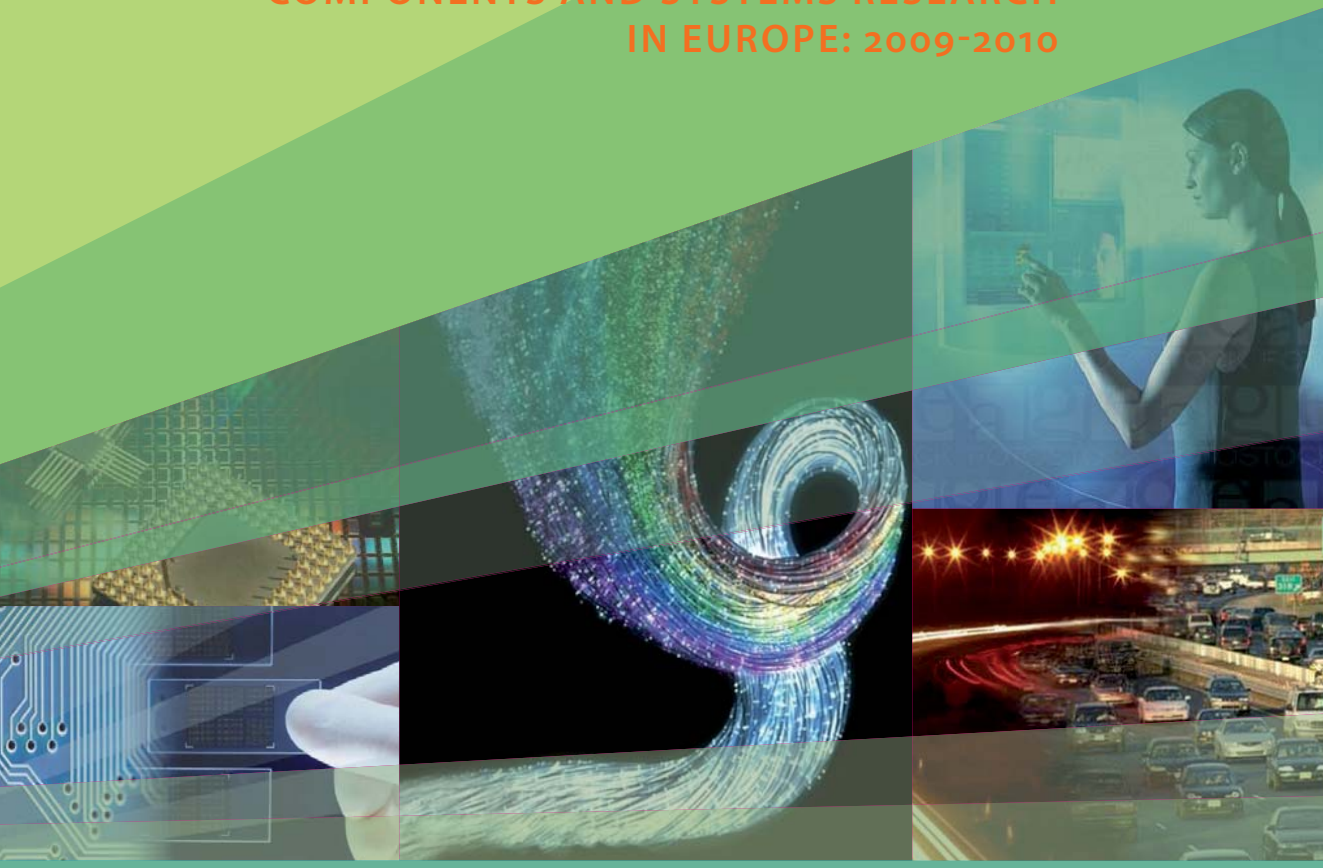
Small and Smart:

COMPONENTS AND SYSTEMS RESEARCH IN EUROPE: 2009-2010



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Did you ever wonder how it is possible that your brand new mobile phone, no heavier than your very first one bought 10 years ago, allows you to take and exchange wonderful pictures or videos, find your way in unknown cities thanks to its integrated navigation system, read and write emails everywhere, listen to your favourite music and do even much more? And how your own car tells you how much it consumes, indicates the tyre pressure, avoids skidding when breaking in an emergency, and will soon be able to call emergency services automatically in case of a severe accident? Did you ever imagine making your weekly shopping without having to scan all the products you buy, by just dropping them into the trolley and looking at the amount you have to pay on its embedded screen? Many of these very exciting applications are or will soon be possible due to the fantastic progress of Information and Communication Technologies (ICT), and in particular at the level of micro and nanotechnology components and embedded software.

Today, electronic systems are all around us. Following Moore's law, the size of electronic devices (transistors) is constantly being reduced, allowing the number of transistors on an electronic circuit to double every two years. This trend has been respected since the early 1970s, when the first silicon chips were made with about 2300 transistors and ran at 0,47MHz. The most recent devices include more than 2 billion transistors and operate at a frequency above 2000MHz! Smaller, more complex and powerful computing devices can thus be produced, which consume less energy and can be integrated everywhere. Sensors of all types (temperature, pressure, acceleration…) can now be integrated into these electronic devices. Recent research even makes it possible to bind organic molecules directly into silicon chips, enabling the creation a new range of circuits that automatically detect micro-organisms or pollutants. Analysis kits will soon be the size of an MP3 player, allowing your doctor to quickly make his diagnosis when you are ill, or integrating automatic water pollution control in every tap!

The ICT application fields are constantly broadening and, as a consequence, electronics is becoming present everywhere, in many forms. The latest developments in the area of organic electronics have made it possible to print electronic circuits on flexible foils, just like photos are printed. Such devices could for example be integrated in a T-shirt and constantly monitor important health parameters such as heart rate and blood pressure. Furthermore,

Editorial

the progress made in photonics technologies such as photovoltaics and high efficiency lighting (LED) is of utmost importance in the current thrive to be more energy efficient. LEDs are now being used in our houses, in cars and even for urban lighting!

With the increased complexity of components and systems, the development of efficient embedded software has been paramount for the management of increased functionality and intelligence. Europe is at the forefront of this discipline and intends to keep its leadership through the huge research efforts spent in the domain.
All these very exciting technologies have already produced extraordinary results. But Europe will not stop here, and continues investing in quality R&D initiatives and supports thousands of researchers in universities, research centres, and industry, including SMEs. Such investments enable the development of novel technologies, allowing for innovative ICT Components and Systems to be created and used in groundbreaking applications, thus helping Europe to meet the numerous challenges of our modern society.

This magazine will give you a taste of the latest developments and achievements in European research in: Nanoelectronics, Microsystems, Photonics, Embedded systems and Control, and Transport, in 2009 and early 2010.

Happy reading!

Thierry Van der Pyl,

Director Components and Systems,

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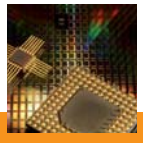

Nano

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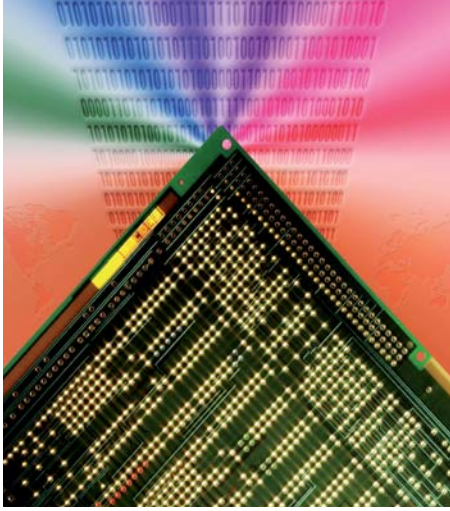
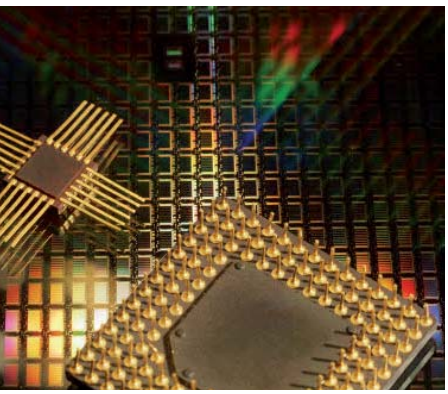
NANOELECTRONICS – SMALL AND SMART



The smallest thing your eye can see might be a strand of hair or a silk fibre. If you try to imagine something a thousand times smaller, you've reached the mysterious realm of the nanoworld where billions of electronic devices can be made at molecular level, e.g. in the space of just a few square millimetres. When combined with powerful and reliable software, these miniature electronic devices can deliver new features and services for improving our daily lives. Such nanoelectronics and computing technologies trigger and serve innovation in many industrial and socio-economic sectors including telecommunications, transport, consumer goods, manufacturing, healthcare and energy. For example, a car today has anything between fifty and a hundred electronic chips which control the engine, steering, braking, stability, dashboard, entertainment system, navigation and more. In the future, we can expect further reduction in emissions with computer-controlled hybrid engines, and collision avoidance for pedestrians and other vehicles.



In order to stay competitive, Europe has to be the pioneer in developing tomorrow's technology. Electronics, which today is a lead manufacturing industry, generates more added value than any other manufacturing sector; at €1140bn in 2008, its market size is bigger than that of the automotive industry. All innovation in services and in most industrial products relies on electronics to some extent. Without them, Europe can neither maintain its current position in high value-added sectors, nor can it innovate in new products and services on which growth and jobs depend. Advances in electronics (cost and functionality) critically depend on advances in micro and nanoelectronics components. However, the sector faces a number of challenges, including fragmentation of its research and competitive pressures from other regions of the world. At risk are not just short-term opportunities for new products and services, but loss of the ability to innovate in those sectors with the greatest potential for value creation and growth in the long-term.

