

Artificial intelligence: Digital pen helps people learn to write

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The digital pen will combine handwriting with digital media and will help people learn to write. Credit: STABILO International GmbH

A smart digital pen that helps people learn to write is currently being developed in the framework of the German-French project Kaligo-based

Intelligent Handwriting Teacher (KIHT). The collaboration project funded by the German Federal Ministry of Education and Research is coordinated by Karlsruhe Institute of Technology (KIT). Within this project, researchers of KIT study algorithms of artificial intelligence (AI) that enable reconstruction of a writing trace and interpretation of handwriting. The smart learning device is to benefit as many pupils as possible.

Handwriting is an important tool of the knowledge-based society. Repeated studies revealed that writing a text by hand results in a higher quality of the result than typing. The new project is aimed at helping people learn to write by combining handwriting with [digital media](#). The smart digital pen resembles a conventional pen and can be used to write on paper. However, it is equipped with inertial sensors that capture smallest changes on the free spatial axes and, hence, to detect any position in space. The smart digital pen can be connected to any commercially available mobile end devices, including a tablet, and interacts with the mobile Kaligo app. With the help of this app, exercises can be adapted individually and data can be synchronized and stored automatically.

Teachers are given more freedom for creative and communicative tasks

"Use of the smart digital pen together with an adequate computer program automatically supports the learning of writing. In this way, teachers and parents are given more freedom for creative and communicative tasks," says Professor Jürgen Becker, Head of KIT's Institute for Information Processing Technology (ITIV). The software and AI algorithms are mainly dealt with by the French partners L'IRISA (Institut de Recherche en Informatique et Systèmes Aléatoires) and Learn&Go, both located in Rennes. Learn&Go, for instance, has

developed the mobile Kaligo app for training how to write. Integration of suited AI concepts in the [embedded systems](#) is in the focus of the German partners, KIT and the manufacturer of writing instruments STABILO International in Heroldsberg. The project is coordinated by KIT.

Researchers develop concepts for integrating algorithms

The group of Professor Jürgen Becker, ITIV, studies algorithms suited for reconstruction of a writing trace and for interpretation of handwriting. Researchers develop various concepts to integrate the AI algorithms as a function of the embedded hardware. Complexity of the entire system is distributed between both hardware and software, which allows for rapid and efficient AI execution. The aim is to enable online reconstruction of the writing trace from the sensor data and to develop efficient and miniaturizing hardware that can interact with all commercially available mobile end devices. At the end of the KIHT project, a practical test at a demonstration plant is planned. Team leader Dr. Tanja Harbaum (ITIV) underscores the great potential of the smart digital pen for schools in particular: "This [project](#) pools the competencies of high-ranking international partners from science and industry and is aimed not only at advancing research, but also at providing an innovative product that benefits many children."

Provided by Karlsruhe Institute of Technology

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