A SNAPSHOT OF KDS
A KNOWLEDGE DELIVERY SYSTEM

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June, 1979

SUMMARY

KDS is a computer program which creates multi-paragraph, Natural Language text from a computer representation of knowledge to be delivered. We have addressed a number of issues not previously encountered in the generation of Natural Language at the multi-sentence level, viz: ordering among sentences and the scope of each, quality comparisons between alternative aggregations of sub-sentential units, the coordination of communication with non-linguistic activities by a goal-pursuing planner, and the use of dynamic models of speaker and hearer to shape the text to the task at hand.

STATEMENT OF THE PROBLEM

The task of KDS is to generate English text under the following constraints:

1. The source of information is a semantic net, having no a priori structuring to facilitate the outputting task.

2. The text is produced to satisfy an explicit goal held by the text generating system, which describes a desired cognitive state of the reader.

3. To achieve the desired state of the reader requires more than a single sentence.

RESULTS

This is not the forum for a extensive analysis of our results; for details, see Mann and Moore [1979]. However, to communicate the flavor of what we have accomplished--from the motivating goal:

(WANTS SPEAKER
(KNOWS HEARER
FIRE-ALARM-SCENE))

and about two pages of formal propositions describing the "Fire-alarm scene", KDS generated the following:

> *Whenever there is a fire, the alarm system is started which sounds the alarm bell and starts the timer. When it is ninety seconds after the timer is started, unless the alarm system is cancelled it calls Wells Fargo. When Wells Fargo is called, it calls the Fire Dept. .*
>
> *When you hear the alarm bell or you smell smoke, stop everything, determine whether there is a fire and decide to permit the alarm system or to cancel it. When you determine whether there is a fire, if there is, permit the alarm system; otherwise cancel it. .When you permit the alarm system, call the Fire Dept. if possible and follow the evacuation procedure. When you cancel the alarm system, if it is more than ninety seconds since the timer is started, the alarm system calls Wells Fargo; otherwise continue everything.*

This represents the most elaborate performance of KDS to date.

SYSTEM DESIGN

The KDS organization reflects our novel paradigm: FRAGMENT- AND-COMPOSE. KDS decomposes the original network into fragments then orders and aggregates these according to the dictates of the text-producing task, not according to the needs for which the internal representation was originally conceived. KDS has shown the feasibility of this approach.

The KDS organization is a simple pipeline: FRAGMENT, PLAN, FILTER, HILL-CLIMB, and OUTPUT.

FRAGMENT transforms the selected portion of the semantic net into an unordered set of propositions which correspond, roughly, to minimal sentences.

PLAN uses goal-sensitive rules to impose an ordering on this set of fragments. A typical planning rule is:

> "When conveying a scene in which the hearer is to identify himself with one of the actors, express all propositions involving that actor AFTER those which do not, and separate these two partitions by a paragraph break".

FILTER, deletes from the set, all propositions currently represented as known by the hearer.

HILL-CLIMB coordinates two sub-activities: AGGREGATOR applies rules to combine two or three fragments into a single one. A typical aggregation rule is:

> "The two fragments 'x does A' and 'x does B' can be combined into a single fragment: 'x does A and B'".

PREFERENCER evaluates each proposed new fragment, producing a numerical measure of its "goodness". A typical preference rule is:

> "When instructing the hearer, increase the accumulating measure by 10 for each occurrence of the symbol 'YOU'".

HILL-CLIMB uses AGGREGATOR to generate new candidate sets of fragments, and PREFERENCER, to determine which new set presents the best one-step improvement over the current set.

The objective function of HILL-CLIMB has been enlarged to also take into account the COST OF FOREGONE OPPORTUNITIES. This has drastically improved the initial performance, since the topology abounds with local maxima.

KDS has used, at one time or another, on the order of 10 planning rules, 30 aggregation rules and 7 preference rules.

The aggregation and preference rules are directly analogous to the capabilities of linguistic competence and performance, respectively.

OUTPUT is a simple (two pages of LISP) text generator driven by a context free grammar.

ACKNOWLEDGMENTS

The work reported here was supported by NSF Grant MCS- 78-07332.

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