie that plays alongside the text. In the mind, as in books, words can have a variety of different meanings, but these cognitive images (or ***ymages***) can help to sort them out. Just think of how clearly a person would be understood if their words were accompanied by a thought-bubble movie playing over their head.

Even when individual words are clear, you still need to figure out what their meanings are supposed to be when they are all strung together; for example, when you come across a phrase like, "I dropped the pit into the shaft well," your brain will extract a companion ymage that identifies:

- the word 'pit' as the stone of a fruit (and not as a hole in the ground);
- the word 'shaft' as a hole in the ground (and not as a pole); and
- the word 'well' as the way in which the pit was dropped (and not as yet another hole).

This ymage will clarify grammar (e.g. 'I' is the *subject* and 'pit' is the *object*), and it will encode thematic relationships (e.g. 'pit' is a *projectile* and 'shaft' is a *target*). The phrase, "Who dropped the seed in the hole?" will share a similar ymage, except that the form 'I' will not be given an explicit representation; instead, the form 'who' will be equated with a mental wildcard. When the ymages for these phrases are aligned, 'I' will overlap this wildcard, answering the question. Conversations amount to this sort of ymage alignment.

Ymage alignment works because even though different sentences use different

words in a different order to express the same idea, they share the same core ymage. The ymage remains the same across different languages; for example, you will find the same core ymage at the heart of all of these phrases: *I like the dog*; *I dig the mutt*; *J'aime le chien*; أَحْبُّ الكلبَ; and 나는 개를 좋아한다. Just as you might hold two pictures up to a light to see how well they overlap, ymages are aligned in your mind to evaluate both the degree and kind of their similarity. This ymage alignment emerges from the symbolic nature of language.

2   The Symbolic Nature of Language

We will start our description of language as a symbol system with a treatment of the components with which we are building this very definition, namely: words. A word is a symbol [1], that is to say, it links a ***form*** (such as the set of letters *p-i-t* in the word shape 'pit') with a ***meaning*** (such as the concept [HOLE IN THE GROUND]):
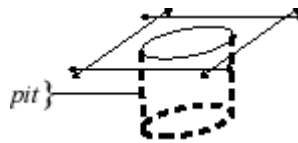

Figure 1   Symbolism ('pit' is associated with the concept [HOLE IN THE GROUND])

Think of this diagrammatic representation as just one part of the complex mental picture or conceptual structure evoked when someone sees or hears the word 'pit'.

While we use *drawings* in this document for illustrative purposes, ymages are by no means solely visual in nature (as the term "image" alone might otherwise suggest). They incorporate impressions from other modalities as well (e.g. sensorimotor stimuli such as [SOFT] and [HUNGRY], and more abstract – but often visceral – impressions such as [HOPE]). Figure 1 is a simple schematic depiction of only *part* of a much larger set of experiential impressions gathered from the environment while learning language. As a sketch, it only represents a *portion* of a much more complex ymage, one which portrays the details of related concepts such as [DEPTH], [GROUND], [GRAVITY], and the like.

For the time being, think of an ymage as any representation of *meaning*, whether that meaning is housed in a human brain or in a section of machine code.

Now, the meaning of a word is *not* a circular reference to even more words in a

dictionary definition, or to other locations in an ontological tree. A word's meaning is grounded in experiential impressions that are triggered when you hear or see the word's form. You are born with some of these meanings in place, and you learn others over time; for example, the fundamental meaning of [PAIN] is innate and primitive, as is [PLEASURE]. In comparison, the meaning of the word [UNDERSTAND] is also a feeling, but it is more abstract and complex, and is developed over time as you experience and interpret the world around you in terms of existing, familiar, relatively fundamental concepts.

Semeiognomy[1] studies communication in terms of symbol systems (Gk. *semeio-*) and cognition (Gk. *-gnomy*), appealing to the symbolic nature of communication.[2] The use of ymagery portrays the processing of language in much the same way that you would manipulate the pieces in a conceptual jigsaw puzzle, taking simultaneous advantage of information encoded in shape, orientation, *and* color. While characterizing language as a symbol system is not new, innovation arises as a machine form of human language emerges from ymagistic representations of concepts.

We will now look at the pitfalls inherent in the mistreatment of meaning (e.g. problems with synonymy, polysemy, and cross-reference), and the advantages derived from Clyr's semeiognomic approach to natural language processing (*NLP*).

3   Synonymy

Synonymy occurs when different forms ('pit', 'hole', and so on) share the same meaning:
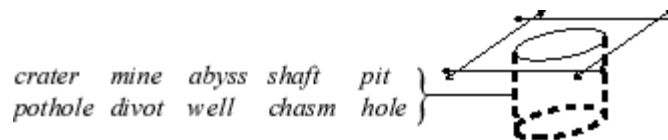

Figure 2   Synonymy ('pit', 'hole', and so forth, all symbolize [HOLE])

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[1] Semeiognomic principles are detailed in our white papers, and in *Computational Intelligence* [2]. We also suggest work by Tracy Mansfield on semeiognomy [3], Marc Hauser on the evolution of communication [4], David McNeill on gesture [5], and Julia Johnson on imagery [6].
[2] This symbolism appears in the works of Ferdinand de Saussure [1] and his followers, and we gratefully acknowledge its influence, as developed in the cognitive linguistic studies of such scientists as: Ronald Langacker [7]; George Lakoff [8]; Lakoff and Mark Johnson [9]; Gilles Fauconnier [10]; Wallace Chafe [11]; Karen van Hoek [12]; and others of that school.

