

RESEARCH NEWS

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1 How smartphones help find avalanche victims

Not a winter goes by without an avalanche incident. In the search for those buried beneath the snow, every second counts. Now smartphones equipped with functions of an avalanche transceiver should help locate the victims quickly.

2 Sweat glands heal injuries

Our body's sweat glands are a source of stem cells particularly suited to healing wounds – stem cells that form new skin cells and manage the healing process. They are not rejected by the body and can be obtained without a hospital stay.

3 No room for wrong notes

Each audio file has its own history. Editing processes such as cutting and compressing leave their own marks, and this is what researchers use to detect manipulated recordings or plagiarized passages of music with the help of special software..

4 Invisibility cloak for hearing aids and implants

Microsystems are at the heart of portable hearing aids and implants. Now researchers are developing a miniature, low-power wireless microsystem to make these medical aids smaller, more comfortable and more efficient.

5 Wind farms to blink only when necessary

They can be seen from afar – the blinking beacons on wind turbines intended to warn approaching aircraft at night. However, the continual blinking disturbs many people. Beacons that only switch on when necessary find more acceptance

6 Helping preserve independent living

Single seniors lead a risky life: after a fall, they often lie on the floor several hours before their awkward predicament is discovered. A sensor system detects these emergency situations automatically and sends an emergency signal.

7 Weight loss program for infrared cameras

Infrared sensors can be employed in a wide range of applications, such as driver assistance systems for vehicles or thermography for buildings. A new camera is providing a test bed for development of new products that use these detectors

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The Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 66 institutes and independent research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of more than 22,000, who work with an annual research budget totaling 1.9 billion euros. Roughly two thirds of this sum is generated through contract research on behalf of industry and publicly funded research projects. Branches in the USA and Asia serve to promote international cooperation.

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How smartphones help find avalanche victims

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Any enthusiast of winter sports dreads being overtaken by an avalanche, knowing that there is little chance of freeing oneself once buried beneath the mass of snow – snow that becomes hard as concrete until the buried person can no longer move as much as a finger. The chances of survival dwindle with each passing minute and death by suffocation draws near. On average, rescuers have 15 minutes to recover victims alive. That is why an avalanche transceiver is an essential piece of kit for anyone spending significant time off-piste. These transceivers don't come cheap, however, ranging in price from between 200 and over 500 euros – perhaps one reason why many walkers and skiers still don't carry one with them.

Soon there could be a new and cheaper alternative to the avalanche transceivers currently on the market. Galileo-LawinenFon, a system being developed by researchers from the Fraunhofer Institute for Material Flow and Logistics IML in Prien, incorporates the transmit and search functions of an avalanche transceiver into a smartphone. In an emergency situation, these mobile phones can locate buried avalanche transceivers using satellite navigation – and are able to draw on the combined signals of the USA's GPS, Europe's Galileo and Russia's GLONASS satellite systems to do so. The companies proTime and Volmer Informationstechnik, as well as the electrical engineering and IT department of Rosenheim University of Applied Sciences, are participating as partners in the project, which has been awarded funding of 1.7 million euros by the Federal Ministry for Economic Affairs and Technology BMWi .

Getting straight to buried victims

“Like commonly available avalanche transceivers, the Galileo-LawinenFon has a transmit and search mode. Unlike previous transceivers however, when looking for victims the system is not restricted to the electromagnetic field formed by a transmitted signal but makes use of satellite signals as well. Since our solution draws on numerous available sensors and satellite systems, the signals transmitted by victims can be located with a great deal of precision. Magnetic field signals are processed in 3D so that we can pinpoint accident victims in a matter of seconds and improve their chances of survival,” says Holger Schulz, a scientist at Fraunhofer IML. This is one of system's big advantages over currently available devices, where “send” mode involves emitting only an electromagnetic signal. The device then searches for any missing persons along the lines of this magnetic field. In the case of the most basic devices, this means that only a semicircular area is being covered at any one time, which in turn prolongs the search. The new technology, on the other hand, leads straight to the buried skier.

