

PRESS RELEASE

PRESS RELEASEFebruary 22, 2016 || Seite 1 | 3

Fraunhofer IIS technologies supporting effective toothbrushing – individually tuned to the user!

Erlangen/Barcelona, February 22, 2016 – Mobile World Congress, Hall 8.1, Booth 8.1168: For healthy teeth, it is crucial to spend the right amount of time brushing and to brush with precision. The latest generation of electric toothbrushes supports users with applications on their smartphones. Based on the image analysis software SHORE™ developed by Fraunhofer Institute for Integrated Circuits IIS as well as its localization technologies for position recognition, Procter & Gamble is now presenting a new smart tooth-brushing system at the Mobile World Congress. By telling users which area of teeth they are currently brushing, this system supports them in their daily dental hygiene as recommended by dentists.

It's not just the toothbrush that determines whether dental care is correct and improves dental health. To keep teeth healthy, it's much more important to brush "correctly" and pay equal attention to all areas. To support users as effectively as possible, Procter & Gamble (P&G) has been working with scientists from Fraunhofer IIS on the development of a new "smart interactive" toothbrush Oral-B GENIUS. The toothbrush connects via Bluetooth with an app on users' smartphone, which can be affixed directly to a mirror. Analysis can begin as soon as users begin brushing their teeth.

Image analysis and inertial sensors for a better brushing result

The integrated Fraunhofer SHORE™ facial detection and analysis technology allows head movement and hand position to be recognized and analyzed in real time. This lets users know whether they are brushing too little or too long in one place, or whether they have missed an area. "We are using image-based classification to further develop and refine the algorithm of our SHORE™ software library so that it can determine the exact position of the toothbrush," is how Dr. Jens Garbas, head of the Group for Intelligent Systems explains the technical challenge facing his team. "SHORE™ has to be able to provide reliable results even with poor lighting, frequently changing head positions or rapid hand movements." The Fraunhofer developers use their SHORE™ software to determine the position of the jaw from images and evaluate the results with a large number of testing sequences.

In order to further improve the robustness and precision in line with requirements, the SHORE™ developers have taken colleagues from the Multi-sensor Systems Group at

Leiter Unternehmenskommunikation

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Fraunhofer IIS on board. Thanks to what are known as inertial sensors in the brush handle, smart analysis software can assess the brush's position and movements and combine this information with data from the image analysis. The advantage of this type of sensor fusion is that more precise information is generated on whether each area has been brushed for a sufficient period of time and whether any areas have been left out. Users can see the results directly on their smartphones and adjust their brushing accordingly. "Our challenge in achieving sensor fusion across the two technologies was to produce a reliable classification of the brushing area even when the acceleration sensors weren't delivering measurement data with a high data rate. Our determination to solve this tricky task without building any additional technology into the system was what spurred us to come up with new approaches to sensor fusion for optimum combination with image-processing data," reports group leader Jochen Seitz.

PRESS RELEASE

February 22, 2016 || Seite 2 | 3

Collaboration with Procter & Gamble

P&G, the world's leading manufacturer of household, health and beauty-care products, whose portfolio of brands includes Oral-B and Braun, has been collaborating with scientists at Fraunhofer IIS since 2013. In its search for a highly reputed, reliable development partner for a new, smart generation of toothbrushes, the P&G Group's Research Division noticed a presentation of SHORE™ facial detection and analysis software. The efficiency and capabilities of SHORE™ soon brought the two partners together to develop new ideas and solutions for software-based assistance systems. "The scientists at Fraunhofer IIS have excellent technological and application-oriented know-how. Our collaboration with them supports us in the user-oriented further development of attractive new products, so we can offer our customers real added benefits for dental hygiene," says Frank Kreßmann, Research & Development for Connected Devices and Oral Hygiene at P&G.

Presentation of the new toothbrushes at the Mobile World Congress

The new Oral-B GENIUS smart electric toothbrush, featuring integrated image analysis software and movement analysis developed by Fraunhofer IIS, offers users far more advantages than many familiar applications of electric toothbrushes to date. Procter & Gamble is presenting these new interactive toothbrushes at the Mobile World Congress in Barcelona.

About SHORE™

SHORE™ is a real-time software developed by the Fraunhofer Institute for Integrated Circuits IIS for detecting and analyzing faces in images and videos: It can analyze people's age, gender and emotional state/facial expression. For the past 15 years, one focus for the Intelligent Systems Group has been to develop and research algorithms and procedures for the image-based detection, analysis and interpretation of faces, gestures, movements and persons. In 2001 the first system able to recognize people's faces in real time against any background and to follow them over a long period of time in a stable, robust manner was introduced. Findings generated by work in this area are introduced into the Fraunhofer software library SHORE™ (Sophisticated High-speed Object Recognition Engine), which is being constantly refined.

The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. Its research activities are conducted by 66 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of nearly 24,000, who work with an annual research budget totaling more than 2 billion euros.

The **Fraunhofer Institute for Integrated Circuits IIS** is one of the world's leading application-oriented research institutions for microelectronic and IT system solutions and services. It ranks first among all Fraunhofer Institutes. With the creation of mp3 and the co-development of AAC, Fraunhofer IIS has reached worldwide recognition. In close cooperation with partners and clients the Institute provides research and development services in the following areas: Audio & Multimedia, Imaging Systems, Energy Management, IC Design and Design Automation, Communication Systems, Positioning, Medical Technology, Sensor Systems, Safety and Security Technology, Supply Chain Management and Non-destructive Testing. About 880 employees conduct contract research for industry, the service sector and public authorities. Founded in 1985 in Erlangen, Fraunhofer IIS has now 13 locations in 10 cities: Erlangen (headquarters), Nuremberg, Fürth, Dresden, further in Bamberg, Waischenfeld, Coburg, Würzburg, Ilmenau and Deggendorf. The budget of 120 million euros is mainly financed by projects. 23 percent of the budget is subsidized by federal and state funds.

Detailed information on: www.iis.fraunhofer.de/en