Some differences in the meanings are associated with each of these synonymous forms, such as the expected depth and roundness of the hole in question, the raggedness of its edge, and the like, but the basic meaning and the core ymage will remain the same.

Over the course of a conversation, the links between forms and meanings often change. In the case of synonymy, the same meaning might be linked to different forms as the discussion progresses, such as when the concept [HOLE] is first identified with the form 'hole', and then later on with the form 'pit'. If a person wants to use a contemporary search engine to find references in a text to [HOLE], they[3] can type 'hole' into the search box, but the engine will not find those instances where [HOLE] has been identified in the text with the forms 'pit', 'shaft', 'well', or any other synonymous alternative. The search displays poor ***recall***, because it doesn't return all of the hits that the user wants.

Ymage technology will improve that recall, because it is not stumped by differences in the words' forms, but rather takes advantage of the properties shared in common by the words' ymages.

4   Polysemy

In the case of ***polysemy***, the same form ('pit') can be linked to different meanings (i.e. the concepts [STONE OF A FRUIT] *and* [HOLE]):
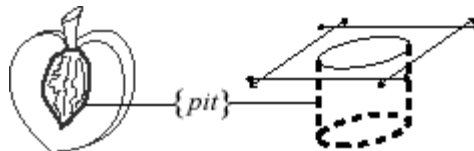

Figure 3   Polysemy ('pit' symbolizes the concepts [STONE OF A FRUIT] *and* [HOLE])

The form is the same, but the ymages are distinct. During a conversation, the same form can be used to identify first one meaning and then another, such as when 'pit' is used to identify the [STONE OF A FRUIT], and then gets used to refer to a [HOLE]. If a user asks a regular search engine to find 'pit', and has in mind that it should find 'pit' as in [HOLE], the application doesn't *understand* that the user wants [HOLE] and not [STONE], so it will return hits on both meanings. The search engine is said to display poor ***precision***, because it does not winnow out the garbage.

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[3] It is Clyr policy to use the word 'they' as a generic, non-genderic pronoun.

Ymage technology increases precision, because it doesn't search for ambiguous word forms, but rather for ymages, which are as unambiguous as the two pits in Figure 3.

5   Cross-reference

And now we come to the case of ***cross-reference***. In this document, the word shape 'it' has been linked (so far) to *at least* three different meanings: [YMAGE]; [WORD]; and [SKETCH]. If Saussure were to be mentioned again in this text, it could be said that he had a beard, and the word form linked to the meaning [FERDINAND DE SAUSSURE] would change from 'Ferdinand de Saussure', to 'Saussure', and then to 'he'. In this very sentence, the form 'he' can be used to refer to Langacker instead of Saussure, in saying that he picked up where Saussure left off. Form-meaning links can change frequently in this manner over the course of a text.

When searching for a concept (e.g. [HOLE]), typical NLP applications fail to retrieve text in which a pronoun is used (e.g. 'it') instead of a full word form (e.g. 'hole'). The alternative, a pronoun search, is hopelessly vague; the search will return all instances of the pronoun, no matter what concept that pronoun is associated with in context. While associations between forms and meanings change over the course of a text, ymage technology can be used to track ymage constancy within that text, and so bridge these cross-references. Pronouns would no longer block the hits that the user wanted to find.

6   Symbol Networks

When synonymy and polysemy are added together, networks like this emerge:
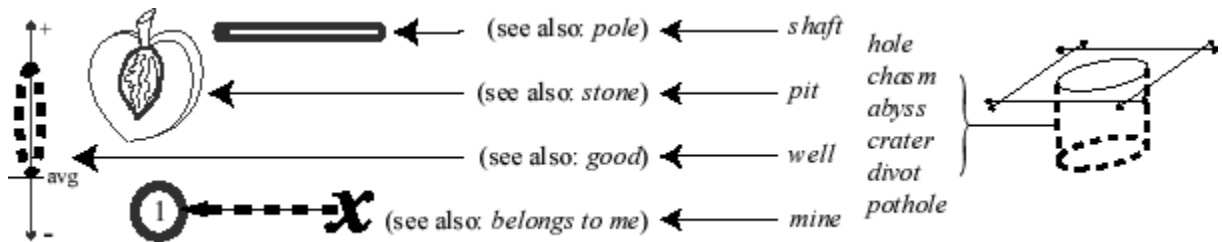

Figure 4   Natural Language Ambiguity (Synonymy and Polysemy)

So, 'pit' is synonymous with 'shaft', which is synonymous with 'pole', and so on; similarly, 'pit' can mean [HOLE] or [STONE], and 'stone' can mean [SEED] or [ROCK], so

the proliferation expands along yet another dimension. Add to this all of the things to which pronouns might refer, and the net broadens even further. This symbol network is variably different for every language, and it takes native users years of practice to become proficient in its navigation. Information will remain *hidden* when this navigation is obfuscated by such factors as synonymy, polysemy, and cross-reference.

Ymage technology can represent meaning in a way that accounts for synonymy, polysemy, *and* cross-reference. It treats language as a symbolic system, and so its responses will pattern after human behavior, giving ymage-based programs an edge when it comes to sorting through a given language's symbol network. Ymage technology can, therefore, help NLP programs to approach human performance more closely.

7   References

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