

„Feeling“ Data Through Haptic Displays

Researchers at KIT Are Developing Systems Which Transmit Information via Vibration Patterns or Pressure Signals and Help Control Complex Systems



Haptic displays could simplify complex control tasks in control rooms by drawing attention to relevant events via tactile feedback. This picture shows the control room of the KATRIN neutrino experiment at KIT. (Photo: Irina Westermann, KIT)

To perceive our surroundings we can draw on five senses. But when dealing with technology, we mostly use screens and speakers which only appeal to our senses of vision and hearing. Scientists at Karlsruhe Institute of Technology (KIT) are now developing haptic displays that use the sense of touch. The VibrAID system, for example, will use vibration patterns to simplify dealing with complex control systems.

“Haptic displays transmit information via the skin by vibration or pressure. This can be a smartwatch that alerts us to an incoming message through vibration or a mobile phone in our pocket that uses vibration patterns to navigate us,” says Erik Pescara from the Telecooperation Office (TECO) research group of KIT. But haptic feedback devices can do much more than that. TECO is developing haptic assistance systems for complex control tasks. Possible areas of application of the VibrAID system include control rooms in power stations and transport networks. Large amounts of relevant data are often displayed on screens there. Although such dashboard systems – in other

Monika Landgraf
Chief Press Officer
Head of Corp. Communications

Kaiserstraße 12
76131 Karlsruhe, Germany
Phone: +49 721 608-21105
Email: presse@kit.edu

For further information, please contact

Dr Martin Heidelberger
Editor/Press Officer
Phone: +49 721 608-21169
Email: martin.heidelberger@kit.edu

Further material:

Video – “Feeling” data through haptic displays:

<https://youtu.be/PGQJd3rXTCI>



words graphical user interfaces which display information using a computer – are individually configurable, it may happen that users can't find the relevant information fast enough for controlling the system in an optimum way.

"We want to relieve the visual sense by drawing attention to relevant events using the sense of touch," says Vincent Diener who is developing VibrAID at KIT and also works at TECO. "A portable (wearable) system informs the user about important changes or events on the dashboard with the help of vibration patterns that the system has already learned." This means that the user does not have to be as attentive and they can focus better on other tasks. "A server is running in the background which monitors whether a threshold is exceeded in the system," says Diener. "If this is the case, the system sends the information to the user's smartphone. It will then forward the relevant data via Bluetooth to the wearable and will trigger the vibration." VibrAID consists of a wristband with ten small vibration modules. Since the electronics are easy to remove, the wristband is easy to clean. Using an energy supplier's control room as an example, the scientists are now building a realistic study environment at KIT to test the system.

This video shows applications such as the proximity hat:

<https://youtu.be/PGOJd3rXTCI>

(source: KIT)

The haptic technologies developed by TECO show that when it comes to the interaction between man and machine there are smarter ways than presenting data only via monitors and speakers. In the future, haptic displays could be part of our normal everyday lives at home and at work.

Other haptic technologies by TECO

Proximity hat: The proximity hat uses stimulus perception through pressure. Through weak or strong signals it transmits information to its wearer about how close walls, passageways or objects are. The system surveys the surroundings in real time via ultrasound and could help the visually impaired to find their way around a room, and fire-fighters around a building filled with smoke.

RüttelFlug: During paragliding it is important that the pilot receives information about the thermal conditions to be able to control the glider's ascent or descent. Usually, special measuring equipment shows the altitude and transmits the vertical speed to the pilot through visual or auditory signals. The RüttelFlug system, however, informs paragliders about a change in speed and altitude through vibrations. This means they can enjoy their flight without any annoying beeping or distracting monitors.

Video – “Feeling” data through haptic displays:

<https://youtu.be/PGOJd3rXTCI>

Dossier – “Science Year 2018 – Working Life of the Future”:

<http://www.sek.kit.edu/wissenschaftsjahr2018.php>

As “the Research University in the Helmholtz Association”, KIT creates and conveys knowledge for society and the environment. The aim is to make significant contributions to global challenges in the fields of energy, mobility and information. To achieve this, around 9,300 employees are working together on a broad disciplinary basis in natural sciences, engineering, economics, humanities and social sciences. KIT offers research-oriented studies to prepare its 25500 students for responsible tasks in society, economy and science. Innovations at KIT bridge the gap between knowledge and application for the benefit of society, economic prosperity and the preservation of our natural resources.

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