CONVERGENCE

Frictionless Energy Efficient Convergent Wearables for Healthcare and Lifestyle Applications

Main area: High-Efficiency Sensor Networks
Keywords: Low power wearable sensors, bio-sensors (sweat and breath), activity sensors, environmental (gas and particle) sensors, energy harvesting, energy efficient wearables, energy efficient autonomous systems, signal processing, data analytics, preventive healthcare strategies, energy harvesting, energy efficient computing and communications, heterogeneous integration on flex, silicon-in-foil.
Duration: 36 months
Total project funding: € 2.522.547

Abstract

The wearable sensor platform proposed in CONVERGENCE is centred on energy efficient wearable proof-of-concepts at system level exploiting data analytics developed in a context driven approach (in contrast with more traditional research where the device level research and the data analytics are carried out on separate path, rarely converging). Here we choose realistic wearable form factors for our energy efficient systems such as wrist-based and patch-based devices. Their advancements, as autonomous systems is foreseen in CONVERGENCE to offer unique solutions for new generations of frictionless (non-invasive) quasi-continuous healthcare and environmental monitoring, and for forthcoming smart apparel with embedded autonomous sensing. At long term, the CONVERGENCE platform will form the basis for new generations of human-machine interfaces. Such energy efficient, wireless and multifunctional wearable systems will beneficially track and interact with the end-user through appropriate feedback channels on a daily basis. They will enable personalized advice and assistance promoting healthier lifestyle and improved healthcare prevention, far beyond what today's wireless sensor networks are capable of providing. The project includes and addresses all the value chain needed for the energy efficient body-area networks and wearables, with particular attention to requirements made by health care and healthy life style.

The CONVERGENCE project supports holistically - by multiple efforts at technology, system integration, algorithms and data analytics levels - the advancement of early detection, minimisation of risks and prevention-based healthcare and lifestyle, based on the deployment of some focused embodiments of wearable technology for interactive monitoring and assessment.

CONVERGENCE advocates success via a multidisciplinary and holistic vision of convergent wearable technology designed by engineers with the insight of medical professionals and exploiting strong scientific expertise of academic partners. The proposal address concrete healthcare needs and requirements and promotes the idea that energy efficient wearable components will become crucial for feedback aiming at healthy lifestyle and will be integrated in the future in the healthcare chain for self-use and/or in scenarios involving healthcare professionals.

CONVERGENCE endeavours to exploit these new technologies potential of multi-parameter continuous monitoring in everyday life for true preventive medicine and a new Quality-of-Life. Moreover, this initiative has the ambition to create and develop at European scale a diverse community and network of research partners to generate new research ideas and innovation. We are planning collaborative efforts with some other initiatives such as the former FET Flagship Pilot ITFoM, which will provide string medical expertise and an advanced platform for field trials of the wearable sensing technology.

Consortium

Adrian Ionescu – Ecole Polytechnique Fédérale Lausanne / Engineering – Switzerland – Funded by: SNSF (Coordinator)
Christofer Hierold – Eidgenössische Technische Hochschule Zürich / Department of Mechanical and Process Engineering – Switzerland – Funded by: SNSF
Luca Selmi – Consorzio Nazionale Interuniversitario Per La Nanoelettronica – Italy – Funded by: MIUR
Saverio De Vito – Italian National Agency for New Technologies, Energy and Sustainable Economic Development/Department of Energy Technologies – Italy – Funded by: MIUR
Marco Santonico – Unit of Electronics for Sensor Systems, Department of Engineering, Università Campus Bio-Medico di Roma – Italy – Funded by: MIUR
Luigi Raffo – Università degli Studi di Cagliari/Department of Electrical and Electronic Engineering – Italy – Funded by: MIUR
Fabio Buccolini – TAGLIAFERRI Società Responsabilità Limitata – Italy – Funded by: MIUR
Francis Balestra – Institut Polytechnique de Grenoble – France – Funded by: ANR
Thomas Ernst – Commissariat à l'Energie Atomique – France – Funded by: ANR
Stephane Monfray – STMicroelectronics – France – Partner not requesting funding
Denis Flandre – Université catholique de Louvain / ICTEAM – Belgium – Funded by: F.R.S.-FNRS
Modris Greitans – Elektronikas un datorzinatnu instituts / Signal Processing Lab. – Latvia – Funded by: LZA
Carmen Moldovan – National Institute for R&D Microtechnologies / Lab. of Microsystems for Biomedical & Env. Applications – Romania – Funded by: UEFISCDI
Lucian Mihai Itu – Universitatea Transilvania din Braşov / Department of Automation and Information Technology – Romania – Funded by: UEFISCDI
Didier Locca – Hirslanden Clinic Cecil / Cardiovascular Center – Switzerland – Funded by: SNSF
Mart Min – Tallinn University of Technology / Thomas Johann Seebeck Dept. of Electronics – Estonia – Funded by: ETAg
Haluk Külah – Middle East Technical University / MEMS Center – Turkey – Funded by: TÜBITAK