A multimodal interface for incremental graphic document design

Luc JULIA & Claudie FAURE

Télécom Paris - URA CNRS 820 - Dpt SIG
46, rue Barrault
75634 PARIS cedex 13 - FRANCE
e_mail : julia@sig.enst.fr

Pen-based computers are of great interest in producing graphic design from hand written data. Pen entries offer handwriting, drawing and gestural inputs. The complementarity of gestures and voice can be exploited to design a multiple channel Human-Computer Interface. A first prototype of a multimodal interface for editing and correcting tables, TAPAGE, allows testing of the robustness of the defined architecture. It provides a tool to perform experiments on user behaviour.

The goals of TAPAGE are to explore the following areas :

- **Incremental design** : the user simultaneously thinks and produces a drawing. He may delete, move or draw an element of his drawing. The multimodal interface assists him in performing these operations and the system reacts by displaying an accurate version of the hand drawing.
- **Multimodalities** : There are two kinds of multimodality studied here. First, the modalities are blended (pen and voice), it is interesting to understand how they work together, and to remark that the combination of modalities covers many aspects of human-human communication. The second kind proposes the availability of several modalities (pen or voice) for one action. The choice is made in context and refers to adaptive protocol.
- **Architecture** : to support parallel data processing, an agent-based architecture is proposed. Each input or output modality may be associated to a set of specific agents. Those agents are distributed on different levels of the application in order to maintain a rapid reaction time, which is necessary in a real time interaction. The agents may communicate without involving the functional core.
- **Application** : pen-based computer allows the user to sketch graphic input such as tables, network diagrams, maps, ... and to obtain accurate versions. Line drawing processing and pattern recognition methods are combined with the use of knowledge about visual communication. TAPAGE reconstructs the vertical and horizontal lines, closures and junctions, and also the columns and lines which must have the same size.

Pen communication allows to produce with the same medium gestural commands and data, which can be a source of ambiguities. They are solved in TAPAGE through choices in interaction protocol. Most of the characteristics of this prototype are reused for applications in progress concerning a broad range of hand sketching task such as network diagrams, maps or visual languages.