CATRENE

Cluster for Application and Technology Research in Europe on NanoElectronics

CA202 | Radical 'what you touch is yours' authentication method for digital interaction [eGo]

eGo™

The eGo project provides an innovative way for users to interact wirelessly in a secure (ensuring privacy) and seamless fashion in the emerging world of the internet of things, and more generally to manage their digital interactions in an increasingly connected world. The eGo concept is based on the most natural and intuitive interaction humans can have with objects: through touch.

This project has successfully defined, designed, developed and tested a technology that establishes secure, bidirectional wireless channels between objects or individuals in the future internet of things (IoT), based on a bootstrapping scheme using the electrical conductivity of human skin. Notably, this so-called eGo technology opens the door to new and intuitive ways of interacting digitally.

By simply touching an eGo-compliant object with any part of your body, you in fact initiate a wireless 'pairing' between that object and the eGo 'controller' using body-coupling communication technology. The highly secure eGo device you wear can come in any form factor (like a watch, belt, jewelry or badge). All it needs is to be in close proximity to your body, without the need for direct skin contact. This intuitive way of wireless pairing drastically simplifies the design of man-machine user interfaces and the interactions with smart objects. Computing is no longer just what you see or what you hear. Another human sense comes into play: touch!

An important part of the project was the development of promotional and awareness tools, such as use-case devices and services, to demonstrate eGo's capabilities to the market in general, and several industries and application areas, in particular.

Ready to go

eGo technology has been successfully demonstrated in four different application domains – automotive, payment, access control and healthcare – and two reference designs (hardware and software) have been completed with a total software-development environment. In fact, eGo devices are in their final stage of fulfilling requirements for delivery, as the following results and achievements attest to:

- One month of autonomy ($25\,\mu A$ active sniffing mode);
- 150 ms transaction time capability for supporting highly constrained use cases (like door opening);
- Mass production UWB technology combining highly accurate, real-time localisation performances (± 10 cm) with high data-rate communication (up to 6.8 Mb/s);
- 9D IMU integration (gesture recognition, fall-free detections, UWB and IMU fusion sensors);
- Integration in a watch (5 mm thick) and a volume (battery included) of 3000 mm3;
- Privacy retention through design support (for example, anonymous, authentic and non-traceable transactions);
- Water-resistance (no connector, no button, no holes);
- Adherence to Wireless Power Consortium's energy-interface standards;
- Fingerprint-sensor support;
- Ultra-thin and ultra-low power graphical display.

Award-winning success

This was a European collaboration undertaken by 12

ENERGY-EFFICIENT DEVICES AND ENERGY CONTROL SYSTEMS

Partners:

Worldline
CIT - Cork Institute of Technology
Continental
Decawave
Gemalto
IDEX
INRIA
Lincor Solutions
Precise Biometrics
STMicroelectronics (Tours and Rousset)
Tyndall Institute

Project leader:

Jean-Pierre Tual
Gemalto

Key project dates:

Start: July 2010
End: December 2013

Countries involved:

France
Ireland
Norway
Sweden

Project website:

http://www.ego-project.eu/

PROJECT CONTRIBUTES TO

Communication	✔
Automotive and transport	✔
Health and aging society	✔
Safety and security	✔
Energy efficiency	✔
Digital lifestyle	✔
Design technology	✔
Sensors and actuators	✔
Process development	✔
Manufacturing science	
More than Moore	✔
More Moore	
Technology node	

enthusiastic partners from France, Ireland, Sweden and Norway, who jointly created a large portfolio of advanced-technology components. Offering a vast range of new and intuitive possibilities needed to successfully address the emerging markets of internet of things and wearable devices, this eGo technology makes user interfaces and applications as simple as possible. For example, it can be prototyped and integrated in several form factors in miniaturised systems for new sensors, batteries and ultra-low power transmitters for body-coupling communication (via a natural connector: human skin).

Strong authentication, anonymity and non-traceability protocols were developed and implemented in the project, making the eGo concept both secure and privacy-preserving for managing digital interactions in the new IoT world. In addition, eGo integrated a highly secure microcontroller (comparable to ones embedded in smart cards) and ultra-wide-band wireless transmitters for communication and localisation. Prototypes of wearable devices incorporating the various versions of eGo proof-of-concepts with the key electronic system on chip (SoC) developed in the project – UWB and BCC controllers and protocol processor – were created and evaluated.

Demonstrators for four application domains – payments, automotive, access-control and healthcare – validated key eGo system characteristics. From these demonstrators, implementation guidelines and reference implementations, useful for further market developments, can be derived and wearable devices evaluated.

There were also achievements on the intellectual property front. Twenty patents were submitted, paving the way for the project standardisation strategy, which has entered a new phase as contributions specific to the eGo technology (UWB MAC/LINK layers) are ready for submission to the standards body, ETSI. This should provide European industry with a strong basis for entering the emerging IoT and wearable device market.

The eGo project was presented some 15 times at conferences and exhibitions, and cited or referred to more than 100 times by the international press. Notably, several project deliverables are ready for full

commercialisation, including: DecaWave UWB SoC, the latest chip from the STM32 family; and a new patent-protected Idex fingerprint sensor. One of the project partners is also in contact with financial and telecom operators to launch some 'pre-series' to test market acceptance of the eGo technology; while two others are also looking into payments and retail opportunities. And a fourth is ready to provide a reference implementation to the Irish small- and medium-sized enterprise community.

And the list of accomplishments continues. In addition to awards in 2011 and 2012, the eGo payment demonstrator received the 2013 Innovative Payments Trophy for e-commerce products category at the Pay-Forum fair in Paris. In addition, the DecaWave UWB chip was nominated for 100 Hot products (Wireless category) for 2014 by EDN, and got the ICS New Product Innovation Leadership Award 2014 from Frost & Sullivan.

On the move

eGo technology and products will continue to evolve and grow in four ways, notably by:

1. Improving facilities at the server level for easing management and automated certification of applications and their secure synchronization between all eGo wearable devices owned by the user;
2. Improving the secure body-area network (for eHealth environments) and adding new sensors;
3. Sharing technology with partners and standardising air-to-air interfaces;
4. Introducing a secure, open and multi-application platform supporting trusted service management and full remote personalisation.

And eGo partners are keen to maintain momentum. Based on project results, they submitted two proposals. The first, to extend the project (under the code name H2O) to largely deal with online automated application certification and identity management, was accepted and H2O is expected to start in 2015. The second, code named MUSE, addresses the H2020 call to help disabled people interact with the digital environment.

CATRENE (Σ! 4140), the EUREKA **C**luster for **A**pplication and **T**echnology **R**esearch in **E**urope on **N**ano**E**lectronics, will bring about technological leadership for a competitive European information and communications technology industry.

CATRENE focuses on delivering nano-/microelectronic solutions that respond to the needs of society at large, improving the economic prosperity of Europe and reinforcing the ability of its industry to be at the forefront of the global competition.

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