RESEARCH NEWS

1 New opportunities for 3D technology in medicine

Until now, physicians have largely been skeptical of the advantages of 3D technology. But this may be about to change: the findings of a new study show that even experienced surgeons stand to benefit from the third dimension.

2 Seaweed under the roof

For many coastal dwellers, seaweed washed up on the shore is nothing but a nuisance. But this raw material has proven itself capable of keeping buildings well insulated. Together with industry partners, researchers have succeeded in turning it into insulation.

3 Heating with powder and plastic wastes

Disposing of waste – whether it is coating powder or swarf – is expensive. In the future, a combustor for powdery residues will enable companies to cut disposal costs and heating costs at the same time.

4 An accurate way of predicting landslides

A landslide can seriously injure or even kill people. Now, a new early warning system will be the first to employ geological data in tandem with the latest weather forecasts to provide a concrete warning in emergency situations.

5 Open software platform to bring down energy costs

Energy is getting more and more expensive, and experts are predicting record electricity and heating prices. A software platform promises to lighten the load for households and businesses by making it easier for consumers to put renewables to good effect.

6 Tuned coatings ensure cleanliness

Contaminated industrial plants cost billions every year in Germany alone. Special coatings can prevent the build-up of contaminants. Researchers are now able to adapt ultra-thin coatings for an extremely wide range of applications.

7 Non-glaring photovoltaic installations

If the glare from photovoltaic installations blind airline pilots at take-off or landing, this could be extremely hazardous. In the future, though a new software program will calculate when and where white-outs could occur – and how to prevent them.

8 Newsflash

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.

New opportunities for 3D technology in medicine

While physicians have largely ignored 3D technology until now, it appears to be getting a second chance, according to a new study of the Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute HHI and Klinikum rechts der Isar university hospital in Munich. Thanks in particular to improved 3D-glasses and screens, practical tests have recently shown that 3D systems used in medical technology have benefits that were once believed to be purely theoretical. The researchers showed that even experienced physicians could benefit from the latest generation of 3D devices. In the past, doctors have been rather skeptical of 3D images. In tests conducted over the course of the study, however, some 50 surgeons responded positively to 3D systems both with and without glasses. "While the technology still requires some fine-tuning, technology that does without the need to wear special glasses will increase the popularity of 3D systems in operating rooms. In the past, surgeons were hesitant to use the technology precisely because of the glasses," says Dr. Ulrich Leiner, head of the Interactive Media – Human Factors department at HHI.

Screen resolution continues to improve

The study was conducted as a result of current developments in 3D screen technology. 4K models for medical applications that offer quad HD resolution are already available. "The next step is ultra-high definition with 8K. This will mark a sixteen-fold improvement on the resolution of currently available full-HD images," says Michael Witte of HHI in explaining current trends. Mr. Witte is convinced that 3D without glasses will contribute to a lasting breakthrough. "This is why the researchers thought it was high time to carry out a scientific test that would assess whether 3D technology has reached the level of maturity required of sensitive hospital applications. They invited surgeons at Klinikum rechts der Isar's surgical hospital to test the latest generation of 3D devices."

Surgeons participating in the test tried a total of four different screen systems: 2D, 3D with and without glasses, and a mirror apparatus that served as the "ideal" 3D model. Images were delivered by endoscopic cameras that the doctors used during a simulated routine surgical procedure. Using a needle and thread, the physicians sewed up a wound with ten stitches in a model abdominal cavity. Just as would be the case in a minimally invasive surgical procedure, the surgeons did not have a direct view of their hands, and thus depended on the screen.

"The results were astonishing: with the glasses-based 3D system, the procedure was more than 15 percent shorter, and precision increased considerably. Hand movements were more targeted than with the 2D model. As far as I know, we have not observed this effect among our experienced surgeons in the past," says Professor Hubertus Feußner in describing the test winner. The surgeon, who has worked at Klinikum rechts der Isar for over 30 years, has conducted several thousand operations. "In the past, it

was the most experienced physicians in particular who were very skeptical of 3D technology. And this was not only because it hardly offered any tangible benefits. Many physicians felt uncomfortable looking at the screens, and preferred to rely on their experience as a result," says PD Dr. Silvano Reiser, Feußner's colleague.

Model without glasses is the future of 3D

The model without glasses also made a positive impression: test participants considered its quality as comparable to 2D. "Unfortunately, the system we developed was unable to take the first place ranking. But the first 'hard' practical medical test showed great promise, as we were able to work on the fundamental eye-tracking technology. This is where, through eye-tracking, cameras follow both eyes, and each eye sees a separate image. This creates a 3D effect without glasses," Leiner says. Both researchers see a bright future for 3D: "The study demonstrated that 3D has become an option for surgeons as well. This will revive the discussion among skeptics. And now there is a need for tests in other medical disciplines."