The European Commission (EC) realizes that investing in nanoelectronics today is investing in future innovation. Thus, in order to reach the EU's goals in this area the EC:

- Promotes, coordinates and supports research, education and innovation in the two main fields of nanoelectronics (designing chips and manufacturing chips);
- Promotes cooperation between Member States and industry by means of a public private partnership (ENIAC JU);

- Monitors the general trends in the sector including promotion; of dialogue with all the key stakeholders including industry, research institutes, academia and policy makers;

More information on:

http://cordis.europa.eu/fp7/ict/nano-electronics/

PUSHING THE LIMITS OF CHIP MINIATURISATION

Over the last four decades, computer chips have found their way into virtually every electronic device in the world. During that time they have become smaller, cheaper and more powerful. But, for a team of European researchers, there is still plenty of scope to push back the limits of miniaturisation.

The first generation of CMOS (complementary metal-oxide semiconductor) chips were based on a design process with lithographic features defining regions inside the transistors of 10 micrometres or more. The chips in most products in use today have features more than a hundred times smaller – just 65 nanometres (nm) or 90nm, approximately 1,000 times less than the width of a human hair. That may be small, but in the competitive semiconductor industry, where size is of high importance, it is not small enough.

A reduction in size means more transistors per chip, more transistors means more computing power, and more power means that electronic systems – mobile phones, PCs, satellites, vehicles, etc. – will gain in functionality and performance. And, because the processed silicon wafers out of which chips are made are expensive. Using less of them to do more means the trend towards such devices becoming cheaper can continue.

"The semiconductor industry is in the business of selling square millimetres of silicon. So, by cramming more transistors into a chip you're delivering more capacity, more functionality and more computing power for the same price. It's why things like mobile phones, LCD TVs and DVD players are coming down in price," notes Gilles Thomas, the director of R&D Cooperative Programs at STMicroelectronics in Crolles, France, the world's fifth biggest semiconductor manufacturer and Europe's largest chip supplier.

Over the last five years, STMicroelectronics has coordinated two large EU-funded projects to push back the limits of miniaturisation in the semiconductor industry. The **NanoCMOS** initia-

REDUCING ENERGY CONSUMPTION IN ELECTONIC PRODUCTS

tive, that ended 3 years ago, developed the technology to create a 45nm generation (or technology node) of chips. A follow-up project, called PULLNANO, has recently been finished and was working on developing transistors integrated in silicon as small as 32nm and even 22nm. At that diminutive size, semiconductor manufacturing is continuing to test Moore's Law, an assumption spelled out by Intel co-founder Gordon E Moore, in 1965, predicting that the number of transistors that can be cost-effectively placed on a chip will double approximately every two years.

"The work of **NanoCMOS** and PULLNANO has moved in that direction, although there is probably 12 or 15 more years to go before we hit a practical and economical limit on how small the transistors can become," Thomas Gilles explains (STMicroelectronics).

Source: The whole article about PULLNANO can be found on the ICT Results website: http://cordis.europa.eu/ictresults/index.cfm/section/news/tpl/article/BrowsingType/Features/ID/89282

Increasing internet usage, a growing computer market, electronic devices in vast application domains, like automobile, transportation, health, entertainment, and domotics, all are responsible for substantial consumption of energy and at the same time considerably high CO_2 emission.

In ICT, power consumption furthermore determines functionality and availability (e.g. experienced through battery runtime of mobile devices). For Europe, energy consumption is a major cost and societal concern. A VLSI circuit not matching the power constraints has to be re-designed, increasing product costs drastically, and leading to a late market penetration.

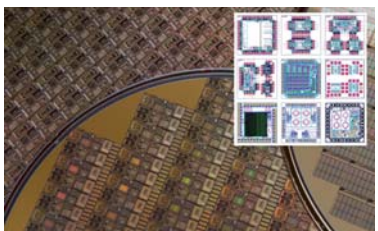
Within excess of several billion digital transistors on a single chip and with transistor feature sizes of only a few nano-meters, the power consumption due to transistor leakage currents has increased dramatically. As a consequence, controlling leakage power recently became a major issue during chip design. The development of counter measures, consisting of methods and tools for automated design and optimization of electronic devices, i.e. EDA-tools, was the main objective of the **CLEAN** project, funded by the European Commission in the context of the 6th Framework Programme for research and technological development as a 3-year Integrated Project. Led by STMicroelectronics, the projects results will enable new energy-aware products and services, significantly reducing the energy consumption image of ICT.

More information on:
http://clean.offis.de

STATE-OF-THE-ART TOOLS AND TECHNOLOGIES FOR UNIVERSITIES AND INDUSTRY

The current EUROPRACTICE IC4 project, part of the 7th Framework Programme for research and technological development, is widely recognized as a world-class service offering state-of-the-art chip design tools and technologies to universities and industry.

Today, technologies, products and services are changing at lightning speed and markets are becoming more global. We are therefore facing enormous challenges. New ICT products are increasingly becoming more complex and development cycles must be shortened to compete with other products in the global marketplace. Complete systems in one chip (SoC) or in one package (SiP) are heterogeneous and include sensors and actuators and must be developed by multidisciplinary teams in a highly efficient and timely manner. The complexity of microelectronics based methods, chip design tools and technologies are increasing even more rapidly than before. The new technologies, such as microelectronics system-on-Chip and opto-electronics, are very complex and very expensive. A huge investment is needed, both financial and in personnel, in order to be able to adopt those technologies in new product development. This continual need for investment in new technology and trained personnel will continue to be a major challenge for the foreseeable future as for example nanotechnology and biotechnology emerge in the design arena.



The use of system level integration in new product developments will be crucial to the success of European industry in future world markets. However European industry currently suffers from a lack of trained SoC engineers. In order to increase European competitiveness, Europe needs to master both the supply and use of these new emerging technologies.

The **EUROPRACTICE IC4** project offers easy and affordable access to chip/subsystems/Microsystems design tools and affordable access to chip prototyping to about 550 universities and 100 research institutes from EU member states and "extended" Europe.

By having access and being stimulated to use new state-of-the-art design tools and technologies for chip and microsystems design, universities will be able to keep in the technology league and enhance their curricula to deliver well-trained engineers to the market.

Through this unique service, started 20 years ago as the EC-funded project Eurochip, today 650 European universities use the same state-of-the-art IC and microsystems design tools, use the same advanced IC and microsystems technologies throughout Europe. Students and researchers are trained on the same design tools, on the same technologies, allowing them to easily work together on common research projects. Every year the **EUROPRACTICE IC4** project makes available the newest versions of the design tools and fabricates about 370 prototype samples of chips designed at European universities and research centers.

More information on:

http://www.europractice-ic.com/

EUROPE BOOSTS INDUSTRIAL RESEARCH IN NANOELECTRONICS

THROUGH A PUBLIC PRIVATE PARTNERSHIP INITIATIVE (ENIAC)

An unprecedented € 3 billion will be invested in nanoelectronics, with the launch of a major Joint Technology Initiative (JTI) endorsed by the Council of Ministers and by the European Parliament at the end of 2007. This initiative, called ENIAC, is a public-private partnership which targets nanoelectronics, the technology that enables increasingly high levels of miniaturisation in the myriad of applications and high-tech products which are emerging today.

«It is the smallest technologies that are taking the largest leaps forward, and our industries must do the same», said Viviane Reding, former EU Commissioner for Information Society and Media. «The possibilities offered by nanoelectronics are only limited by our imagination. They underpin all aspects of everyday devices and so concern everyone in Europe. ENIAC which has a budget of € 3 billion over 10 years is a concrete way to ensure that such a key industrial sector continues its strong economic growth, right here in Europe. It is only thanks to the support received for ENIAC from the European Parliament and from the Council that we can launch this new research initiative today».

To promote economies of scale, cost savings and much shorter times to market for products based on these technologies, and so to keep European industry at the forefront of global developments in these fields, the EU has decided following a Commission proposal of May 2007, to pioneer an entirely new way of funding such research in Europe. The Commission and the EU Member States who wish to participate are pooling their public funding with universities and

industry, including many innovative SMEs, by setting up a public-private partnership. While research funding in nanelectronics so far tends to be fragmented in small projects funded by individual Member States and agencies, the new «open» partnership ENIAC allows Member States and the Commission to co-operate and co-finance pan-European research initiatives focussed on a strategic agenda set by Industry itself.

ENIAC 1ST & 2ND CALL: STATE OF PLAY

The ENIAC Joint Undertaking launched its first call for proposals on May 8th 2008. The call successfully closed on September 3rd 2008.

A total of 158 organisations from 20 different European countries were involved in 12 proposals. Most, if not all, major actors in the European semiconductor industry were included. Around 47% of the companies are SMEs representing 22% of the requested funding. Seven proposals with the highest potential to generate successful projects were selected for funding (public funding in these projects equals to 97 M€).

With an average of more than 20 participants and a cost of 35 M€ per proposal, one of the main objectives for launching the Joint Undertaking was clearly met: Projects should aim at large strategic initiatives and should bring together major European ICT players with SMEs, universities or research centres to form geographically spread consortia. Proposals also cover all 3 social and economically important key lead markets targeted in this first call: transport & mobility; security & safety; and energy & environment as well as design, equipment, material and manufacturing.

The response to the 2nd call in 2009, implemented for the first time in two phases, was significantly higher (twice the number of proposals received) and more SMEs were involved. The evaluation and the subsequent selection by the Public Authorities Board (PAB) delivered a good portfolio of 11 projects, covering the various themes and application fields identified in the ENIAC work programme and for a total requested public funding of 102.3 M€. These projects started their operation at the beginning of 2010.

At the moment, the following Member States participate in ENIAC: Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, and the United Kingdom.

FACTS:

Founding members:

- European Community (represented by the Commission)
- Member States
- AENEAS (industrial association)

Budget (2008-17) is up to € 3 billion

European Community: € 0.45 billion

Member States and Associated Countries : € 0.8 billion

Private sector: € 1.7 billion

More information on:

http://www.eniac.eu

MICROSYSTEMS IN YOUR LIFE

Small portable systems that can detect bacteria in the food chain and ensure the quality of the food we eat; implants that restore limited vision in certain types of blindness or restore hearing and reduce the size of external hearing devices; intelligent clothes that monitor vital signs and revolutionise healthcare and emergency response; autonomous energy efficient systems that contribute to reduce carbon footprint: these are just a few examples of the myriad of applications enabled by Microsystems that are present in our lives and contribute to improve the quality of life of European citizens.