Galileo-LawinenFon consists of a smartphone app and an extra piece of hardware called Galileo-SmartLVS that is connected to the mobile phone via USB. This is compatible with almost all of the newer generation of smartphones. Galileo-SmartLVS includes

a 3D magnetic field antenna for picking up signals, an analog-digital converter, a satellite navigation receiver, acceleration sensors and a reserve battery. The LawinenFon app serves as the interface between the extra hardware and the user. A technique already patented by Fraunhofer and proTime enables the exact position of a buried person to be calculated from the signals captured by the Galileo-SmartLVS. Rosenheim University of Applied Sciences has devised the mathematical algorithm required to put this technique into practice. The distance to the victim and direction to take is displayed on the smartphone screen. In future the user interface is also to show the depth at which the missing person is trapped. "There is also the possibility of adding other useful functions to the app such as current snow and weather conditions. These are extras that standard search devices simply don't offer," says Dipl.-Ing. Wolfgang Inninger, head of the IML project center in Prien.

Already the complete system has passed its first practical test in the Galileo Test and Development Environment (GATE) in the Berchtesgadener Land, where researchers were able to use a prototype to locate a buried transceiver with centimeter precision using satellite navigation. It is hoped the solution will win over the mass market in two to three years – which is good timing since Europe's Galileo satellite system is also expected to launch in 2016. Before then, the researchers want to further extend Galileo-LawinenFon's current reception range of around 30 meters.



An extra piece of hardware coupled with the LawinenFon app transforms any smartphone into an avalanche transceiver. Pictured: the Galileo-LawinenFon prototype. (© Fraunhofer IML) | Picture in color and printing quality: www.fraunhofer.de/press

Sweat glands heal injuries

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It all began with the pancreas. Prof. Charli Kruse, head of the Fraunhofer Research Institution for Marine Biotechnology EMB in Lübeck, still remembers it well. The researchers had isolated some cells taken from the organ in a petri dish as part of their research – their aim was to investigate the function of the protein Vigilin, which is produced in the gland cells. “Suddenly we realized that these cells were reproducing in an unusual way, since the microscope showed not only gland cells in the dish but nerve and muscle cells, too.” Stem cells had formed out of the gland tissue and multiplied to form a variety of different cells. It quickly became apparent that other gland cells shared the same capability: “We slowly worked our way outward from the internal organs until we got to the skin – and the sweat glands. Again, this yielded the same result: a petri dish full of stem cells.” Up to now the sweat glands haven’t really received much attention since laboratory animals such as mice or rats have them only on their paws. A human being, on the other hand, possesses up to three million – predominantly on the soles of the feet, palms of the hand, armpits and forehead.

Healing stem cells obtained from the armpit

Biologists and medics use stem cells to obtain new tissue to replace cells that are damaged or diseased. They play a particularly important role in healing wounds. Stem cells taken from the patient’s own body are ideal because there is no chance of the body rejecting them. Getting at them, however, requires a cumbersome operation to extract the stem cells either from bone marrow or from the blood. “The sweat glands are significantly easier to get to. All that is required is a short walk-in walk-out visit to your dermatologist. We can obtain stem cells from less than 3 millimeters of underarm skin,” explains Kruse. When grafted to a skin injury, these stem cells can have a very beneficial effect on the healing process. Whether it is the cells themselves that build new skin cells and blood vessels or whether their role is to manage healing processes by releasing growth hormones that in turn activate immune cells is currently undergoing investigation.

Tests conducted by the scientists on animals and on human skin in the petri dish have demonstrated the beneficial effect of stem cells in healing injuries. In these tests, the researchers took a skin sample and separated it under a microscope into millimeter-sized living sweat glands. They then multiplied the cells contained in these glands outside the body, and in doing so induced them to form cells of different types: “We used these to populate a substrate, and then put the substrate on a wound we had previously generated on a skin specimen.” The findings showed that the wound healed significantly faster and better with the stem cells than without them. The substrate gives the cells a solid structure and can be made of something such as collagen, a structural protein of connective tissues in the human body, which can later be replaced by the body’s own fibrous proteins. “Without this structure the cells would be taken by

the bloodstream and transported away from the site. It is imperative that the cells stay as fixed as possible on the site of the wound as only then can they react with the skin and take part in the healing process,” says Kruse. He works closely on wound repair with the department for plastic surgery at the University of Lübeck.