A surgeon practices sewing up a wound without a direct view. Doing so is more efficient with 3D screens. (© Fraunhofer HHI) | Picture in color and printing quality: www.fraunhofer.de/press

Seaweed under the roof

Throughout fall, winter and spring, Mediterranean beaches are littered with little balls of seaweed leaves from the Posidonia oceanica plant, more commonly known as Neptune grass. Although the natural material of these Neptune balls is regarded as a waste product and generally ends up as landfill, this readily abundant and renewable material is far too valuable to be thrown away. It displays a variety of characteristics that make it of interest to the building trade: seaweeds are virtually non-flammable, resistant to mold, and can be used as insulating material without the need for chemical additives. It can be used as insulation between the rafters of pitched roofs, to insulate interior walls, or to reduce the amount of heat lost through building envelopes. Fibers act as a buffer, absorbing water vapor and releasing it again without impairing its own ability to keep the building insulated. And with a salt content of just 0.5 to 2 percent, Neptune balls can be used to produce insulation material that will not rot away.

But how exactly is seaweed processed into a building material? A difficult task indeed as it is not easy to remove adherent sand from the Neptune balls. Added to which, individual fibers tend to catch easily on anything including one another and are quick to form new clumps, both during processing and later when being blown into spaces in need of insulation. Suitable methods of turning Neptune balls into insulating material have been developed by the Fraunhofer Institute for Chemical Technology ICT in Pfinztal, in collaboration with industry partners NeptuTherm e.K., X-Floc Dämmtechnik-Maschinen GmbH, Fiber Engineering GmbH and RMC GmbH. The project partners' aim was to produce an insulating material capable of being stuffed or blown into the required space. "Shaking the Neptune balls proved the best way of making sure we end up with fibers that are as long as possible and free of sand," says Dr. Gudrun Gräbe from Fraunhofer ICT. By carefully breaking up the clumps, Gräbe and her team were able to find the best way of acquiring fibers. Once all sand has been dislodged from the balls, a conveyor belt delivers them to the cutting mills, from where 1.5 to 2 centimeter fibers emerge undamaged and drop into plastic bags.

Staying cool with Posidonia fibers

The loose insulating material produced is capable of holding a considerable amount of energy: its value of 2.502 joules per kilogram kelvin (J/kgK) is 20 percent higher than that of wood or wood products, as a study conducted by the Fraunhofer Institute for Building Physics IBP in Holzkirchen shows. This means that the fibrous material keeps buildings cool in hot weather, shielding them from the heat of the day. And there is no doubt about how well Posidonia fibers insulate heat. "The material is employed in construction at sufficient density to prevent it from collapsing in on itself. The density required was determined by the Materials Testing Office MPA NRW in Dortmund," says Gräbe.

According to figures released by the eco-INSTITUTE in Cologne, seaweed is 100 percent organic and is entirely free of extraneous or toxic matter, making it also particularly suitable for allergy sufferers. Yet another advantage of Neptune balls is their favorable eco-balance, which Gräbe and her ICT colleagues have established. The entire manufacturing process requires very little energy. Neptune balls are harvested by hand and brought to Germany by sea from Tunisia and by road from Albania.

Stuffing or blowing

Installing the insulation itself poses little difficulty, and although installation is generally carried out by professionals, you can take on the job yourself. The fibrous material can be filled into the hollow spaces of roof constructions, walls and ceilings, and then packed tight by hand. It is advisable to use a machine to blow insulation into hard-to-reach spaces. The project is also responsible for producing a special blower capable of ensuring insulation reaches every last nook and cranny.

The company NeptuTherm e.K. has given its name to this insulating material from the sea and is already marketing and distributing it. Moreover, Posidonia fibers have already proved their worth in a range of new construction projects and renovations of existing buildings. There are now plans to develop solid, ecologically-sound sheets made from this material in order to offer a comprehensive system for insulating roofs, exterior façades, interior walls and basement ceilings. Researchers from Fraunhofer ICT have performed tests that show that producing such sheets is indeed feasible.

Seaweed balls can be used as insulation free of chemical additives. (© Fraunhofer ICT) | Picture in color and printing quality: www.fraunhofer.de/press

Heating with Powder and Plastic Wastes

A great deal of powder is needed to coat auto parts and other objects – and a great deal of waste is left over afterward: After all, only a fraction of the coating ends up on an autobody; the rest misses the target and is suctioned away. Recycling of residual powder has limits: If coaters mix in too much "recycled" powder, the quality of a coating suffers. Companies therefore dispose of most of the coating powder – an expensive undertaking. Grinding processes are similar: They also produce many residues and companies have to dig deep in their pockets to dispose of them.

