ELIZA -- A Computer Program For the Study of Natural Language Communication Between Man And Machine

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Introduction

Eliza:

a program operating within the MAC time-sharing system at MIT which makes certain kinds of natural language conversation between man and computer possible.
Introduction

Basic principle:

Input sentences are analyzed on the basis of decomposition rules which are triggered by key words appearing in the input text.

Responses are generated by reassembly rules associated with selected decomposition rules.
Keywords and their associated transformation rules constitute the SCRIPT for a particular class of conversation.
Transformation Rules

(1) Decompose a data string according to certain criteria, hence to test the string as to whether it satisfies these criteria or not.

(2) Reassemble a decomposed string according to certain assembly specifications.
Transformation Rules

Example:

A foreigner with limited English knowledge Heard:

I am very unhappy these days.

To express his sympathy, how will he answer?
Transformation Rules

A template to the original sentence:

One part matches “I am” & the remainder isolates the words “very unhappy these days”

How long have you been very unhappy these days?
Transformation Rules

Example:

This foreigner heard a complicated one

It seems that you hate me.
It seems that you hate me.

Decomposed to 4 parts:

(1) It seems that
(2) You
(3) Hate
(4) Me
Transformation Rules

Formal notation:

decomposition template:

(0 YOU 0 ME)

reassembly rule:

(WHAT MAKES YOU THINK I 3 YOU)
Unconditional Substitution

Certain transformations are made on certain words of the input text independently of any contextual considerations.

\[ \text{You} \leftrightarrow \text{I} \]

\[ \text{You} \leftrightarrow \text{Me} \]
Aim:

To sharply delimit the set of decomposition rules which are potentially applicable to a currently active input sentence.
Key List

\[
(K \ ((D_1) \ (R_{1,1}) \ (R_{1,2}) \ \cdots \ (R_{1,m_1})) \\
((D_2) \ (R_{2,1}) \ (R_{2,2}) \ \cdots \ (R_{2,m_2})) \\
\vdots \\
((D_n) \ (R_{n,1}) \ (R_{n,2}) \ \cdots \ (R_{n,m_n}))
\]

Diagram:
Keywords Rank

Example:

I know everybody laughed at me.

Suppose key words:

I & everybody
No rank:

You say you know everybody laughed at you.

Rank: Everybody with higher rank

Who in particular are you thinking of?
Keywords Rank

Mechanism:

the rank of every keyword encountered is compared with the rank of the highest ranked keyword already seen. If the rank of the new word is higher than that of previously encountered words, the pointer to the transformation rules associated with new word is placed on top of a list called the keystack.
Reassembly Rules

\((D_2)1(R_{2,1})(R_{2,2}) \cdots (R_{2,m_2})\).

The mechanism insures that the complete set of reassembly rules associated with a given decomposition rule is cycled through before any repetitions occur.
= Operator

Key word: What

(0) (Why do you ask) (Is that an important question) . . .

Key word: How

(How (=What))
“=“ operator can also be used in reassembly rule

Key word: Am

Input: Am I sick

Output: Do you believe you are sick
or Why do you ask
The script writer must associate the universally matching decomposition rule (0) with it and follow this by as many content-free remarks in the form of transformation rules as he pleases.

Example:

Please go on.

I see.
By a contextual editing program (ED) ---- a part of the MAC library.

The program is called whenever the input text to ELIZA consists of the single word “EDIT”. ELIZA then puts itself in a so-called dormant state and presents the stored script for editing.
Psychotherapist

The psychiatric interview is one of the few examples of categorized dyadic natural language communication in which one of the participating pair is free to assume the pose of knowing almost nothing of the real world.
A demo of Eliza
Acknowledge

Thank you