Since the end of last year, Fraunhofer EMB has been collaborating with Bioenergy CellTec GmbH, which has moved from Cologne to Lübeck. To develop new products for wound repair this biotechnology company makes use of a novel substrate – a biopolymer particularly suited to combination with cells. It is hydrophilic – meaning it attracts and incorporates water – and treated in a way that makes it a particularly attractive place for cells to colonize. Now both partners want to pool their developments and team together to produce products that will heal wounds faster and better. “Particularly in the case of chronic wounds, which often do not heal even over a long period of time, there is still no effective course of treatment,” says Dr. Kathrin Adlkofer, managing director of Bioenergy. These permanently open wounds are caused by diseased veins or arteries, diabetes, tumors, infections or skin diseases.

The Lübeck scientists already have further applications in mind: “Not only are stem cells from sweat glands easy to cultivate, they are extremely versatile, too.” Kruse and his team are already testing a treatment for macular degeneration – a disease of the retina that affects older people. In the case of implants, too, there is a lesser chance of these being rejected if they are encased in stem cells taken from the patient’s own body. Kruse adds: “In the long term, we could possibly set up a cell bank for young people to store stem cells from their own sweat glands. They would then be available for use should the person need new cells – following an illness, perhaps, or in the event of an accident.”



A biopsy punch arranges the biopolymer substrate into the appropriate shape (left). Cells then colonize these circular discs in cell culture vessels (right). (© Fraunhofer EMB) | Picture in color and printing quality: www.fraunhofer.de/press

No room for wrong notes

As the examiner rewinds once again, one question remains: has the refrain of the song been plagiarized? Eyes narrowed, the music expert presses the start button once more and focuses on the melody and notes with the utmost attention. Finally, no doubt remains: the alleged composer has copied not only the melody but whole chunks of the original song as well. "Here, this sort of event is greeted by silence," says Christian Dittmar from the Fraunhofer Institute for Digital Media Technology IDMT in Ilmenau. The software he has developed automatically detects plagiarized music and expunges the stolen parts of the song: "In the most extreme cases, involving particularly brazen theft, there isn't a single note left in the piece." Fraunhofer IDMT's "PlagiarismAnalyzer" detects identical melodies and samples (whole portions of a song) in a matter of seconds. To do this, mathematical algorithms identify the tonal spectrum of the copy and the original and then compare the two.

Software detects manipulated audio material

Two audio recordings display their characteristic wave shape on the computer screen in front of Patrick Aichroth. An optical signal points to suspect points within the material. Dittmar's colleague is also on the hunt for manipulated recordings. However, he is not just concerned with music but with audio files in general – including passages of speech recorded on smartphones. He and his team use a variety of techniques to detect manipulation, from electrical network frequency (ENF) analysis to microphone categorization and the inverse decoder.

"Editing processes such as cutting, encoding or decoding leave behind traces in the audio file. These can be detected through an altered ENF, a change in the microphone used or via the inverse decoder," explains Aichroth. Fraunhofer IDMT developed the inverse decoder on the basis of research findings from the Fraunhofer Institute for Integrated Circuits IIS in Erlangen. The decoder shows which format and which parameters were used to encode the original file – for instance the mp3 format, which compresses the audio track.

It's not just those examining cases of plagiarism that will be able to benefit from the new technologies developed in Ilmenau. Editors, detectives and archivists are sure to find it useful too as the flood of audio content on the internet and within companies continues to rise. "These days, you don't have to be an audio technician to make a recording. Smartphones have become so widespread that audio recordings often exist which might provide substantiating information on important events. As the amount of audio content continues to rise, so too does the danger of manipulation – and there is hardly ever time to check the recording manually," says Aichroth.