At European level, we are funding research projects that develop and integrate the heterogeneous hardware technologies that make these applications possible as well as enable them to achieve customer demands for increasingly more complex, higher quality, lower cost and more reliable systems.

Key domains covered by EU-funded research are medical technologies, energy efficient Microsystems, Microsystems for the Internet of Smart Things, smart manufacturing, and smart fabrics and interactive textiles.

More information on:

http://cordis.europa.eu/micro-nano-systems

http://cordis.europa.eu/ims

A LAB IN THE PALM OF YOUR HAND

The work carried out in the OptoLabCard project is leading to the development of small portable devices that can detect bacteria in the food chain and help ensure the food on family dinner tables is safe to eat.

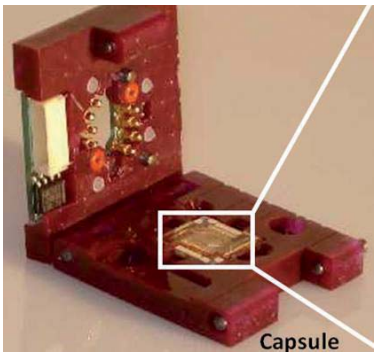
There is no quick and simple way to detect infectious bacteria on farms, or even in food processing and distribution plants. Samples have to be sent to labs for testing, a process that can take hours or days. The idea of a lab-on-a-chip, a device small enough for someone to carry around but able to perform many of the tests normally carried out in a full-sized laboratory, has been around ever since the appearance of the micro-electro-mechanical systems (MEMS) technology. However, the cost of producing such a system and the failure of many developers to incorporate a means of preparing samples on the spot has meant that few have gone into commercial use.

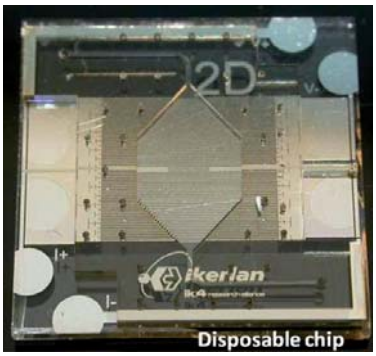
Now, a team of European researchers within the **OptoLabCard** project has addressed these problems by creating a prototype that allows DNA tests on bacteria to be performed in a portable, easy-to-use and cost-effective chip. Their work could also be used to develop portable devices that can identify pathogens and pollution in water supplies or detect diseases as diverse as cancer, hepatitis, AIDS and flu in humans.

What sets the **OptoLabCard** prototype apart from previous devices is the material used to manufacture the components of the chip, and the way in which samples are prepared prior to testing. Using a single material for

most components makes the chips simpler and cheaper to produce. The chip itself is disposable, while a reader or base unit contains all the electronics and optics. Meanwhile, incorporating sample preparation into the chip means that users can effectively replicate laboratory processes out in the field.

More information on:
http://www.optolabcard.com





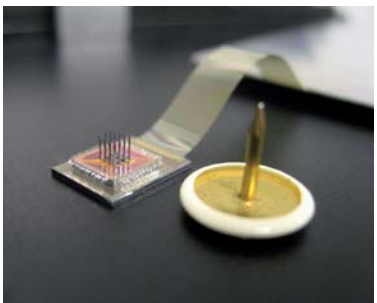
ON THE WAY TO BETTER UNDERSTAND THE HUMAN BRAIN

The NeuroProbes project helps researchers to investigate the relationships between groups of neurons and, as a consequence, further the understanding of mechanisms underlying a number of diseases and conditions such as behavioural disorders.

The **NeuroProbes** project has the objective of developing tools for recording and stimulating individual neurons in the brain to enable researchers to understand fundamental brain processes at cellular level. Although these are research tools, **NeuroProbes** also aims to evaluate their use in clinical applications, such as the management of intractable epilepsy, and prosthetics for vision and hearing restoration.

Compared to similar systems, **NeuroProbes** differentiates itself by enabling unprecedented three-dimensional access to a large number of neurons over long periods of time. Thanks to a modular approach, **NeuroProbes** makes it possible to assemble systems that conform to complex brain areas and interact with them, not only electrically but also chemically, by sensing substances and also delivering drugs. Additionally, by integrating electrodes in the needle-like probes, it is possible to attain much finer spatial resolution, to search for signals of interest and scan the brain tissue at the cellular level.

More information on:
http://naranja.umh.es/~np



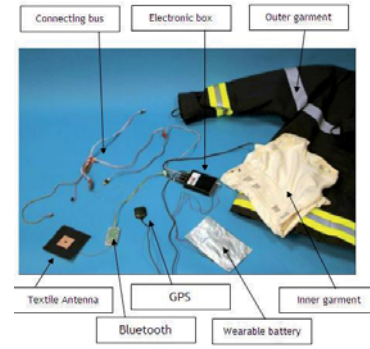
WHEN CLOTHES BECOME SMART

Clothes that monitor your heart, measure the chemical composition of your body fluids or keep track of you and your local environment are now feasible and will revolutionise healthcare and emergency response. Critical research issues enabling these smart clothes are being investigated by a group of EU-funded research projects.

Smart fabrics and interactive textiles (SFIT) –material that incorporates clever electronics or cunning molecules- is thriving. However, they entail research challenges, too. Smart textiles must be comfortable, their technology must be unobtrusive, they must withstand a difficult and variable environment and, particularly for medical and emergency applications, they must be absolutely reliable.

Europe has been fast to spot the potential of this area, which represents a market thought to be worth over €300M; and many projects, grouped in the SFIT cluster, are tackling some of the sector's toughest challenges. These projects are developing new applications and innovative solutions to the current problems, leading to new markets ranging from clothes for emergencies and health monitoring, to sporting and medical applications.

A few examples of the projects in this domain are: CONTEXT, which has developed contactless sensors for the prevention of lower back pain and repetitive strain syndrome; BIOTEX, which has developed sensors that can measure body fluids like sweat, PROETEX which targets rescue workers like fire fighters, is developing a system to monitor the wearer and the outside environment, or the STELLA project, which is developing stretchable electronics for large area applications.



More information on:

http://www.csem.ch/sfit

http://www.proetex.org

http://www.stella-project.de

http://www.context-project.org

http://www.biotex-eu.com

FLEXIBLE DISPLAYS FOR THE MASS MARKET

European researchers within the ROLLED project have developed a flexible OLED element that can be manufactured using printing technology. This cost-effective method for mass manufacturing flexible displays promises to revolutionise packaging, advertising and even clothing since it can be used to prevent product copying, to measure the freshness of food contained in packages or to attract the attention of customers when embedded in product packaging or supermarket shelves.

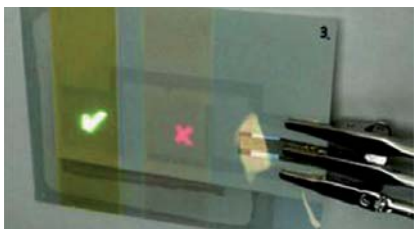
An OLED is an organic light emitting diode, functioning in a way similar to traditional LED lights. Importantly, the power consumption of the OLED light source is very low. Using organic materials, OLED light elements can be affordably manufactured using printing methods on large, flexible surfaces. In the ROLLED project, a cost-effective manufacturing method for mass manufacturing flexible displays was tested in two demonstration tests. In addition, this method can also be applied to the printing of solar cells used as a power source for various small portable devices.

The first demonstrator was presented as a two-colour OLED element that is attached to a product package. When the package is unopened, a green tick is displayed. When the package is opened, the fuse is blown and the tick changes into a red cross. The second demonstration showed how the OLED element can be powered by an NFC telephone. The EU flag was printed on a business card. When an NFC phone was placed near the card, the stars printed with the OLED elements lit up. The acquisition cost of the equipment needed in the manufacturing process to print OLED displays is clearly lower compared to other techniques, and the speed of production is higher than in traditional production methods. The savings achieved can be up to half of the traditional production costs of OLED elements manufactured using a glass substrate. The expertise developed during the production of flexible OLED elements can also be applied to the printing of solar cells used as a power source for various small portable devices.

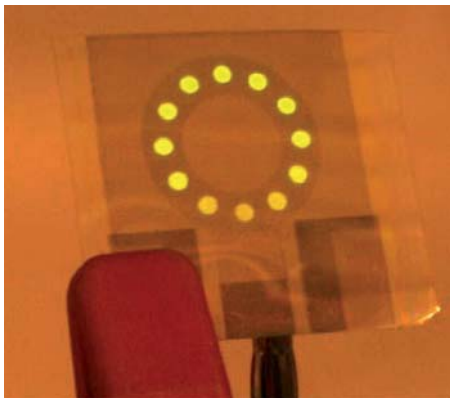
More information on:
http://www.vtt.fi/proj/rolled

SMART SYSTEMS FOR BETTER HEALTH AND QUALITY OF LIFE

Around 50% of the population will suffer from at least one of the health problems targeted in the Healthy Aims project. The advances made thus offer new hope to millions of patients suffering from conditions such as stroke and incontinence, and diseases affecting our eyes, ears and brains.

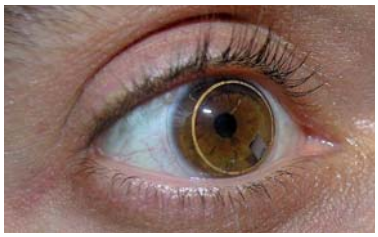


A consortium of 27 universities, research centers, hospitals, IT companies and manufacturers in the **Healthy Aims** project have created in record time advanced medical solutions to help the ageing population and people with disabilities. **The Healthy Aims** project has demonstrated innovative prototypes and clinically tested a functional electrical stimulator for muscle movement or bladder control following a stroke or illness, and an implant device to restore limited vision in certain types of blindness. **Healthy Aims**



has also realized a cochlear implant to restore hearing and reduce the size of external hearing aids, and an implant to measure the pressure inside the brain cavity, a crucial diagnostic for sufferers of hydrocephalus where an excess of fluid can damage the brain. From the European Union's perspective, this new

generation of medical implants have the potential to improve the quality of life for millions of Europeans and reduce the costs of long-term treatment.



