

Is Natural Language Understanding Recognition or Construction?

by Nemecio R. Chavez, Jr. and Melanie J. Martin

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What's it about?

- **What is natural language understanding?**
- **Example:**

Mary ate spaghetti with George. [Lee2001]

Elements in Understanding

- **A comprehender may do the following as a part of the understanding process [Asselin2002, Grasser1997].**

- Set a purpose
- Determine the point of view
- Resolve referring expressions
- Relate text to prior knowledge
- Find the meaning of new words based on context
- Form connections between statements
- Revise prior knowledge
- Generate inferences
- Construct explanations
- Create questions and then answers.

- **The knowledge of the world the comprehender has plays a large role in understanding.**

The Process

- **Meaning is achieved through five levels of understanding [Grasser1997].**

1. Surface Code

One by one she dropped pebbles into the pitcher.

2. Textbase

PROP1: dropped(AGENT = she, OBJECT = pebble, TARGET = pitcher)
PROP2: repeat(PROP1)

3. Referential Situation Model

4. Pragmatic Context

5. Text Genre

Important Factors and Deep Comprehenders

- **Within and between these levels there should be coherence.**

The water level rose before each pebble was dropped into the pitcher.

- **“Deep comprehenders construct rich representation at the levels of the situation model, pragmatic communication, and discourse genre, whereas the textbase and surface code have a secondary status.” [Grasser2002]**

Example: Mr. Hug [McCarthy1990]

A 61-year old furniture salesman was pushed down the shaft of a freight elevator yesterday in his downtown Brooklyn store by two robbers while a third attempted to crush him with the elevator car because they were dissatisfied with the \$1,200 they had forced him to give them.

The buffer springs at the bottom of the shaft prevented the car from crushing the salesman, John J. Hug, after he was pushed from the first floor to the basement. The car stopped about 12 inches above him as he flattened himself at the bottom of the pit.

Mr. Hug was pinned in the shaft for about half an hour until his cries attracted the attention of a porter. The store at 340 Livingston Street is part of the Seaman's Quality Furniture chain.

Mr. Hug was removed by members of the Police Emergency Squad and taken to Long Island College Hospital. He was badly shaken, but after being treated for scrapes of his left arm and for a spinal injury was released and went home. He lives at 62-01 69th Lane, Maspeth, Queens

He has worked for seven years at the store, on the corner of Nevins Street, and this was the fourth time he had been held up in the store. The last time was about one year ago, when his right arm was slashed by a knife-wielding robber.

Example (Continued): Questions and Answers

6. Who was in the store when the events began? Probably Mr. Hug alone. although the robbers might have been waiting for him, but if so, this would have probably been stated. What did the porter say to the robbers? Nothing, because the robbers left before he came.
7. Who was in the store during the attempt to kill Mr. Hug? Mr. Hug and the robbers.
8. Who had the money at the end? The robbers.
9. Is Mr. Hug alive today? Yes, unless something else has happened to him.
10. How did Mr. Hug get hurt? Probably when he hit the bottom of the shaft.
11. Where is Mr. Hug's home? (A question whose answer requires a literal understanding of only one sentence of the story.) Does Mr. Hug live in Brooklyn? No, he lives in Queens.
12. What are the names and addresses of the robbers? This information is not available.
13. Was Mr. Hug conscious after the robbers left? Yes, he cried out and his cries were heard.
14. What would have happened if Mr. Hug had not flattened himself at the bottom of the pit? What would have happened if there were no buffer springs? Mr. Hug would have been crushed.
15. Did Mr. Hug want to be crushed? No.
16. Did the robbers tell Mr. Hug their names? No.
17. Were the robbers present when the porter came? No.
18. Did Mr. Hug like the robbers, and did they like him?

Example (Continued): Questions and Answers

19. Why did the robbers leave without killing Mr. Hug? Perhaps, they thought they had killed him, and perhaps their anger was appeased by the actions they had performed, and perhaps they had taken all the time they dared, and perhaps something specific happened to frighten them away.
20. What would have happened if Mr. Hug had tried to run away? Perhaps he would have succeeded, but more likely they would have injured or killed him since probably they had weapons, and there were three of them.
21. What can Mr. Hug do to avoid this in the future? No solution is entirely satisfactory. He could carry a gun or he could quit or he could get his employers to install an alarm system or maybe he will be lucky.
22. Did Mr. Hug know he was going to be robbed? Does he know that he was robbed?
23. Was Mr. Hug's right arm slashed before his left arm was scratched? Yes, because the former was a year ago.
24. How did the robber try to crush him with the car? By pressing the buttons or operating the control lever to make the car go to the bottom of the shaft.
25. Why did Mr. Hug yell from the bottom of the elevator shaft? So as to attract the attention of someone who would rescue him.
26. How long did the events take? More than half an hour but less than a day. Most of the time was spent by Mr. Hug filling out forms in the hospital.
27. What crimes were committed? This question has the advantage that it is one that is normally answered on the basis of such a story, since the police report of the incident was probably the basis of the New York Times story. Robbery, possibly assault with a deadly weapon, and attempted murder are the more obvious crimes. One might specifically challenge natural language systems to answer this question.

Example: Where Do You Stand?

- **Only a limited understanding is possible. [Mueller2002]**

Gernsbacher's View Of Language Understanding [Gernsbacher1992]

- **Specialized skill using language-specific processes and mechanisms or draws on many general cognitive processes and mechanisms.**

- **Introduces a three step framework called Structure Building to help describe the processes:**
 1. Laying a foundation for mental structures;
 2. Mapping coherent information onto developing structures;
 3. and the Process of Shifting to initiate new substructures.

- **Two mechanisms control the structure building process:**
 1. the Mechanism of Enhancement;
 2. and the Mechanism of Suppression.

Direct Memory Access Parsing

- **“Phrasal patterns are attached directly to memory structures.”**
[Riesbeck1994]

- **Accounts for entities and learned templates of common events.**

RESTAURANT TEMPLATE

- **Helps explain:**

John walked into a restaurant and waited to be seated.
The hostess sat him, told him the specials, and gave him a menu.
After 20 minutes, John hadn't order and left very upset.

- **Criticizes Gernsbacher's model because it fails to account for specific knowledge and how quickly it is accessed.**

Commonsense Problem: The Crow and the Pitcher [Aesop1954]

Down at the very bottom of the pitcher there was a little water and the thirsty crow tried every way to reach it with her beak. But the pitcher was much too tall. The crow got thirstier and thirstier. At last she thought of a clever plan. One by one she dropped pebbles into the pitcher. Every pebble made the water rise a little higher. When the water reached the brim, the thirsty crow was able to drink with ease.

Gernsbacher Vs. Riesbeck

- **Psychological Plausibility**
- **Computational Plausibility**
- **Where's the construction?**
- **Where's the recognition?**
- **Are they saying the same thing?**

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