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To illustrate his point he cites two situations where automatically checking audio material could prove extremely useful. The first involves an editorial team at a German publication. Just before they are about to go to print, the journalists get hold of some controversial audio material that would put a completely new spin on the title story. The decisive question is whether the recordings are genuine. Or imagine the following scene: the police possess several mobile phone recordings that heavily implicate the main suspect. Here too the officers need a speedy initial assessment of whether the recordings are genuine or whether they have been manipulated.

Fraunhofer's scientists in Ilmenau developed their software as part of the EU-sponsored REWIND project (<http://www.rewindproject.eu>). In this project Fraunhofer IDMT is working alongside universities in Brazil, Italy, Spain and the UK. "We want to understand the basic theoretical principles and also to develop technologies from which practical tools evolve. We are bringing together the strengths of all the technology developed to date so that we can offer a quick analysis even for larger volumes of data," says Dittmar. It currently takes around 5 seconds to detect a 10-second original sequence within a 30-second piece of music.

REWIND will be ending in April 2014. Shortly prior to this, from 10-14 March, 2014, Fraunhofer IDMT will be showcasing results from the project at CeBIT in Hannover at the Fraunhofer-Gesellschaft stand (Hall 9, Booth E40). Visitors to the stand will be able to see for themselves how easily an audio file can be manipulated, how hard it is to tell the difference by ear alone and how the tools developed in Ilmenau work in practice.



A look at how an editorial department might operate in the future – thanks to Fraunhofer software, journalists can verify the authenticity of an audio recording in a matter of seconds. (© Fraunhofer IDMT) | Picture in color and printing quality: www.fraunhofer.de/press

Invisibility cloak for hearing aids and implants

RESEARCH NEWS

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People with impaired hearing struggle with things we take for granted, whether it is listening to birds warbling in the garden or chatting with friends and acquaintances. They experience particular problems with hearing at higher frequencies and by following-up conversations. According to the World Health Organization (WHO), hearing loss is one of the six most common illnesses in the industrialized world. In Germany, around one in five of those over the age of 14 have to be treated for hearing difficulties. Often a simple hearing aid can restore the lost frequencies and makes it possible for the patient lead a normal life again. The device is most often worn behind the ear, although some variants can even be inserted directly into the ear. In the EU WiserBAN project, Fraunhofer researchers are developing a new microsystem designed to make hearing aids so small, so that they can be concealed out of sight within the ear. The technology is also suitable for implants, pacemakers and insulin pumps. This all means that the system uses only a fraction of the energy required by conventional devices, keeping cumbersome battery changes to a minimum. "Ideally, patients should not even be feeling of wearing the hearing aid over long periods of time," says Dr. Dionysios Manassis from Fraunhofer Institute of Reliability and Microintegration IZM in Berlin.