All these products share a small number of core Microsystems technologies, developed within the **Healthy Aims** project, that will give the European medical devices industry a range of techniques for the future.

More information on:
http://www.healthyaims.org

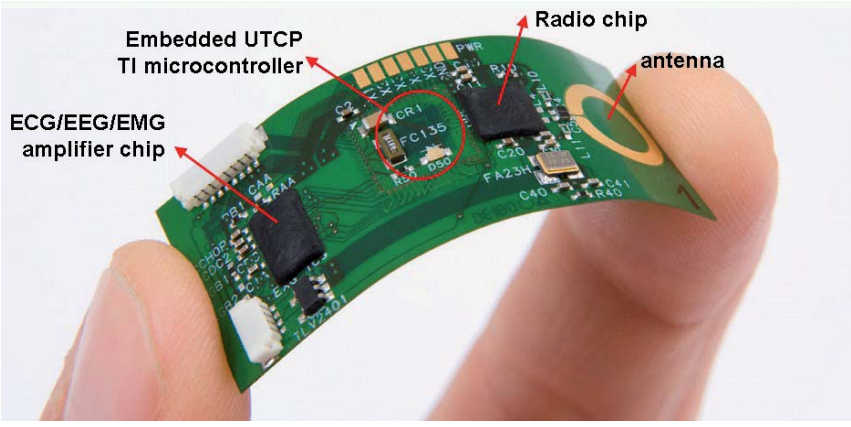
TOWARDS MORE FLEXIBLE FLAT ELECTRONIC SYSTEMS

Mechanically flexible electronic systems conform to the shape of the object they are mounted to, at a weight that is much below their rigid predecessors. The transition from rigid components to smart flexible circuits follows a trend that can be seen in all application areas and to which the SHIFT project is contributing by developing the technologies that enable it.

The **SHIFT** project has developed a technology for an ultra-thin chip package (UTCP), which is just 100µm thick. With its UTCP, **SHIFT** has established a technology for integrating semiconductor chips in flexible boards based on polyimides. The UTCP concept permits very flat structures. After thinning the chips to less than 30µm, they are placed between two polyimide layers measuring just 20µm. This yields an extremely thin, flexible packaging method. Of particular advantage is that chip, polyimide and metallization layers all are thin enough to be elastically bendable. This embedded structure can be mounted on a rigid board or a flexible carrier. But it is equally well suited for substituting unhoused chips in a stack of board layers. Appropriate fan-out metallization for wider connector grids makes the alignment of this structure on the board less critical.

Figure 1 illustrates that very compact structures of high functional density can be achieved by embedding a microcontroller chip in a flexible substrate, in this case to make a wireless ECG (electrocardiogram) monitor.

More information on:
http://www.vdivde-it.de/portale/shift



SMART MANUFACTURING

In January 2008, the European Commission adopted a far-reaching package of concrete measures demonstrating that agreed climate change targets are technologically and economically feasible and provide a unique business opportunity for thousands of European companies. With its Communication «Addressing the Challenges of Energy Efficiency through Information and Communication Technologies» presented in May 2008, the Commission underlined the role of ICT as an enabler of energy efficiency across the economy.

The Communication proposed the setting up of Consultation Groups with industrial and societal stakeholders to investigate opportunities offered by ICT to increase energy efficiency throughout the economy. As nearly one third of global energy demand and CO2 emissions is attributable to manufacturing, a systems approach, enabled by ICT, which transcends process and sector boundaries seems to offer significant potential for savings.

In July 2008, the Commission organised a consultation meeting with industry in order to assess the potential for savings in manufacturing through ICT. The industry represented in this Smart Manufacturing Consultation Group involved the process industries, discrete manufacturing and semiconductor manufacturing industries. Technology providers, in particular ICT providers, made significant contributions. The Group also involved representatives from academic institutions, European universities and research institutes, specialised in this R&D field. The findings have been laid down in a report.

The report provides a consolidated summary of suggestions made by the Consultation Group. Firstly, it identifies opportunities for ICT to reduce the carbon footprint of Europe's manufacturing industry. It then provides an analysis of the significance of manufacturing for Europe's economy, wealth and jobs, it analyses the share of manufacturing on Europe's energy consumption and then attempts to consolidate estimates for savings potentials in industry through the use of intelligent devices on the shop floor and embedded control. The savings potential for various manufacturing activity areas is summarised below:

Process Optimisation	25-30%
Optimised Logistics	16%
Integrated Process Chains	30%
Development of New Products	10-40%
Intelligent Motor Drives	20-40%
Alignment with Best Performers	15%

The report concludes with a list of recommendations for ICT deployment activities in the short-to-medium term (2009-2015) and a summary of R&D needs for new ICT benefiting manufacturing in the long term (2015-2020). It is expected that the proposed measures will help manufacturing to move away from the dominating economic paradigm of «maximum gain from minimum capital» towards a more sustainable paradigm of «maximum value from a minimum of spent resources».

More information on:

ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/micro-nanosystems/smart-manufacturing_en.pdf

PHOTONICS WHAT & WHY

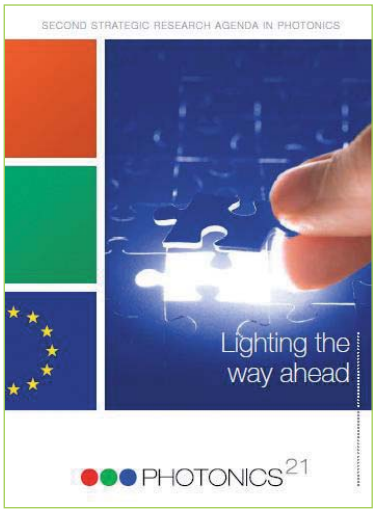
Many of the applications and devices we solicit every day which are only possible thanks to photonics go unnoticed by most people. Our modern communication services would not be possible without the lasers, optical fibres and photodiodes. The telex would still be our main service to send documents around the world. Transnational and in particular transatlantic communications would be extremely expensive. All applications relying on the transmission of large amounts of data, at high speed, affordable costs and with practically constant availability could not be supported without the underlying photonics network technology. Another example of the comfort photonic technology provides us: can you remember the times when the non-erasable memory of a computer was the floppy disc with a total capacity of 1.4 MByte? Nowadays, this is hardly sufficient to store a typical document we produce on our computer, in particular if we embed one or more digital pictures. Today, we have CDs, DVDs or blue-ray discs which have a capacity of up to 50 GByte (almost 50 thousand times more capacity than a floppy disk) which is sufficient to store a complete movie in HDTV format.

What is photonics then? It is the physics of the 20th century and the products of the 21st century. Pierre Aigrain described it as follows: «Photonics is the science of the harnessing of light. Photonics encompasses the generation of light, the detection of light, the management of light through guidance, manipulation, and amplification, and, most importantly, its utilisation for the benefit of mankind.»

Photonics is omni-present in our everyday life: from the cameras on mobile phones to LED lighting, photovoltaics, lasers (which are used everywhere from communication and health to DVD players and manufacturing) and FTTH: fiber to the home. Other emerging applications are biophotonics, sensing for safety and security, etc. The photonics area has all the essential elements for success: a first-rate existing knowledge base in the research community; a world-class industry which is getting organised; increased national and European research funding; and outstanding co-operation with industry through the Photonics21 technology platform. With these, we can help to ensure a strong, successful and globally competitive European photonics industry, based on excellent and responsive research, for the benefit and wellbeing of everyone. Photonics will be the technology of the 21st century, and this is an area where the efforts of the Commission can make a real difference!

PHOTONICS21 TECHNOLOGY PLATFORM

Photonics21 was founded in December 2005, based on an industry-led initiative encouraged by the European Commission in 2004. It brings together the key stakeholders in Europe in the area of Photonics. In 2009 there were over 1400 members from 49 countries and together they represent the entire photonics sector, including industrialists, researchers, academics and policy makers. The purpose of Photonics21 is to simulate greater and more effective investment in research and development, to accelerate innovation and to eliminate barriers to the deployment and growth of new Photonic technologies.



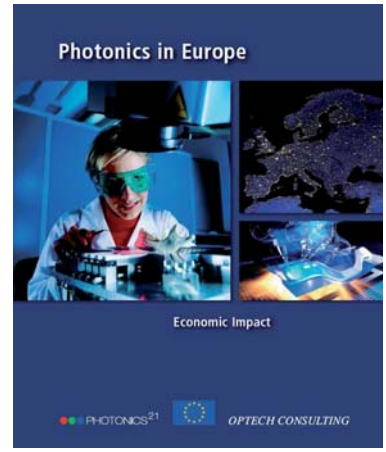
Through a vision shared with industrial and public actors, it has the critical mass necessary for visionary and industrially relevant R&D in photonic components, systems and applications. One of the main tools for creating this shared vision is the Strategic Research Agenda, presenting medium to long term objectives for R&D in Photonics. The activities of Photonics21 are organised according to Working Groups. These are: WG1-Information and Communication; WG2-Industrial Manufacturing and Quality; WG3-Life Science and Health; WG4-Lighting and Displays; WG5-Security, Metrology and Sensors; WG6-Components and Systems; WG7-Research Education and Training.

Each Working Group is responsible for updating the relevant section of the Strategic Research Agenda, as well as giving recommendations to the public authorities and identifying opportunities for cooperation, mutual support and joint activities. Strategic research topics as well as relevant markets are continuously monitored.

