A New Architecture Conception for a Two Dimensional Tactile Display

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The design of new solutions for dynamic access to graphic information for the blind requires new kinds of mechanisms on the one hand and a systematic approach to the construction of the whole display on the other hand. The information transfer in the tactile-haptic way from machine to man can be described by a seven layer reference model. The seven layers are labeled "application (7)", "presentation (6)", "communication control (5)", "transport (4)", "addressing (3)", "conversion (2)" and "transmission (1)". The new concept deals with the lower four layers, which are also called the mechanism-oriented layers:

Layer 1: the kind of stimulus: The transmission layer is denoted by single pins made of plastic or metal which convey a sprung sensation.

Layer 2: the control of stimulus: The conversion layer describes the kind of pin-mechanism used. In this concept, the mechanism works with a wire of shape memory alloy which transforms - when electrically heated - electrical into mechanical energy activating a pneumatical valve. The pneumatic energy (excess or below atmospheric pressure) drives and holds the pin in the upper or lower position. Because no (mechanical) driving parts are needed at the side of the pin, a close arrangement of mechanisms in a two-dimensional way is possible.

Layer 3: the addressing of mechanisms: The addressing layer manages the selection of the single pins. This is done by collecting a quadratic number of pins into a display module which is internally controlled by a microprocessor. For the display area several display modules are arranged in a rectangle form.

Layer 4: the control of the display: The transport layer is realized by a special communication module which serves in one direction as interface to the computer and in the other direction as controlling unit for the communication within the display. For conveying the information some additional bus modules are needed. The communication is realized as a ring, it starts in the communication module, goes through the different display modules and back to the communication module.

Advantages of the architecture: The new patented pin-mechanism allows a high resolution and a two-dimensional arrangement. The parallelism of the information processing within the display modules results in short picture modification times. The modular design of the display with few types of modules is advantageous for production and maintenance. The replacement of a single module will be simple.

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