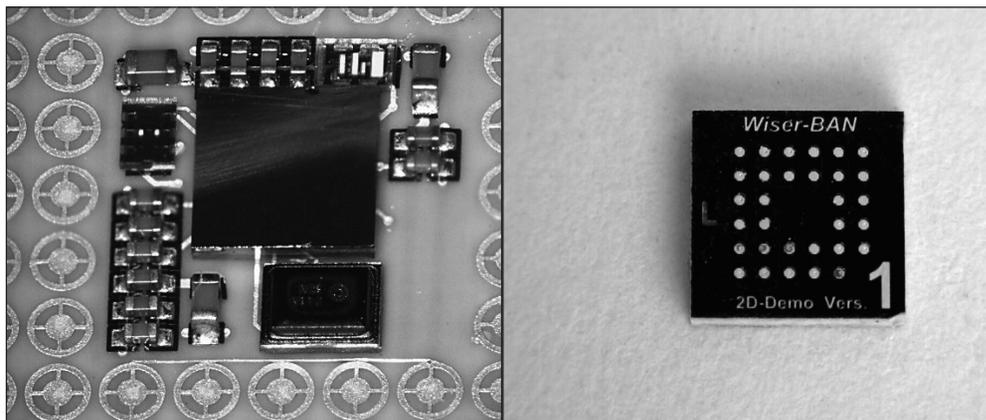
19 components in just one micro package

With dimensions of just 4mmx4mmx1mm, the new microsystem is fifty times smaller than the current models for body area network (BAN) applications – electronics applied directly to the body. To achieve this, the project partners first developed especially small components such as innovative miniature antennas, system-on-chip integrated circuitry and high frequency filters. The job of the researchers at Fraunhofer IZM was to find a space-saving concept to accommodate all the components involved – 19 in all – in a single module. "This is a real challenge as all the components are of varying sizes and thicknesses. But having exploited various embedding technologies, which lead to advanced system-in-package (SiP) miniaturisation, we have managed to arrange all the components in the smallest possible space – just as in a package," explains Manassis. As viewed from outside, it is no longer possible to see the individual components. But that is not all, since the Berlin packaging experts have also developed a modular 3D stacking concept that saves extra space. This works by building the components into several smaller modules and then stacking these on top of each other.

Extending the scope of their work, the project partners are also developing special antenna and wireless protocols. These serve to communicate important information such as pulse, blood pressure or glucose levels straight to the supervision Physician's tablet or smartphone. The resulting WiserBAN wireless system makes obsolete the relay station – an extra device that patients have previously been obliged to wear to extend the communication range. Another advantage is that the wireless protocols developed within the project are based on the reliable IEEE 802.15.4 and 802.15.6 standards.

Conventional devices have ordinarily relied on Bluetooth, where there are often issues with interference with other devices.

Project partners are also looking to optimize energy management. Hearing aids worn behind the ear are powered by a 180mAh battery (milliampere hour), which must be either replaced or recharged approximately every two weeks. Now the aim is to minimize the system's energy consumption to around one milliwatt (mW), and so to extend battery life to up to 20 weeks. It is hoped that the new technology will act as the springboard for more comfortable and more reliable healthcare products in the future – from long-term electrocardiography to insulin pumps. Furthermore, there is the potential to use the microsystem in implants and pacemakers.



Fraunhofer researchers pack a total of 19 components (left) into their microsystem (right). System-on-chip integrated circuitry, high frequency filters, passive components are all fitted into a space measuring 4mmx4mmx1mm. (© Fraunhofer IZM) | Picture in color and printing quality: www.fraunhofer.de/Press

Wind farms to blink only when necessary

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Wind power has been booming in Germany since the beginning of the energy transition. However, the voices of critics have been growing along with the increasing number of wind turbines. Citizens' initiatives in Lower Saxony and Baden-Württemberg for instance have founded a umbrella association meant to provide local groups with a political say. Residents primarily feel encroached on. Among other things, they complain about the noise of the turning rotors, but the blinking beacon lights at the top of the masts also bother them. These signals are meant to warn low-flying aircraft and prevent the aircraft from colliding with the masts. The beacons are in continuous operation at night and in fog. Local residents perceive the permanent flashing as an annoyance, especially in the case of larger wind farms. In addition, the red warning beacons attract birds, which are fatally injured through collisions with the rotors.

Sensors spread safety umbrella

The Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR together with the commercial firm Industrial Electronics and the wind farm engineering firm Dirkshof Wind GmbH are working on a solution to the problem in a project named "Parasol". The beacons should only be switched on in instances when the facility is actually approached by an airplane at the corresponding altitude. In this way, the periods when the warning lights are flashing are considerably shortened. The new system that detects and analyzes air traffic in the area of the wind farms is based on passive radar sensors. They are called passive devices because they emit no radar beam of their own. Instead, they utilize local radio station frequencies to locate airplanes. Thanks to the format of their signals, digital signals like DAB+ and DVB-T are especially well-suited for differentiating among objects. "We are able to operate the system without a transmitter module of its own, and dependent on weather conditions. A transmitter license required for active radar systems it not required for this, so it can be operated cost-effectively," says Heiner Kuschel, department head at FHR in Wachtberg. "The collision warning lights only switch on when an airplane is within a radius of four kilometers and flying below an altitude of about 2500 feet (700 meters). We use the passive radar sensors to essentially extend a protective umbrella over the wind farm like a parasol."

