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Body area network monitors arousal level

Leuven, Belgium – October 14, 2008 - In the framework of Holst Centre, IMEC developed an ambulatory arousal monitor. The new research concept uses a combination of body parameters to monitor a person's arousal level. The compact form factor and the long battery lifetime allow the use of the arousal monitor in new application domains such as mobile gaming and clinical trials.

Being able to measure and analyze the emotional state can be of great value for a variety of applications in the entertainment and medical sector. For example, online avatars can automatically adapt to a player's state of mind without him having to actively indicate it in a game menu. Or, in drugs screening, being able to objectively quantify parameters such as stress can complement the more subjective indication and gradation of traditional tests.

IMEC's approach within its Human++ program at Holst Centre uses a body-area network that measures four body parameters to detect a person's emotional state. The body-area network consists of two small wireless sensor nodes that communicate to a PC acting as a base station. The wireless sensor nodes take care of ultra-low power digital signal processing and wireless communication of the measured data. The first wireless sensor node is integrated in a chest belt and measures respiration and ECG (electrocardiogram or heart activity) based on IMEC's proprietary single-channel biopotential ASIC. The second node is integrated in a wristband and consists of a commercial sensor for skin temperature and a dedicated circuit board measuring the galvanic skin conductance between two fingers. The physiological measurements are combined and interpreted in the software running on the base station where an indication about the person's arousal is derived in real time.

The entire system consumes twenty times less power than a comparable Bluetooth device, allowing several days of autonomy on a commercial prismatic Li-Ion battery. Future research will focus on making the system fully autonomous, e.g. by using

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energy harvesters that produce electricity from body-heat; increasing the amount of local computing done within the sensor nodes; increasing the amount of parameters that can be measured; improving the robustness and reliability and including ultra-low power wireless RF communication.

IMEC's platform serves as a research demonstrator to showcase and evaluate the underlying technology and building blocks. Partner companies – and possible other interested parties – can use and commercialize the technology in future product generations, which can be situated in all sorts of other scenarios and domains than the ones named above.



Wireless body area network for arousal monitoring: physiological signals are monitored, wirelessly transmitted and analyzed to extract, in real-time, the arousal level characteristic of one's emotional state.

About IMEC

IMEC is a world-leading independent research center in nanoelectronics and nanotechnology. IMEC vzw is headquartered in Leuven, Belgium, has a sister company in the Netherlands, IMEC-NL, offices in the US, China and Taiwan, and representatives in Japan. Its staff of more



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than 1600 people includes more than 500 industrial residents and guest researchers. In 2007, its revenue (P&L) was EUR 244.5 million.

IMEC's More Moore research aims at semiconductor scaling towards sub-32nm nodes. With its More than Moore research, IMEC looks into technologies for nomadic embedded systems, wireless autonomous transducer solutions, biomedical electronics, photovoltaics, organic electronics and GaN power electronics.

IMEC's research bridges the gap between fundamental research at universities and technology development in industry. Its unique balance of processing and system know-how, intellectual property portfolio, state-of-the-art infrastructure and its strong network worldwide position IMEC as a key partner for shaping technologies for future systems.

Further information on IMEC can be found at www.imec.be.

About Holst Centre

Holst Centre is an independent open-innovation R&D centre that develops generic technologies for Wireless Autonomous Transducer Solutions and for Systems-in-Foil. A key feature of Holst Centre is its partnership model with industry and academia around shared roadmaps and programs. It is this kind of cross-fertilization that enables Holst Centre to tune its scientific strategy to industrial needs.

Holst Centre was set up in 2005 by IMEC (Flanders, Belgium) and TNO (The Netherlands) with support from the Dutch Ministry of Economic Affairs and the Government of Flanders. It is named after Gilles Holst, a Dutch pioneer in Research and Development and first director of Philips Research.

Located on the High Tech Campus in Eindhoven, Holst Centre benefits from the state-of-the-art on-site facilities. Holst Centre has over 100 employees (growing to over 200 by 2010) and a commitment from over 15 industrial partners.

Visit us at www.holstcentre.com

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