

Chapter 13. Progress in Natural Language Processing

The Quest for Artificial Intelligence, Nilsson, N. J., 2009.

Lecture Notes on Artificial Intelligence, Spring 2016

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Overview of Chapter 13

- W. John Hutchins has called the period 1967 to 1976 the quiet decade.
- ALPAC report brought a virtual end to MT research in the USA for over a decade and MT was for many years perceived as a complete failure. The focus of MT activity switched from the United States to Europe.
- Although the late 1960s and early 1970s might have been a “quiet decade” for machine translation, it was a very active period for other NLP work. Researchers during these years applied much more powerful syntactic, semantic, and inference abilities to the problem of understanding natural language.

Chapter 13. Progress in Natural Language Processing

13.1 Machine Translation

Machine Translation

■ Quiet Decade

- W. John Hutchins has called the period 1967 to 1976 the quiet decade.
- Due to the ALPAC report, the focus of MT activity switched from the United States to Europe.

■ Systran (System Translator)

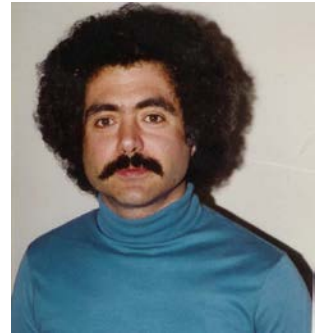
- Petr Toma, a Hungarian-born computer scientist and linguistics researcher in 1968.
- Russian-to-English translation system funded by U.S. Air Force.
- One of the main automatic translation systems and market by the Imageforce Corporation
- Measurement of performance
 - Intelligibility: Can the translation be generally understood?
 - Correctness: Do human post-editors need to modify the translation?

Chapter 13. Progress in Natural Language Processing

13.2 Understanding

13.2.1 SHRDLU

- Natural language dialog system by Terry Winograd
- Carry on a dialog about a world consisting of toy blocks and a gripper for moving them about.
- Procedural representation of knowledge in LISP programs
 - Syntax.
 - Semantics.
 - Inference.
 - Knowledge about blocks world.
- Fuels a debate among AI researchers about the pros and cons of these two knowledge representation strategies – procedural versus declarative.



Terry Winograd

13.2.1 SHRDLU

■ Example of part of a dialog

- The user's input is numbered and shown in lowercase letters, and SHRDLU's response is in all caps

1. pick up a big red block.

// In order to pick up the red block, it had to clear it off by finding a space for the green one and moving the green one away.

OK.

// The system answers "OK" when it carries out a command.

2. grasp the pyramid.

// There are three pyramids in the scene, so the program does nothing.

// I DON'T UNDERSTAND WHICH PYRAMID YOU MEAN.

3. find a block which is taller than the one you are holding and put it into the box.

// The system has to figure out what is meant by "one" and "it," as well as using deduction to decide which block it is holding.

BY "IT," I ASSUME YOU MEAN THE BLOCK WHICH IS TALLER THAN THE ONE I AM HOLDING.

// Printed out to keep us informed. The hand has to set down the red block to pick up the taller blue one.

OK.

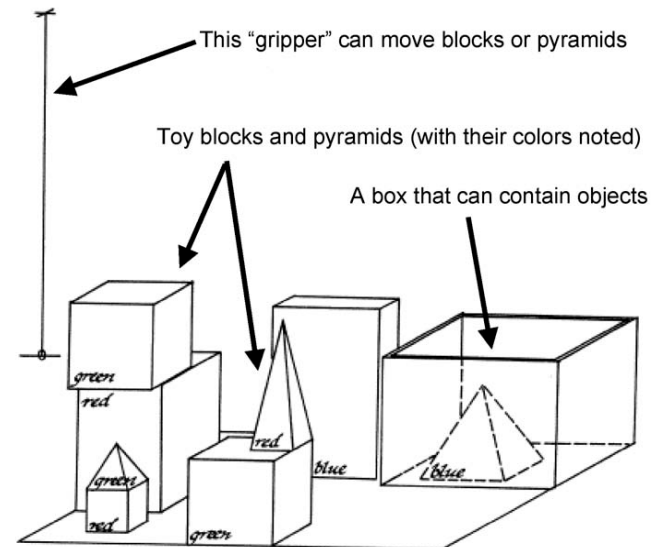
4. what does the box contain?