The radio station transmitters send out signals that are reflected by the airborne objects. The passive radar sensing system uses mathematical algorithms to compare the reflected signals with the direct radio station signals it receives. The distance, position, and velocity of the approaching aircraft can be calculated using this comparison. The system comprises three sensors, each of which consists of an antenna unit attached to the wind turbine mast, and signal processing located within the mast. A CPU in each wind farm for evaluating the data completes the system. A prototype has already been installed and successfully tested at a wind farm operated by Dirkshof in the town of

Reußen-Köge near Husum, Germany. Kuschel and his team are presently optimizing the signal detection algorithms. Parsol is expected to go into operation in 2015. "We hope that more local residents will agree to construction of wind farms through the installation of the collision warning lights. The goal of Parsol is to advance the state of renewable energy and make Germany more competitive in the economic arena," says Kuschel. The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) provided 1.2 million EUR (USD \$1.8 million) in funding for the project.



The sensors being attached to the turbine mast. The warning beacons only blink if the radar system detects an airplane.
(© Fraunhofer FHR) | Picture in color and printing quality: www.fraunhofer.de/press

Helping preserve independent living

RESEARCH NEWS

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Mr. S. is visually impaired and dependent on a cane since suffering a stroke. Nevertheless, as a 70-yr old living alone, he would rather not move into a care home. Most older people harbor this wish. They want to stay in their own familiar surroundings and continue to live independently for as long as possible. According to data from the German Federal Statistical Office, this applies to 70 percent of seniors. Against better judgment, they are putting their health at risk, for not only does the risk of cardiovascular problems increase with age, but the risk of falling increases also. According to estimates, about 30 percent of those over 65 years of age living at home experience a fall at least once a year. For those over 80 years old, it is more than 40 percent.

Many of the accidents happen during daily housework. However, older persons who are unsure on their feet frequently have accidents at night as well. Often it is hours before they are assisted. They cannot always trigger a domestic emergency device, often called a radio button – because they are not wearing the device, are unconscious, or injured. An emergency alarm like this therefore only offers limited help, just as sensors worn on the body. These sensors react as well to rapid hand movements and are therefore particularly prone to triggering false alarms. Sensors built into the floor no doubt detect emergencies, but they can only be installed through extensive construction at great financial expense.

Maintenance-free and cost-effective emergency system

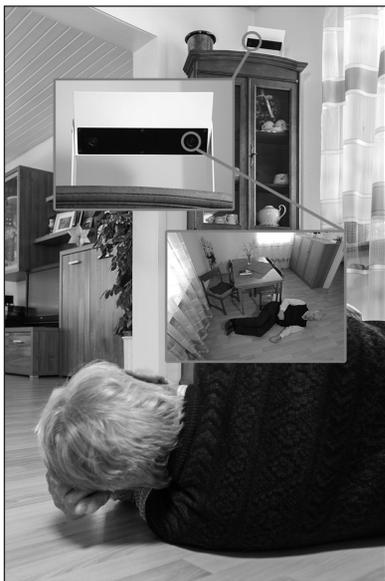
A system that was maintenance-free, able to detect emergency situations automatically, and could be integrated cost-effectively into every home without restricting the movement of the occupant would be quite helpful. Such a solution, providing safety in every room, is currently under development by researchers at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA using safe@home. The partners in the project are the BruderhausDiakonie, a nonsecular social service foundation in Reutlingen, as well as the Vitracom and Sikom companies. Sensors boxes installed like smoke detectors on the ceiling register when a person falls or needs assistance. If a box detects an emergency situation, it notifies the alarm unit in the home, the CareBox. This unit immediately calls for help – by telephone, cell phone, or internet.