In December 2007 the study 'Photonics in Europe: Economic Impact' was published. This study was based on a survey of the photonics market in Germany, carried out by Optech Consulting at the request of the German Federal Ministry of Education and Research. Photonics21 had taken the initiative to continously monitor the markets to cover all of Europe. The results are very revealing about the position of photonics and provide reflections in the latest SRA

More information on:

http://www.photonics21.org/



PLUGGING THE 'GREEN GAP'
TINY LASERS FOR MINIPROJECTORS

Laser diodes, widely used in devices such as barcode readers, CD players and laser pointers, miss out on the green part of the light spectrum (the so-called 'green gap'), an obstacle which has proven to be difficult to overcome using conventional technology. They are also unsuitable where high brightness is required, such as for light projection.

There is a growing commercial interest in using new laser technology that generates high-brightness light across the full range of colors including green and to make light projectors small and energy-efficient enough to be integrated into portable devices such as laptop computers or even mobile phones.

Novel compact high-brightness lasers which meet these requirements and are suitable for mass production are now within reach, thanks to

the pioneering results achieved in the NATAL project. The breakthrough results of the project closely relate to advances in novel nano-structured laser materials, paving the road for commercial high-brightness miniature laser diodes that enable compact digital projectors and a host of other potential applications in industry, medicine and scientific research.

More information on:

http://www.orc.tut.fi/natal.html

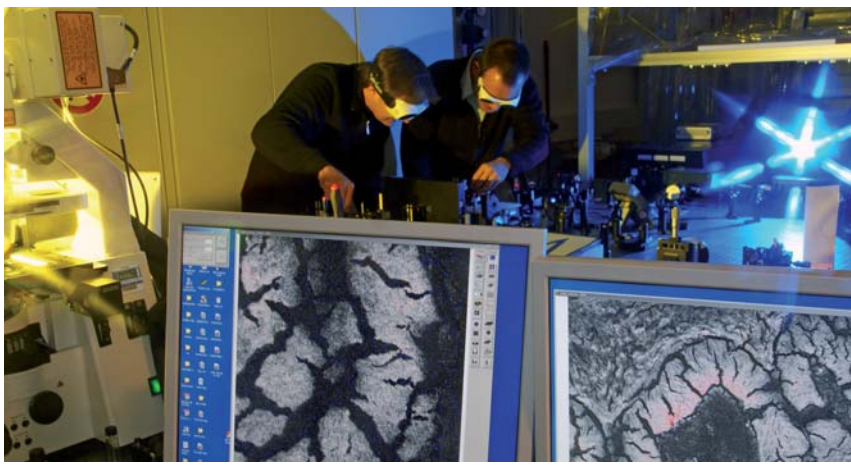
PHOTONICS4LIFE AND THE VISION FOR TOMORROW'S HEALTH CARE

Biophotonics offers some uniquely powerful tools which have the potential of transforming the fields of health care and life sciences. The potential includes very early and accurate detection of diseases allowing prevention or treatment with greatly increase success rates, faster detection through point-of-care diagnosis, more effective personalized treatment, and ultimately deeper understanding of the very origins and mechanisms of diseases.

The network of excellence Photonics4Life has brought together top experts in the field of Biophotonics with the aim of creating the critical mass needed in order to unleash the true potential of biophotonics. The research activities of Photonics4Life include photonic technologies for the analysis of cell processes, non- and minimally invasive diagnosis, therapy and point-of-care diagnosis and optical micro-manipulation and therapy.

More information on:

www.photonics4life.eu



NEMO – A ONE-STOP SHOP FOR ALL YOUR MICRO-OPTICAL SOLUTIONS

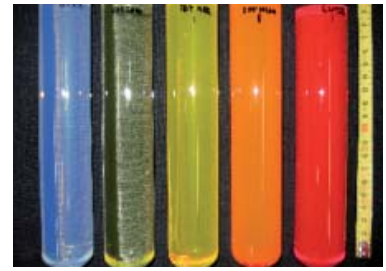
Micro-optics is a term which covers a range of micro-scale optical structures and components such as micro-lenses, wave-guides and gratings. Micro-optics plays an essential role in a large range of applications from sensing to displays and communications.

The Network of Excellence on Micro-Optics, NEMO has reached the end of a journey of four-and-a-half years. In this time it has brought together over 30 top European players in micro-optics who cover the full chain of expertise and capabilities needed in this area. NEMO has successfully demonstrated its ability to provide the full range of services and capabilities in a wide range of research and industrial projects. Although NEMO has reached its end, activities will live on and will continue to play a role in engaging European industry to offer a competitive edge in this very global market.

More information on:

www.micro-optics.org/

POLYCOM: A NEW PLASTIC OPTICAL FIBRE TECHNOLOGY



Plastic optical fibre (POF) for data transmission is often described as the "consumer" version of glass optical fibre, the kind that makes up the long-distance trunk routes of telecommunications networks.

Flexible plastic fibres, with a core diameter of 1mm and made from polymethyl methacrylate (PMMA), are cheap to produce, easy to install and transmit light in the visible range as opposed to infrared, making maintenance easier and safer. But those properties typically come at the expense of lower bandwidth and high attenuation, restricting their use to sending data over short distances at relatively low speeds. As a result, POF networks have mostly been used as an alternative to copper wires for short-distance – or so-called last-mile – data transmission.

Novel research by the team of POLYCOM project has helped put POF on track for use in optical computing, ultra-high-speed LANs, new sensing devices and even clothing that lights up for safety or simply fashion.

"The range of applications for POF and the optical technology that underlies it is extensive... and its development beyond the current state of the art could benefit a wide range of sectors over the coming years," explains Guglielmo Lanzani, a researcher at Milan Technical University and coordinator of POLYCOM.

Source: ICT results article 19/10/09 http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&BrowsingType=Features&ID=90941

More information on:

http://www.fisi.polimi.it/polycom/

OPENING UP THE LAST PART OF THE SPECTRUM

Terahertz waves occupy the part of the spectrum between light and radio, specifically between infrared and millimetre waves. With wavelengths of 0.1-1mm, THz waves can be used like light or x-rays to create detailed images of solid objects. They have the useful property of passing easily through packaging and clothes, and since they are non-ionising they are safer than x-rays.

But THz waves can probe the content of objects as well as their shapes, thanks to their ability to respond to chemical properties. This is because their frequency range of 0.3-3THz matches the natural molecular vibrations of many common substances and biological materials.

Add these two properties together and you have a scanner that can not only detect a hidden package, but also show what is inside. New European research on THz waves could enable applications that include detecting tumours

beneath the skin, a new and powerful kind of microscope for biological research, and quality control in semiconductor and pharmaceutical factories, as well as smart security scanners.

According to THz expert Martyn Chamberlain, coordinator for TERANOVA project, the difficulty is that THz radiation is hard to generate, lying as it does in the "no-man's land" between electronics and optics. Electronic generators cannot yet operate at frequencies above 0.3THz, Chamberlain explains, while traditional THz lasers are too bulky for most practical applications. As a result, THz radiation has been comparatively neglected.

The project (ended February 2009) developed lasers that produce intense pulses of near-infrared light lasting as little as one femtosecond (a thousandth of a trillionth of a second!). When these extremely short pulses hit a special semiconductor target they produce "broadband" THz radiation, which has great potential for a range of new research tools in chemistry, biology and basic physics.

Source: ICT results article 01/12/08 http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&BrowsingType=Features&ID=90252

More information on:

http://www.teranova-ist.org/

IPHOBAC: BREAKTHROUGH FOR POST-4G COMMUNICATIONS

While 4G mobile communications are still under development, European researchers are working on a post-4G technology able to deliver data wirelessly up to 12.5Gb/s.

The technology – known as 'millimetre (mm)-wave' or microwave photonics – has commercial applications not just in telecommunications (access and in-house networks) but also in instrumentation, radar, security, radio astronomy and other fields.

Despite the quantum leap in performance made possible by combining the latest radio and optics technologies to produce nm-wave components, it will be a few years before these benefits come closer to the average EU citizen.

This is thanks to research and development work done by the project IPHOBAC, which brought together partners from both academia and industry with the aim of developing a new class of components and systems for mm-wave applications.

While several companies in Japan and the USA have been working on merging optical and radio frequency technologies, IPHOBAC is the world's first fully integrated effort in the field, with a lot of different companies involved. This has resulted in the three-year project, which ended December 2009, already having an impressive list of achievements to its name.

Project coordinator Andreas Stöhr says that millimetre-wave photonics is a truly disruptive technology for high frequency applications. "It offers unique capabilities such as ultra-wide tunability and low-phase noise which are not possible with competing technologies, such as electronics."

Source: ICT Results article 05/03/09 http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&BrowsingType=Features&ID=90438

More information on:

http://www.ist-iphobac.org/

BRIGHTER
SEMICONDUCTOR LASERS

A European project to develop a complete cycle of technologies for a new generation of high-brightness semiconductor lasers promised to transform the healthcare, telecom and display technology sectors.

The semiconductor lasers developed by the Brighter project offer high power and very high efficiency in a small, relatively low-cost package, and they have direct applications in cancer treatment and imaging, high-bandwidth fibre-optic communications, laser-based projectors, heads-up-displays, and even TV screens.

This 23-partner integrated project had a €16.2m budget, with EU funding of €9.7m. It followed on and further advanced two earlier projects Ultrabright and Bright. "We did not start from zero. Many of the partners from earlier projects joined this effort to develop very high-quality semiconductor lasers for specific, real-world applications," notes Michel Krakowski, coordinator of the Brighter project.

"There are many semiconductor lasers and many application fields, but certainly for lasers in the spectral range between 355nm up to 1060nm, Brighter has developed state-of-the-art technology and become one of the leaders in the field," he adds.

Source: ICT Results article 18/06/09 http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&BrowsingType=Features&ID=90691

More information on:
http://www.ist-brighter.eu/

A patient undergoing photodynamic therapy ans studied with a first functional model of the fluorescence imaging system developed within the BRIGHTER project.