THE BLUE PYRAMID AND THE BLUE BLOCK.

5. what is the pyramid supported by?

// Earlier the system responded to "the pyramid" by saying "I don't understand which pyramid you mean." now, it knows that we must mean the one which was just mentioned.

THE BOX



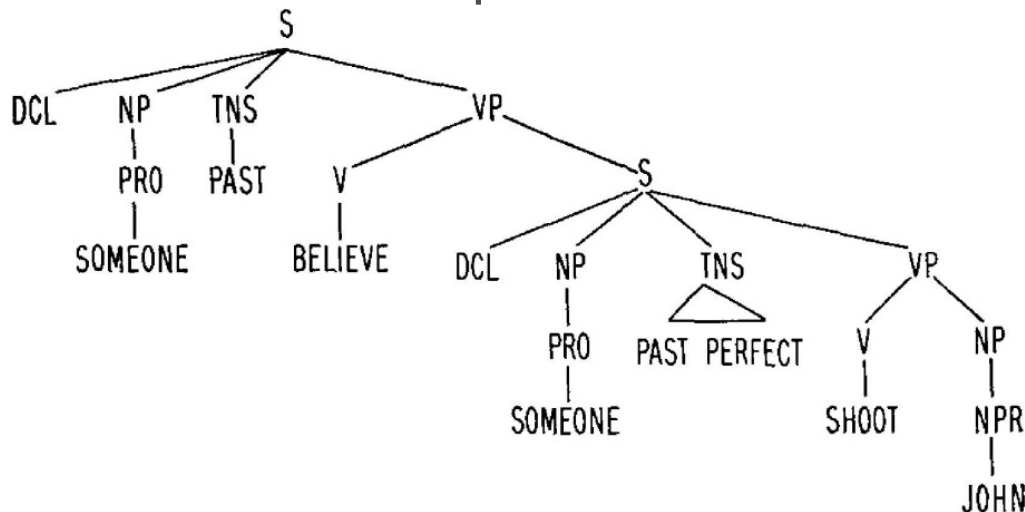
SHRDLU's world

13.2.2 LUNAR

- Answering system about the moon rocks by William A. Woods, sponsored by NASA's Manned Spacecraft Center.
- Syntactic analysis
 - Performed by using Augmented Transition Networks.
- Semantic component
 - Transform English sentences into logical languages called Meaning Representation Language.
- First question-answering system to publish performance data.
 - Answer successfully 78% of the questions and 90% with minor fixes.

13.2.3 Augmented Transition Networks

- ATN is a maplike graphical structure
 - Nodes: points of progress in the parsing process
 - Paths: syntactic categories
- ATN could perform transformations in natural language but in a more efficient way
 - Traversing the path builds the syntactic structure of the sentence in the form of a parse tree



A parse tree obtained for the sentence “John was believed to have been shot

13.2.4 GUS

■ Genial Understander System

- Intended to engage a sympathetic and highly cooperative human in an English dialog, directed towards a specific goal within a very restricted domain of discourse.
- A travel agent engaged in a conversation with a client who wants to make a simple return trip to a single city in California.

■ It is certainly limited, but it deals with 'resolving anaphora'

GUS: Hello. My name is GUS. I can help you plan a simple trip by air. Where do you want to go?

(1) *Client*: I want to go to San Diego on May 28.

GUS: What time do you want to leave?

(2) *Client*: I must be in San Diego before 10 am.

GUS: Would you like P.S.A. flight 102 that arrives at 9.15 am?

(3) *Client*: What is the next flight?

GUS: Air California flight 310 that leaves at 8.30 am and arrives at 10.00 am.

(4) *Client*: I'll take the first one.

GUS: In what name should I make a reservation, please?

(5) *Client*: Dan Bobrow.

GUS: I have confirmed the following flight: P.S.A. flight 102 on Wednesday May 28 from San Jose to San Diego that leaves at 7.30 am and arrives at 9.15 am. What date do you want to return on?

(6) *Client*: On Friday in the evening.

GUS: Would you like the flight that leaves at 7.45 pm?

(7) *Client*: That's fine.

GUS: I have confirmed the following flight: P.S.A. flight 307 on Friday May 30 from San Diego to San Jose that leaves at 7.45 pm and arrives at 9.30 pm. Thank you for calling. Goodbye.