The system works with highly sensitive optical and acoustic sensors that determine the location and condition of a person as well as their movements within a room. The technology uses this data to detect a fall within seconds and identifies a motionless state if no movements are detected within a specific period of time. The system also responds to cries for help. “The occupant is immediately phoned by the CareBox in order to exclude a false alarm. A computer-generated voice asks how they are. The occupant can cancel the alarm by answering. If they fail to answer the phone, safe@home identifies it as an actual emergency,” explains Marius Pflüger, a scientist at IPA in

Stuttgart. In this case, family members, neighbors, or care givers are notified. "The sensor boxes, which are about the size of a box of chocolates, operate unobtrusively and automatically. Changing batteries, activating the hardware – none of this is necessary. Privacy is also assured, since the data are evaluated directly in the sensor without having to be stored or transmitted," says Pflüger.

Prototypes of the emergency detection system have been undergoing round-the-clock operational testing in six residential care home units since mid-2012. In order to establish statistically significant detection rates, emergency situations were simulated in addition to evaluating normal operation. So far, the subjects of the test system have accepted the system and do not feel the the sensor boxes are annoying. Instead, they fulfilled their main requirement of enhancing personal safety. The seniors assess the automatic confirmation as useful. "One reason for the high acceptance rates are the comprehensive interviews we carry out in advance with potential users in order to find out what they value in a fall detection system," says Pflüger. The most important thing for those interviewed was that the system work reliably and properly in every room during routine daily life, and that it could be integrated in every kind of living space. Those interviewed also wanted to have as little contact with the technology as possible.

Safe@home should be ready for market in late 2014. Pflüger and his team are assuming high market demand. There are already over 5.4 million people in Germany 60 years and older living alone in their own homes today. In 2030, 33 percent of the population in this country will be over 65.



The sensor box registers the emergency situation in seconds and notifies the alarm unit in the home.
(© Fraunhofer IPA) | Picture in color and printing quality: www.fraunhofer.de/press

Weight loss program for infrared cameras

RESEARCH NEWS

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We want it cozy and warm in our homes when the thermometer outside gets down into the minus area. Especially with older buildings, however, the money we pay for heat ends up out the window. The fault lies hidden in incorrect insulation, or at spots around windows or ceiling joints that are not sealed. These weak points cannot be perceived from outside – unless you are viewing the building through the lens of an infrared camera. This type of camera is equipped with specialized sensors that distinguish the temperature differences of the building. Thermal bridges, where the heat penetrates faster to the outside, become immediately visible in these thermographic images of buildings. The only catch: you need detectors that are highly sensitive in the far-infrared region to detect very small temperature differences. However, these detectors need to be permanently cooled to a frosty -310 degrees Fahrenheit (-190° C). The cameras are very large, heavy, and consume a lot of energy as a result of this additional cooling.

Instant images on the PC

Scientists of the Fraunhofer Institute for Microelectronic Circuits and Systems IMS are developing infrared sensors for the far-infrared region that also operate at room temperature. A prototype camera at the Institute in Duisburg, Germany, will likely simplify product development based on these room-temperature detectors in future. “It is very time-consuming and expensive to create an image from a new detector. The sensor must first be adapted to the given camera model. We want to reduce this effort by offering a suitable camera as a testing platform for our detectors that generates images on a PC immediately,” explains Dr. Dirk Weiler from the Fraunhofer IMS.

The EVAL-IRFA camera doesn’t just prepare the infrared photo material faster. While commercially available infrared cameras have integrated image processing that typically sharpens temperature edges or smoothes surfaces, the model from the Duisburg researchers presents a true image of every pixel. While it makes sense to enhance the images during regular operations later on, doing so during the R&D phase is counterproductive. The performance and operation can only be evaluated and adapted to a given application with the help of the raw detector data. “Since our customers come from very different application areas, they often times have very specific requirements for the sensor – in relation to the optical or temperature resolutions, for example,” explains Weiler. “If we tweek one or the other adjustment during the development phase here, the customer can immediately check the result in the actual image using our camera.”

The researchers in Duisburg are looking forward to presenting their camera during Sensor & Test in Nuremberg, from 3-5 June this year. The goal is to introduce room-temperature IR detectors into applications faster. Weiler is certain the demand is there:

“Our technology opens up innovations especially for mobile applications, since it leads to smaller, lighter, and more energy-efficient camera systems.” This is of interest not just in thermography for buildings. IR cameras installed as part of driver assistance systems could improve road safety, since people and animals on unlighted roadways can be detected at large distances – without high beams blinding oncoming traffic. Infrared cameras could also be valuable in building surveillance or monitoring production machinery.