EMBEDDED SYSTEMS AND CONTROL

Just imagine the following. You arrive home late after a hard day's work to find your favourite music playing, a relaxing bath running and a delicious dinner cooking in the oven: all as if by magic. What a wonderful idea, but how did it happen?

Another scenario: it's a warm, sunny day and you're driving along a deserted road in the middle of the countryside. Whilst driving you start to feel a little drowsy, your car drifts towards the middle of the road, crossing the solid white line, and then a beeping noise wakes you up just in time to allow you to correct the trajectory yourself, otherwise the car takes over control thereby avoiding an accident.

Both these situations are perfectly plausible scenarios not so far away from reality, thanks to state-of-the-art embedded systems solutions. But what are embedded systems?

Embedded systems are the invisible electronics and software that bring intelligence to everyday objects, devices and processes. They are special-purpose computer systems designed to perform one or a small number of dedicated functions in environments often constrained by real-time performance requirements, resource consumption, cost, safety and security.

Cars, cameras, toys, household appliances, cell phones, MP3 players, aircraft, industrial machines and medical equipment are all every day examples of where embedded systems are currently used.

Aiming at promoting European leadership, increasing productivity and improving competitiveness leading to growth and job creation, the Commission supports research in embedded technologies in three main technical domains:

- **Embedded System Design** refers to methods and tools for increasing the productivity of system development while ensuring that systems are predictable, dependable and secure http://cordis.europa.eu/fp7/ict/esd/
- **Computing Systems** incorporate multiple processing elements and must be programmable, versatile and adaptable to fit the needs of a broad range of applications http://cordis.europa.eu/fp7/ict/computing/
- **Networked Embedded Systems and Control Systems** focus on cooperating objects, where the integration of computing, communication and sensing can lead to autonomous and robust distributed systems; on middleware for seamless connectivity and interaction; and on control of large scale, complex distributed systems http://cordis.europa.eu/fp7/ict/necs/

The European Commission has also participated in setting up **ARTEMIS**, the Joint Technology Initiative (JTI) for Advanced Research and Technology for EMbedded Intelligence and Systems.

JTIs are public-private partnerships at European level which address strategic areas where research and innovation are essential to European competitiveness. The legal structure that will implement this vision in embedded system is the ARTEMIS Joint Undertaking (JU).

This community body brings together 21 EU Member States, Norway, the European Commission and industry repre-

sented by the ARTEMISIA association, the association of R&D actors in the field of Embedded Systems.

Building on the Strategic Research Agenda developed by the European Technology Platform, ARTEMIS aims to help European industry consolidate and reinforce its world leadership in embedded computing technologies. The economic impact in terms of jobs and growth is expected to exceed €100 billion over the next ten years.

'The ARTEMIS Joint Undertaking has been granted autonomy on 26/10/2009

and it has already launched its 3rd call for Research & Development project proposals in February 2010. As a result of the 2009 Call, ARTEMIS decided to allocate €105 million of public funding to 13 industrial R&D projects. This amount will be matched by more than €100 million of own resources by industry and research actors, thus producing a R&D volume exceeding €200 million.

The funded projects will address the development of embedded electronic and software systems in areas of major industrial, economic and societal impact, such as energy efficiency, smart homes and buildings, sustainable cities, automotive and avionic safety, health systems and security.

The ARTEMIS-JU website:

www.artemis-ju.eu

The ARTEMISIA website:

www.artemisia-association.eu

FLYING WITH THE WIND...

A key socio-economic challenge for Europe is: how to deal with climate change, while meeting rapidly increasing demand for energy and ensuring security of supply? Wind energy can be a significant part of the answer. The new frontier of the wind industry is large-scale offshore wind farms. While promising, considerable research and development tasks remain to be carried out before it reaches its full potential in terms of the efficient, stable, safe, predictable and controllable supply of energy.

The AEOLUS project research and develop models that allow real-time predictions of flows from a set of spatially distributed sensor measurements. The results are applied to offshore wind farm installations. In these installations, the turbines are affected by the wind but they also change the wind field within the farm through the control. How do we allocate the wind resources optimally between the individual turbines?

The AEOLUS project will research and develop the foundations for understanding how the wind resource may dynamically be shared among individual wind turbines in a wind farm to increase the energy performance while reducing the mechanical loads. The result is lifetime energy efficiency. The usefulness of the techniques is validated through a case study and by physical experiments on a scaled wind power farm.

More information on :

www.ict-aeolus.eu.

BUILDING EXCELLENCE…

The ArtistDesign Network of Excellence (NoE) is the visible result of the ongoing integration of the European research community in Embedded Systems Design.

The central objective for the ArtistDesign NoE is to build on existing structures and links to become a virtual Center of Excellence in Embedded Systems Design. More concretely, the expected results of the ArtistDesign NoE are:

- the integration of the academic research creating a context, an infrastructure and a culture for the design of joint, multi-organizational, multi-disciplinary research and development (R&D) work in Embedded System Design.
- the integration of the state of the art knowledge into the Embedded System Design European education, promoting approaches and techniques which are well adapted to meeting current and future industrial needs.

The NoE has a very dynamic International Collaboration programme, interacting at top levels with the best research centers and industrial partners in the USA: (NSF, NASA, SRI, Boeing, Honeywell, Windriver, Carnegie Mellon, Vanderbilt, Berkeley, UPenn, UNC Chapel Hill, UIUC, etc) and in Asia (Tsinghua University, Chinese Academy of Sciences, Seoul National University, East China Normal University, etc).

ArtistDesign NoE also has a very strong tradition of Summer Schools, Graduate Courses, and major workshops.

More information on:
www.artist-embedded.org/

artist Network of Excellence on Embedded Systems Design

HELPING OTHERS…

Unmanned helicopters could soon be a key part of emergency relief operations, as well as bringing a new dimension to filmmaking, thanks to some innovative work done by the AWARE project.

When natural disasters happen one of the first casualties is often the communications network. As a result, rapid response crews can be working virtually blind, cut off from each other and the victims they are trying to help. Where there are transport arteries, such as roads, rivers and railways, they are also very often damaged or disrupted, which makes getting medical and relief supplies to survivors extremely difficult.

When such disasters happen in remote areas with little in the way of communications or transport infrastructure to start with, the problem is exacerbated.

A solution for both the communications and delivery of supplies problems is now being researched within the AWARE project, which comprises academic and commercial partners from five European countries.

The AWARE project successfully tested the first integrated platform providing the middleware and functionality required for the cooperation among unmanned aerial vehicles, such as autonomous helicopters, and a ground sensor-actuator wireless network, including mobile nodes carried by people and vehicles.

More information on:

www.aware-project.net

MAKING IT EASIER…

Modern, co-operating embedded systems are difficult to develop, and very difficult to test and maintain because they are designed and manufactured by different parties.

DECOS project aims at fighting this complexity by designing an integrated architecture which allows several applications of different criticality to be put on a smaller number of control units. This was achieved by providing an enabling dependable middleware technology based on time-triggered core services which guarantee a set of properties for safety of the system.

The project created a prototype tool-chain and test-bench, guiding the complete process, from model to deployment. The package includes validation and certification support, as well as hardware and software components and basic software building blocks.

DECOS applied its results to three vital application fields:

- Automotive demonstrator: a traffic jam assistance, heading control, door control and adaptive lighting system were integrated on top of the new middleware.
- Industrial control demonstrator: a system to suppress critical vibrations in nano-imprinting machines which is business critical.
- Aerospace demonstrator: all-electronic airplane flap control instead of mechanical coupling and synchronization.

More information on:

- www.decos.at
- http://cordis.europa.eu/ictresults/popup.cfm?section=news&tpl=article&ID=89689&AutoPrint=True

MAKING NEGOTIATIONS…

Ana, a tourist visiting Santander reaches for her mobile phone to take a photograph of her friends at the beach. At the same time several satellites are transmitting data to the mobile indicating what exact place, the photo is taken from. The streetlights from the corner also speak with the headphone transmitting tourist information about the area. Her friends' mobile phones send the names of their owners so that they are saved in the photo and thus all this data is available when checking the photo album back at home. All this happens instantly after pressing

the camera button, and while her friends listen to music, answer telephone calls or are doing some other pictures themselves.

We currently have the technology for our mobile phones, cars, bus-stops, etc., that constituted the environment in which we live, to do all these things separately.

But, what we still need to develop are the methods to allow us join all these applications and to manage the complexity that this union implies. This is precisely the aim of the FRESCOR project - to develop new techniques to manage the complexity of the future digital systems.

The FRESCOR project applies habits from human society within the computers of the digital systems. Each part of a program that is executed in the computer must negotiate a contract in which it indicates the resources of the system that is going to need, and the flexibility that it can tolerate to improve the quality of this answer. The system will accept or not this contract according to the resources available, and will check the fulfilment of its terms should it be accepted.

More information on:

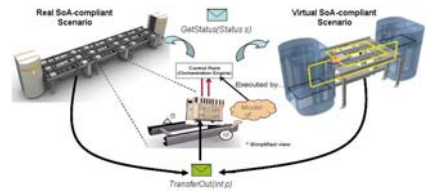
www.frescor.org

DEVELOPING NEW INDUSTRIAL AUTOMATION SYSTEMS...

Since manufacturing plays a vital role in economy and society, remaining fundamental to creating stable employment, the adoption of manufacturing innovations is needed in order to promote performance improvement of European manufacturing processes.

In this context, the primary objective of the SOCRADES project is to develop a design, execution and management platform for next generation industrial automation systems, exploiting the Service Oriented Architecture (SoA) paradigm both at the device and at the application level.

The SOCRADES project is creating a service-oriented ecosystem, where networked systems are composed of wired/wireless smart devices that interact with the physical and the enterprise environment. Its major achievements are prototypes on the device level service platform and the exploitation of the released software



building blocks to consolidate the prototypes.

