

Targeted Detection: Application to Error Detection in a Pedagogical System

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In a learning environment (tutorial system), the problem of the detection of students' errors is fundamental. When an error is detected, the tutorial system can choose the best time to provide information and explanations in order to help the student make progress. The mechanism of error detection must be able to draw from knowledge about the studied domain and to adapt itself to various pedagogical strategies. In an interactive system, the problem of the detection of students' errors arises in an incremental manner, at each input of information.

The learning environment that we are building¹, the software "Combien?" (How many? in French) is a pedagogical system to help students learn combinatorics using mathematical language. In this system, the student builds via an interface a solution of the exercise whose internal representation is a tree-like structure.

Furthermore, we have designed a targeted detection mechanism² which makes it possible to identify a pattern associated with a condition binding some of the variables in a conceptual tree structure.

This mechanism can be used for the incremental detection of errors in the building of a tree-like structure. The concept of target (new input element to be analysed) allows us to take into account the interactive aspect. In order to detect and explain the errors, the system needs specific knowledge. This knowledge is grouped in a data structure named error schema. Two important components of each error schema are a tree-like pattern with distinguished variables and a condition of error binding these variables.

In the Combien? software, we implemented error detection using the targeted detection method. For each class of problem, we defined an error schema data base. In the school year 2001-2002, this Combien? software was used for combinatorics teaching at secondary school (final year). Some students used the software before their combinatorics course, and the others after the course. In both cases, the students (in groups of three) solved the exercises without the teacher's help. The contextual aids of the system were sufficient in themselves.

¹ Tisseau G., Giroire H., Le Calvez F., Urtasun M., and Duma J., *Design principles for a system to teach problem solving by modelling*. Lecture Notes in Computer Science N° 1839, ITS'2000, pp. 393-402, Springer-Verlag, Montréal, 2000.

² Giroire H., Le Calvez F., Duma J., Tisseau G., Urtasun M., *Un mécanisme de détection incrémentale d'erreurs et son application à un logiciel pédagogique* RFIA 2002, pp. 1063-1072, Université d'Angers, Janvier 2002.