Transformation Module

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1. Transformation Module

The transformation module, an important part of IDEA (Interactive Device between Environments and Artifacts), transforms descriptive expressions based on people's consciousness about the environment (e.g. "a clear water") into technical expressions about an environment based on environmental quality (e.g. "water transparency") . The core function of the module is performed by a database, which consists of tables with rules for transformation and synonyms (Fig. 1). When a user enters a phrase based on his environmental consciousness into the system, an index synonym phrase is chosen from the synonym table.   Then, the index phrase is transformed into a technical expression that describes the environmental quality according to transformation rule table (Fig. 2). The module has a learning function to find a better result every time. These transformation processes and the results are recorded as the transformation history, and are used for the next transformation.
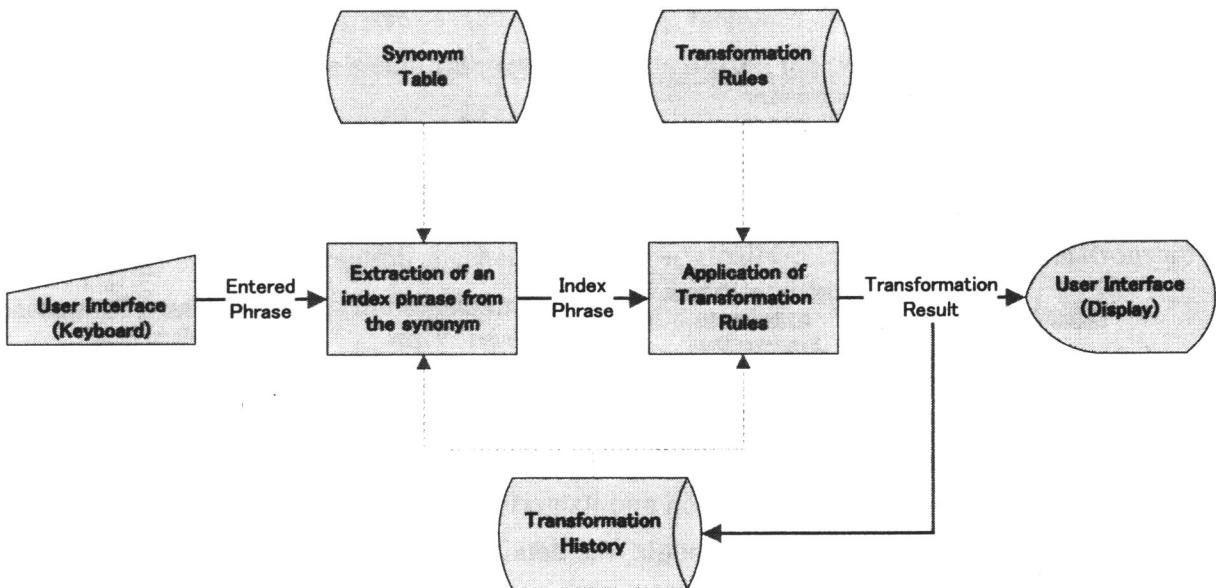

Fig. 1 Structure of the Transformation Module

2. Activities during 2004 - 2005

(1) Test data generation

Transformation rules and synonym database for the performance testing were generated using the results of keyword questionnaire survey conducted in 2002. 139 phrases were extracted from expressions about lakes and forests that respondents used in their answers, and each of them was given connections to the relevant technical expressions based on the environment quality. These 139 phrases and the technical expressions were registered in the transformation rule table as the index phrases and transformation outcomes, respectively. The expressions similar to the index phrases were also extracted from the questionnaire results and registered into the database as synonyms (31 nouns and 248 adjectives). These operations about the test data generation were conducted in IDEA Working Group.
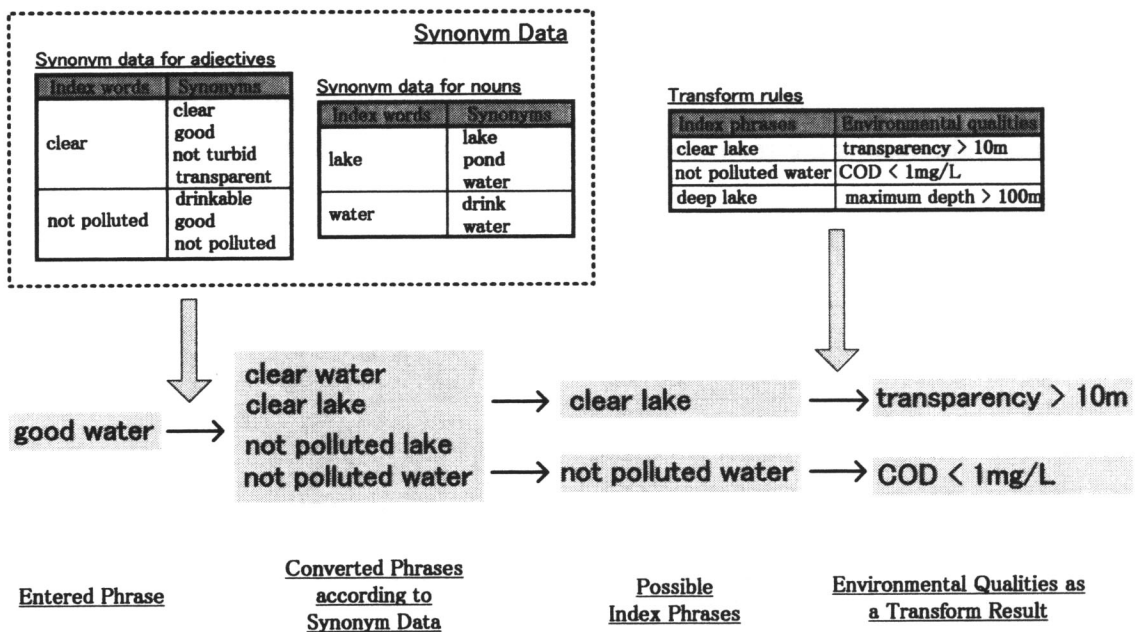
Fig. 2 Procedure of transformation and its example

(2) Experimental module implementation and its performance test

Before the implementation of the module, the details of the functions that the module needs to perform were identified. Since the main objective of this performance test was to examine the transformation procedure, only the fundamental functions necessary to use the transformation rules and the synonym data in the transformation process were implemented. Registration of new data and implementation of additional functions (e.g. transformation using related words) were not planned for this test. Since the module needs to be frequently reconstructed based on the results of the performance test, Microsoft Access 2003, in which changing the database structure and the user interface is relatively easy, was used as the

database management software in this implementation.

Although the basic mechanism of transformation was completed in the performance test, following problems were identified in the experimental module:

1) Transformation results are greatly influenced by the history of transformation. Therefore, accumulation of certain amount of history data is necessary for a minimum stability of the transformation results.

2) Detailed transformation process including conversion of synonyms should be visible to the user so that he can judge the reasonability of the transformation result.

3) The procedure of registering the history of transformation should be simplified.

3. Activity plans for 2006 - 2008

2006

The complete transformation module will be implemented based on the results of the performance test with the experimental module. The data registration function, which was not in the experimental module, will be newly implemented in the complete module. Accumulation of the history of transformation is required in the complete module as well as the functions of generating of new transformation rules and synonym data. As this module will be incorporated into IDEA system, it needs to be configured to work seamlessly with the other components of the system, i.e., the response prediction model and the questionnaire about people's environmental interests during the process of implementation.

2007-2008

System operation and its maintenance are the main activities planned after 2007. Additionally, the transformation mechanism using logically related words (ex. relationship between fish and fishery) will be examined.