Videos of the new demonstrator and the latest demonstrations of SOCRADES project are now available at:

www.socrades.eu/Home/default.html

RAISING AWARENESS…

More and more, the supercomputer market, the commodity market (including laptops and other consumer electronics such as mobile phone, PDAs and navigation systems), and the embedded market are interconnected. Increasingly, the same components are used in all of these systems, creating new business opportunities for the European computer industry.

The emergence of multiple, heterogeneous and interconnected processing elements on a single chip require a radical change in computing architectures and programming paradigms.

The goal of the High Performance and Embedded Architecture and Compilation Network of Excellence (HiPEAC) is to build a strong community capable of conducting the necessary research efforts to meet the high and increasing demand for computing power in all embedded applications.

The objectives of HiPEAC are:

- To create a visible and integrated community of researchers on these topics which will be capable of influencing the domain in the coming years;
- To identify, raise awareness and then steer academic research efforts to industry relevant or fundamental scientific issues;
- To stimulate cooperation between researchers from the processor architecture and the compiler domains.

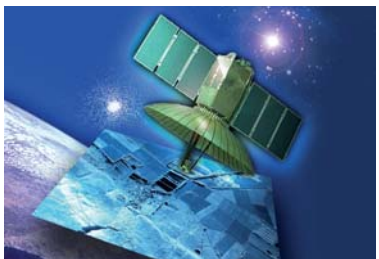
More information on:

HiPEAC website www.hipeac.net

MASTERING SYSTEMS COMPLEXITY…

The SPEEDS project is a pioneering new approach to systems engineering by providing better integration and cooperation of avionics and automotive electronic applications, leading to a groundbreaking evolution in embedded systems design.

SPEEDS has defined a new generation of end-to-end methodologies, processes and supporting tools for embedded systems design that not only addresses but also dramatically reduces and boosts design reuse.



In industrial practice, components of larger systems are developed by different teams and using different tools, always following the "best in class" approach for the respective component. The main problems are data exchange between the various tools and keeping the system model consistent during the developing process. Today's tool integration and chain of development tasks is controlled by file exchange and standard office communication.

SPEEDS developed an appropriate heterogeneous rich component model – called HRC -which provides a uniform concept across all layers and views, hence all tools of a tool chain are able to use this

data format for their specific purposes. This unique capability of HRC facilitates the exchange of models across tools and application domains.

More information on:

www.speeds.eu.com

ICT FOR TRANSPORT

In the area of «Information and Communication Technologies (ICT) for Transport», we contract, fund and monitor research projects exploring ICT applications for mostly road transport. For a number of years already, the focus of our projects has been road safety. A textbook example of an ICT road safety project is PReVENT. It developed, among other applications, a radar sensor to detect obstacles on the road, e.g. a big box lost by a truck. As soon as the on-board sensors detect the box, the driver is informed about it. In case of no reaction, a visual or acoustic warning goes off. If there is still no reaction, the system brakes by itself and thus avoids or strongly mitigates the impact.

Without European research funding, smart cruise control, which is adapting to traffic flow, would not yet be on the market. Systems that help avoid collisions would not be as advanced as they are today.

Nowadays, ICT-for-Transport's focus on road safety is complemented by research in environmental aspects of road traffic: Reductions in fuel consumption and CO_2 emissions by means of ICT are being explored. The electric car will become a new centre of attention in the very near future.

More information on:

eSafety website:
http://ec.europa.eu/esafety
Intelligent Car website:
http://ec.europa.eu/intelligentcar .

THE INTELLIGENT CAR INITIATIVE
RAISING AWARENESS OF ICT FOR SMARTER, SAFER AND CLEANER VEHICLES

In the framework of i2010, the Intelligent Car Initiative was launched in February 2006 to serve one overall purpose: to use modern Information and Communication Technologies (ICTs) to make road transport safer and cleaner.

To accomplish its overall mission, in particular a quicker deployment of 'intelligent' road safety systems, the initiative's goals have been three-fold: 1) to coordinate and promote the work of all stakeholders working in the field of road safety, e.g. motor clubs, emergency services, car manufacturers and many more;

i2010
Intelligent Car Initiative

2) to give guidance to research efforts so that the most promising technologies profit from European research funds;
3) to raise awareness among consumers, drivers, car dealers etc. of the benefits of these modern, ICT-based applications for road traffic.

Under the Intelligent Car Initiative, the emergency call service eCall has been developed and will soon be available on the market. Research funds worth more than €150 m have been spent in a more targeted and integrated

way. World-wide media attention for European road safety research was raised by two big 'Intelligent Car' events. Furthermore, consumers, drivers and others have been informed about the benefits of the most promising systems, e.g. Electronic Stability Control (ESC), through the Initiative's offspring eSafetyAware! and its campaign eSafetyChallenge!.

More information on:

http://ec.europa.eu/intelligentcar

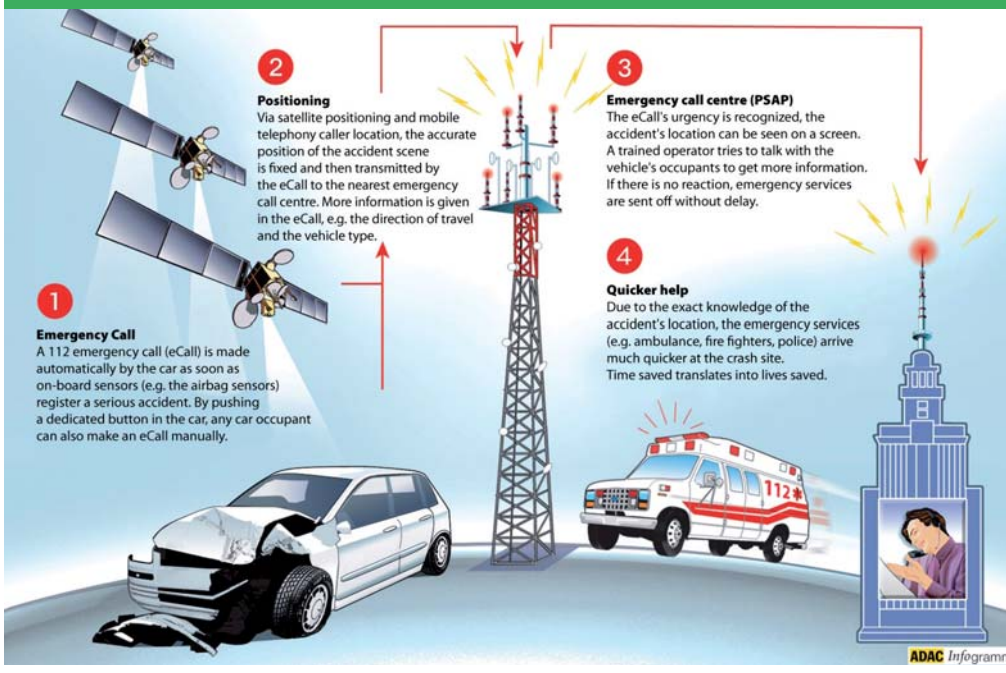
eCALL: CRASHED CARS CALL 112

In a nutshell, eCall is a mobile phone fixed at a safe place in a car. It is connected with the sensors that set off the air bags. As soon as the airbags inflate in a serious accident, the mobile phone automatically call the nearest emergency calls centre wherever you are in Europe. It uses the European-wide emergency number 112. In the call, it sends off a set of data useful for the rescue services. The single most important data is the exact geographic location of the accident scene. It is fixed by means of both satellite positioning systems and GSM networks.

The exact knowledge of the crash site enables the rescue services to react much quicker. Studies suggest that response time will be reduced by 50% in rural settings and by 40% in urban areas. Time saved translates into lives saved! Estimates say that eCall will save 2,500 lives in Europe annually, when all cars have it onboard.

eCall should be available as an option for new cars soon. eCall will function all over the European Union plus Iceland, Norway and Switzerland. Recently, Russia also expressed an interest in eCall.

eCall: The crashed car calls 112!



The eCall alert and rescue chain

ICT FOR CLEAN & EFFICIENT MOBILITY

The concentration of greenhouse gases in the atmosphere is rising, leading to higher temperatures on the earth, rising sea levels, shifts in climate zones etc. In brief, it leads to 'Climate Change'!

We must keep climate change under control: the average temperature must not go up more than 2 °C by 2100. This can be achieved by cutting greenhouse gas emissions. Carbon Dioxide (CO_2) is the most important greenhouse gas. It is the end product of all combustion processes, including the burning of fuel in vehicle engines.

In 2005, 19.7% of all European CO_2 emissions came from road traffic. Therefore, road transport has to take its share in the reduction of greenhouse gases.

Information and Communication Technologies (ICT) have a high potential to help reduce motor traffic's CO_2 footprint. In November 2008, eSafety's working group 'ICT for Clean & Efficient Mobility' spelled out this potential in its final report: up to 25% of automotive CO_2 could be saved.

The report recommends the following priority actions:

- Research in how information on a fuel-efficient driving style ('eco-driving') could be given to the driver automatically using on-board and off-board services;
- Multi-media campaigns to create awareness of and acceptance for eco-driving;
- More options for drivers to buy for their cars eco-driving feedback, reporting and analysis tools;
- Research and development in traffic management and control systems using e.g. CO_2 emission parameters when recommending preferable routes;
- Digital maps showing the fuel consumption profile of alternate routes;
- Research in the environmental benefits of ride-sharing, car-sharing and multi-modality (= the combined use of different means of transport for one trip);
- Less empty mileage (trucks running without cargo) and higher load factors in freight transport.

More information on:

http://ec.europa.eu/information_society/activities/esafety/forum/ict_clean_mob/index_en.htm

SPARC – REPLACING MECHANICS WITH ELECTRONICS IN CARS

Time is a critical factor in many traffic accidents. Fractions of a second can make the difference between life and death. Imagine vehicles, where the brakes would react to the pedal with virtually no delay.

Today's heavy-goods vehicles are operated by mechanical systems, with the support of air (brakes) or oil (steering wheel) pressure, wich means that it takes time to transmit the braking impulse from the brake pedal to the wheel.