The new prototype camera can offer a test bed for building smaller, lighter, and more energy-efficient infrared devices. (© Fraunhofer IMS) | Picture in color and printing quality: www.fraunhofer.de/press

Digital express service for patient files

There are over 2000 hospitals with almost 350,000 resident physicians in Germany. They all exchange results, diagnoses, and therapy plans with each other. With chronic or complicated diseases, the files become quite full. Often the general practitioner as well as several hospitals and specialists are involved. The physicians receive the information via medical reports. Several days can pass before all of the relevant data have been assembled by fax or mail.

The Fraunhofer Institute for Open Communication Systems FOKUS in Berlin and Fraunhofer Institute for Software and Systems Engineering ISST in Dortmund have accelerated this process. With Electronic CaseRecord, physicians can exchange information about patients simply via computer. "They receive the data faster and the data are always complete. With the classical approach, files are sometimes simply overlooked if too many parties are involved," says Dr. Jörg Caumanns from FOKUS.

The researchers have developed a communications platform in cooperation with physicians and software manufacturers. The beta tests were successful. Since then, several hospitals have started using Electronic CaseRecord or are preparing for its deployment in regional health networks. "Electronic CaseRecord is well along to becoming the standard for exchange of patient information between physicians," according to Caumanns. Protection of sensitive data is the first priority: the files reside on local servers of the participating hospitals and physicians; exchange of data over the Internet is secured by digital certificates.

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Predicting the remaining operating life of power plants

Wind power today can already cover most of the electrical power requirements in Germany – as long as the wind blows. If not, the power grid needs to be fed from other sources. Natural gas or coal fired power stations that can operate flexibly – delivering full power quickly on demand – are of increasing importance in Germany. Especially the components in the steam circuit that undergo enormous temperature changes are heavily stressed. During a cold start they are heated from less than 50 °C to over 500 °C within a few hours. While a cold start seldom occurs, hot starts from 380 °C to more than 500 °C every other day are common, especially in combined cycle power plants.

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“The life expectancy of a conventional power plant based on fossil fuels is currently around 40 years. However, the long-term investigations and simulations of power stations that turn on and off frequently to compensate for fluctuations of regenerative energy sources are not available,” says Dr. Gerhard Maier, a scientist at the Fraunhofer Institute for Mechanics of Materials IWM in Freiburg, Germany. Both the experiments and computational modeling for simulations are being developed by IWM in a research project for RWE Generation SE. Then the remaining life times of flexible power stations should be predictable using the IWM methodology by 2015.

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RFID wristband identifies merchandise quickly and without direct contact

Endless rows of high shelves fill the hall. Where are the sensor and the cable that are supposed to be connected to the component group later in vehicle assembly? Inventory warehouse workers do not have a lot of time to locate items with the desired color and finish. Until now, they had to scan the boxes on the shelves using a manual barcode scanner in order to post the correct withdrawal of the part from inventory. In the future, this process will be carried out using an RFID wristband device. Researchers at the Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg have developed the light-weight system of just over five oz (150 gr). Warehouse workers and assemblers can quickly identify items without direct contact. The advantage of the RFID wristband over barcode scanners employed up to now, as well as over other mobile RFID hand-scanners, is that the employees have both hands free. This reduces superfluous movements and workflow is not unnecessarily interrupted. “Workflow is better and employees can work not only faster, but more comfortably as well,” says Martin Kirch, an engineer at IFF.

RFID transponders replace the barcodes on the items and identify them. The data are transmitted by radio to the wristband where an integrated antenna receives it. The radio interface and battery are built into it as well. In addition, there is an alternative design to the wristband design – the RFID glove. The system is in prototype form. Employees in the logistics and manufacturing sectors – the automobile and nutrition sectors for instance – will likely be able to employ it later this year.

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