

Experimental System for Argument Text Generation: *Dulcinea*

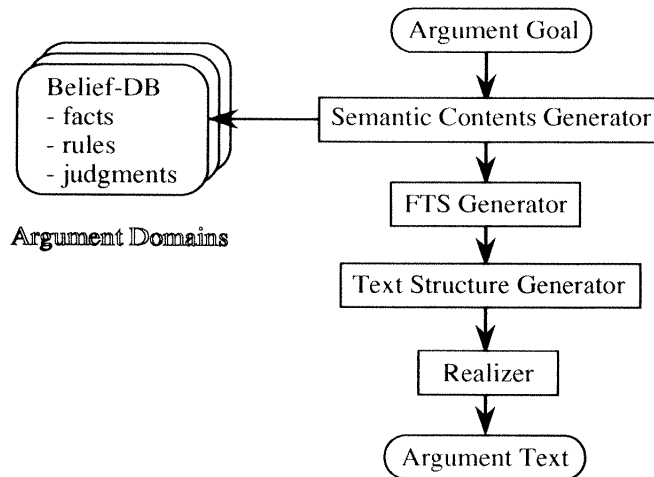
ABSTRACT

To establish the component techniques of the text generation for a natural language interface of FGCS, we have developed and evaluated an experimental system on the parallel inference machine.

This experimental system generates Japanese text that justifies a given goal according to the belief contents of the system.

KEY FEATURES

1. Belief content consists of facts, rules and judgments for the state of affairs. Exchanging the contents of a belief database enables the system to make arguments in various domains.
2. This system can generate not only direct grounds, but also refutations for the expected opposing arguments, together with examples that are indispensable to persuasive argument.
3. By varying the argument strategies and criteria for sentence structure, we perform the text generation experiment and conduct research into the objective criteria for “natural” text.



System Configuration

WHAT IS ARGUMENT TEXT GENERATION ?

Argument texts written by humans are appropriately structured to express judgments and attitudes on topics based on the standpoint of the author.

By computer, however, it is difficult to produce coherent texts. Therefore, it is necessary to consider coherence and appropriate structure planning if high quality argument texts are to be generated by computer. The goal of our research is to investigate the argument strategy for text coherence and clear standpoint expression.

GENERATION MECHANISM

We set the standpoint of the system by assigning it an argument goal. *Dulcinea* puts forward an argument that justifies the given argument goal according to its beliefs. The argument texts consist of direct grounds for the argument goal, refutations for the expected opposing arguments, together with examples. The beliefs consist of three types of belief contents: *Fact*, *Rule*, and *Judgment*. An example of beliefs is given below.

Rules: $\text{change}[\text{obj2}=\text{bus-route, loc=L}] \Rightarrow \text{decrease}[\text{obj2}=\text{passenger, loc=L}].$
Facts: $\text{introduce}[\text{obj}=\text{one-way-system, loc=Midosuji}].$
Judgments: $\text{ng}[\text{abolish}[\text{obj}=\text{bus}]].$

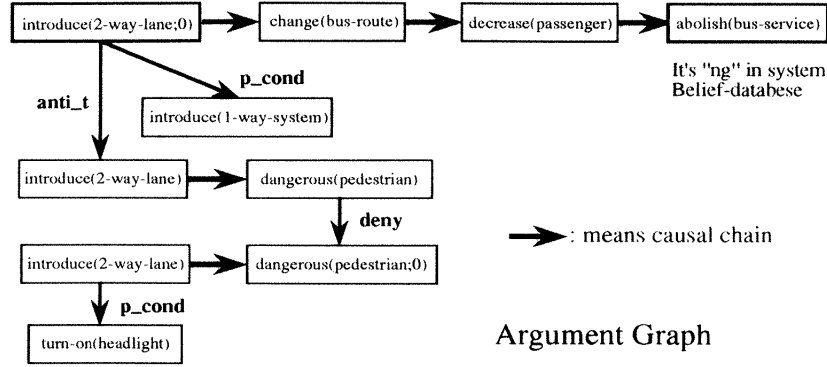
The argument goals we give the system can be of one of the three kinds of modal expressions listed in the table below, where A stands for some state of affairs. If a judgment $g(A)$ exists in the system's belief, then the system believes A to be good.