The idea put forward by EU-funded research project SPARC was to replace some of these mechanical parts by electronic connections and electric devices (so-called actuators), the latter sitting at the spot where the action is needed. For instance, in SPARC the brake pedal was connected with the brakes by a simple electric cable. The brake itself was an electric motor sitting on the axle next to the wheel. Due to the nature of electronics, the electronic brake signal arrives much quicker at the brake than the air

pressure (pneumatic signal) of current systems, and the brake actuator works faster than the mechanical brake disks, too. Precious time can be saved, contributing to road safety.

As human error is almost always the cause of road accidents, the SPARC system also analyses and combines the information from different sources in (e.g. the driver's commands, or on-board sensors) and calculates the safe path in parallel to the driver's steering. The system can thus support the driver in making safe driving decisions or, in critical situations, such as driver inattention, overrule the driver's input to avoid an accident.

SPARC's systems were successfully integrated into a heavy-goods truck and, to show their flexibility, into a small passenger car.

More information on:

http://www.transport-research.info/web/projects/project_details.cfm?id=36021&backlink=%2Fweb%2Fcommon%2Fsearch%2Ecfm&referer=searchstring%2Asparc

INSAFES

DRIVER INFORMATION SYSTEMS TAKING THE TRAFFIC SITUATION INTO ACCOUNT

ABS, ESP, FCW, BSW, LDW, all these strange abbreviations stand for systems that assist the driver when he is driving. Some of these systems are under development, others are already deployed in cars.

The purpose of these systems is to make our driving safer and easier. But will cars equipped with more and more of them really increase our safety? How will these systems work together? Will alarms pop up all the time, and contradictory messages confuse the driver?

These questions have been addressed by INSAFES, a PReVENT subproject. Several assistance systems were integrated with the aim to provide the driver with consistent output including timely messages/alarms. The information is given to the driver only when he has free capacities to deal with it. For instance, less important messages are only put through in 'normal' traffic situations, but blocked in difficult situations such as driving on a roundabout etc.

The INSAFES system is capable of constantly monitoring the area around the vehicle. It assists the driver in maintaining a safe speed and distance, warns him of lateral events and incidents in his blind spot. The system also helps him to keep the lane, and it provides information about hazards via short range communication.

If an accident is unavoidable, INSAFES helps the driver brake more efficiently. It also presets the safety belts and airbags so that they are functioning optimally in the crash.

An overtaking vehicle and its INSAFES dashboard representation to the driver

More information on :

http://www.prevent-ip.org/insafes

INTERSAFE – INCREASED SAFETY AT INTERSECTIONS

The INTERSAFE turning assistant at work

Are you aware that 30 % of all fatal and serious accidents occur at intersections?

Did you ever feel uneasy, when approaching an intersection especially in an unknown city: trying to concentrate on the complex traffic situation and, at the same time, on finding the way to your destination? Were you really able, at any given moment, to be fully aware of the situation and to react properly?

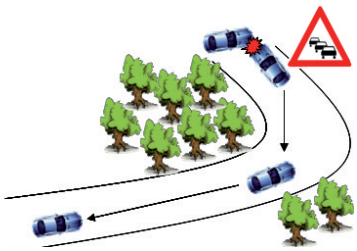
INTERSAFE, another EU-funded project from the PReVENT family, is dealing with such complex traffic situations in order to warn the driver in time of any potential danger. INTERSAFE uses modern sensors which are integrated both into the road infrastructure and the cars. These sensors collect data that can mirror the traffic situation at the intersection. Via 'car-to-car' communication, a picture of the situation can then be sent to all the cars approaching the intersection.

Drivers get a better picture of the relevant part of the traffic situation. Thus, it is possible to avoid critical situations caused e.g. by red-light running, or by pedestrians hidden behind a parked car but stepping out into the street.

More information on:

http://www.prevent-ip.org/intersafe

WILLWARN – DRIVERS LOOKING BEYOND WHAT THEY CAN SEE



An obstacle behind a curve

You are driving along a road in the countryside, when unexpectedly you are confronted with an accident just behind a curve. As you barely have time to brake, a new accident is unavoidable.

The weather is fairly good, the road is almost dry. However, the temperature is quite low, so you are driving at a reasonable speed, when, all of the sudden, you roll over on an icy patch and loose control of your car.

Road traffic poses risks every day. However risky situations could be avoided, if the driver would have timely information enabling him to «look» beyond his horizon. But how? Here, modern telecommunication technologies kick-in to contribute to safer driving by providing the needed information in time.

WILLWARN (Wireless Local Danger Warning), an EU-funded research project, has shown that short range radio communication between cars can carry the information to those who are approaching a dangerous spot. Cars and roadside equipment cooperate to gather information on accidents, traffic jams, slippery road sections etc. This information is then sent by the cars or the road signs to the oncoming traffic in order to warn drivers in time. This timely information will then lead to more adapted driving ahead of the dangerous spot, thus avoiding further accidents and problems.

More information on:

http://www.prevent-ip.org/willwarn

HUMANIST – SUPPORT SYSTEMS RESPECTING THE DRIVER'S CAPACITIES

Driver information and support systems, be it classical ones like the car radio or novelties such as navigation systems, are to support the driver in his driving tasks. They must not distract him from concentrating on the roadway and the traffic situation.

Information and Communication Technologies (ICTs) offer a broad range of new driver support systems: Just think of assistants that help you to keep your lane, or applications for safe speed and safe distance to the car ahead. Any such systems inform the driver of a potential danger and warn him, if this danger turns into a serious risk. Due to the sheer volume of information items and warnings, which traditional and new systems can jointly give to the driver, they may become a risk by themselves: There is a threat that they overload the driver with information and thus distract him from his core task: driving.

In order to constantly reap the driver support systems' enormous benefits, namely higher road safety and greater traffic efficiency, their design and operation has to take the driver and his capacities into account: driver support systems need to be easy to use, intuitive, failsafe, false-alarm-free, accepted by the driver, and must not overload him with too many alerts.

The competencies to develop driver support systems that meet these criteria have always existed in Europe. However, they were scattered around in various countries and numerous research institutes. To obtain effective and meaningful research results for Europe's automotive sector, which produces cars for the European market and beyond, it was necessary to integrate these competencies in some way. Therefore, 23 research institutes came together to form a so-called Network of Excellence. As the network's mission revolved around human-centered design of driver support systems, they gave it the name 'HUMANIST'.

HUMANIST was funded by the European Commission until mid 2008. As a successful Network of Excellence, it has become self-sustainable and now continues its work without further European funds.

More information on:

http://www.humanistvce.eu

ISMAEL – SENSORS MULTIPLYING AIRPORT SAFETY

Modern airports are equipped with a range of technologies to monitor vehicles on the ground, be it aircraft or service vehicles, because a precise picture of the traffic on the runways and taxiways is a prerequisite for passenger and airport safety. Standard technologies used for airport monitoring today are ground radar and surveillance video and infrared cameras.

All three technologies have their inherent limitations: The number of radar antennas on a given surface is limited, as their electromagnetic radiation can pose a health risk or cause problems of interference. Like ground radar, cameras cannot 'look' around corners or beyond objects. In addition, cameras do not work unfailingly in heavy rain or snowfall, in fog or hard frost.

The prime objective of ISMAEL was to develop and test an additional airport safety technology not subject to the limitations of radar and cameras, and based on a different natural phenomenon, namely magnetism: The earth is surrounded by an invisible magnetic field. Each and every ferro-metallic object slightly alters this magnetic field. Would it be possible to measure the alterations of the field caused by aircraft and service vehicles in an airport?

The ISMAEL team dug magnetic sensors in the ground at the runway entrances and taxiways of three European airports: Frankfurt Rhein-Main, Europe's second-largest airport, the mid-sized Thessalonica airport in Greece, and the small aerodrome in Saarbrücken, Germany. The sensors put into the ground were extremely cheap, as the project used off-the-shelf magnetic heads normally used for hard disk readers.

The projects results exceeded the expectations. Not only was it possible to exactly pinpoint the location of vehicles in the airport in almost all weather conditions, but also to specify the kind of vehicle that was sensed. The accuracy of the measurements was so high, that not only aircraft could be distinguished from service vehicles, but also types of aircraft from each other.

The EU-funded ISMAEL project ended in July 2007. However, activities towards marketing of the system are ongoing. At the moment, the standardization and certification procedures are underway, and negotiations with interested entrepreneurs are held. Due to the flexibility of the system – it can be used for airports of all sizes – and its cheapness, interest in the technology is high. Talks are ongoing with airport operators worldwide showing a strong interest in the system.

More information on:

http://www.ismael-project.net

FORMULA 1 DRIVERS IN SUPPORT OF eSAFETY CHALLENGE

Michael Schumacher framed by two campaign mascots

Seven-time Formula 1 World champion Michael Schumacher supported eSafety road safety technologies and highlighted their potential to save lives and mitigate injuries at eSafety Challenge's first annual event in Vallelunga/Rome, on 8 and 9 September 2009.

Schumacher was accompanied by Formula 1 drivers Giancarlo Fisichella and Heikki Kovalainen, as well as eight-time 24-hour-Le-Mans champion Tom Kristensen and DTM driver Susie Stoddart. In a variety of automobiles ranging from small cars to heavy duty vehicles, the racing drivers spectacularly illustrated the benefits of Electronic Stability Control (ESC) and Warning & Emergency Braking System, Lane Support, Blind Spot Monitoring and Speed Alert.

The impact of these systems in reducing the number of road deaths in Europe is high. ESC alone would save 4.000 lives annually and avoid more than 100.000 injuries, were all European cars ESC equipped.

The prime objective of the eSafety Challenge campaign is to inform drivers, car dealers, policy makers etc. about the benefits of the above mentioned safety systems.

eSafety Challenge campaign is co-funded by the 39 member organisations of the eSafetyAware! platform, the FIA Foundation and the European Commission. eSafety Challenge started its activity in April 2009 and is expected to continue its work for at least two more years.

More information on:

www.eSafetyChallenge.eu

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