Argument Goal	Assertion	Corresponding Judgment
$\text{must}(A)$	It must be A	$\text{ng}(A)$
$\text{hb}(A)$	It had better be A	$g(A)$
$\text{may}(A)$	It may be A	$\neg \text{ng}(A)$

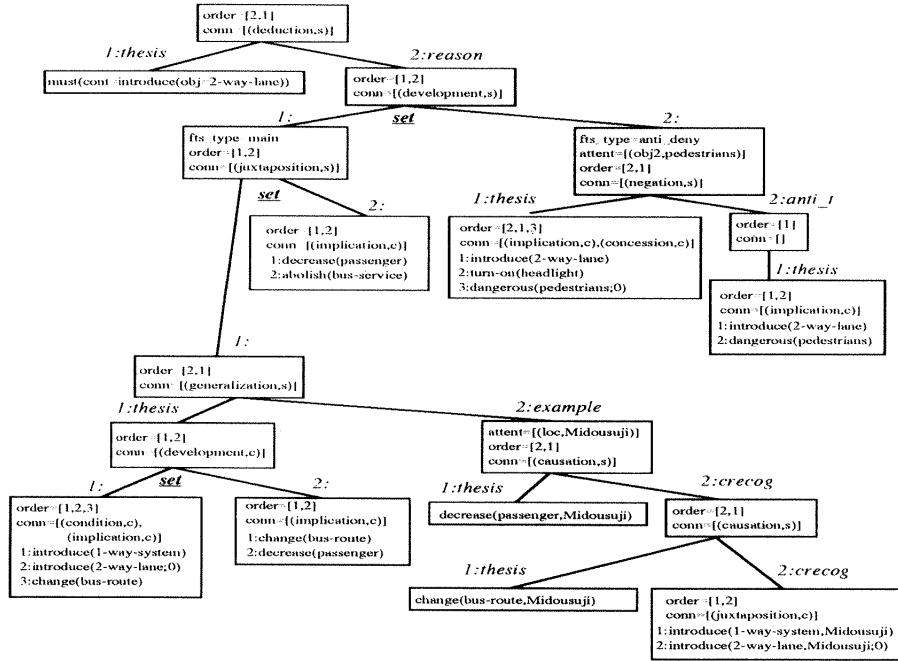
Dulcinea represents the semantic contents of an argument as an argument graph. The following figure shows an argument graph that insists on the argument goal “the *two-way lane* must be introduced”. A two-way lane is a lane that allows buses to drive the “wrong way” up a one-way street.

Then, the argument strategy on the linguistic text structure is applied to the argument graph to organize abstract text structure FTS (Functional Text Structure), which represents not only the semantic contents, but also the text structure.

Next, *Dulcinea* produces various surface syntactic text structures by adding order and connection information to the FTS. It then selects the best text structure according to the linguistic knowledge criteria.



Finally, *Dulcinea* generates argument text by omitting redundant words and selecting words that correspond to each object. The following figure shows the FTS added order and connection information.



DOMAINS AND THEMES OF ARGUMENTS

Dulcinea can handle many kinds of argument domain and theme, such as the following extracts.

Traffic: introduction of two-way lanes / development of electric cars

Whaling: moratorium on the hunting of whales

Working Conditions: reduction in number of working hours

Housing: extended families living together

Sports: prize money for Olympic prizewinners / commercialization of the Olympic Games

Medicine: regarding brain death as actual death / execution of euthanasia

EXAMPLE OF ARGUMENT

Argument Domain: Traffic Matters

Argument Goal: A two-way lane must be introduced

Generated argument text: (*English translation*)

In *Midousuji* street, a one-way system was introduced while a two-way lane for buses was not introduced. This forced a change in the routes of bus services resulting in a decrease in passengers of 40%. In this way, if a two-way lane is not introduced with a one-way system, the routes of bus services changes and the number of passengers will decrease. Moreover, if the number of passengers decrease, the bus service may be forced to stop.

On the other hand, introducing a two-way lane seems to put pedestrians in danger. However the pedestrians were not in danger in London when a two-way lane was introduced, because the buses turned their headlights on. In this way, if the buses turn their headlights on, the pedestrians will not be in danger, even though a two-way lane is introduced.

Therefore, a two-way lane must be introduced.

OUTLINE OF DEMONSTRATION

First of all, we choose traffic matters as the argument domain and make an argument which asserts “We must introduce the two-way lane”. At first, we limit the argument to its direct grounds and give you a brief explanation of the function and output for each module. Then, using the same argument theme, we make a complete argument that includes refutations for the opposing arguments, together with examples. After that, opposing arguments such as “must not introduce a two-way lane” will be performed. Other argument themes in the same area of traffic matters may also be demonstrated. Finally, we will take another domain, of your choice, and show you some arguments.