In the future, industrial plants will be able to cut such disposal costs as well as heating costs for facilities, kilns and many other high-temperature processes. This is being made possible by a plant, which researchers at the Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg developed in cooperation with an industry partner. "The plant we developed enables us to recover heat from any combustible, powdery industry waste, whether it is coating powders, polymer powders or even wood constituents," says Marcus Kögler, in charge of the project at the Fraunhofer IFF. "The potential savings are large: 25 percent of the natural gas usually used for heating and, additionally, 100 percent of the disposal costs are being saved at a reference facility. A plant with a larger capacity can even produce electricity that can be supplied to the electrical grid."

An Ideal Burner for Small Quantities of Waste

The plant consists of three basic units: a pulverized fuel burner, a boiler and a filter system. Powdery waste is conveyed into the burner pneumatically, i.e. with compressed air, where it is agitated systematically, brought into contact with air and burned. Water stores the heat produced and thus heats facilities or kilns. The flue gases produced during combustion are suctioned off and purified in the filter system. The pulverized fuel burner is approximately 50 times smaller than conventional models and thus has only approximately two percent of their capacity. The advantage: This also makes the burner worthwhile for smaller quantities of waste, like those produced in small and medium-sized enterprises. "In order to be able to compute the temperature distributions and flow paths in this small burner, we first ran CFD (computational fluid dynamics) simulations," says Kögler. These simulations answered numerous questions for the researchers, thus helping them develop the burner: How do the powder particles flow in the burner? How can they be agitated optimally? How can the lowest emission levels be achieved? In another step, the researchers further optimized the burner's settings and parameters in experiments.

A pilot plant is already operating at MBG Metallbeschichtung Gerstungen GmbH. It cuts the natural gas used by one quarter. The company holds a patent on the process for the recovery of heat from powder residues from coating plants, which was granted

in conjunction with this project. The researchers from the Fraunhofer IFF customized the pilot plant specifically for the company's requirements. The researchers have to modify each new plant for the requirements, depending on what powder is produced in a plant. In other words, they have to engineer the pulverized fuel burner's combustion system for the size of the particular particles and design the filter system so that it optimally filters each of the flue gases produced out of the air. Learn more about the recovery of heat from residues, entrained flow combustion and the pilot plant from the Fraunhofer IFF's experts at the Hannover Messe (Hall 2, Booth D18) from April 8 to 12.

This pilot plant in Gerstungen recovers energy from fine grained production residues.
(© Fraunhofer IFF) | Picture in color and printing quality: www.fraunhofer.de/press

An accurate way of predicting landslides

A deluge of rain pelts down on the already thoroughly sodden ground. Rivers burst their banks as local residents haul up sandbags to protect themselves from the rising waters. In hilly areas, people are no less anxious, knowing that the waterlogged earth on a hillside can easily slip, burying cars and houses beneath it and, if the worst comes to the worst, even people. Experts use maps marked with danger areas to determine the probability of a specific slope succumbing to a landslide. But these maps only cover a specific point in time, and do not take current weather conditions into account. Of these atmospheric factors, heavy rain in particular can trigger catastrophes.

Now, safety experts are to be supported by the ELDEWAS early warning system. This system makes use of regularly updated weather conditions and forecasts, coupling these to regional information on elevation profiles, slopes and land use, allowing it to issue an early warning in case of danger. ELDEWAS stands for "Early Landslide Detection and Warning System" and is being developed by research scientists at the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB in Karlsruhe. "The ELDEWAS early warning system goes hand in hand with INCA-CE, a project co-financed by the EU in which researchers are working on improving short-term weather forecasting, or 'nowcasting'," says Dr. Oliver Krol of Fraunhofer IOSB. While standard meteorological data is for the most part only updated once an hour, with a spatial resolution of ten kilometers, the experts working on the INCA-CE project are able to provide weather forecasts at 15-minute intervals with a spatial resolution of one kilometer.

Factoring in current weather conditions

The early landslide warning system is initially being developed by researchers for use in the state of Burgenland in Austria, with the regional safety center providing all the necessary data. Which slope is this and how steep is it? What type of ground are we dealing with – sand, clay or rock? How is the land used? Where are the installations, houses or roads? Where is wooded and where is open land? Researchers then combine these parameters, which stay stable over the long term, with weather data, which is constantly in flux. The weather data is provided online by Austrian meteorological service ZAMG, which is also taking part in the INCA-CE project. Initial practical testing is planned for the spring, when current weather information will be incorporated into the early warning system for the first time. The prototype is due to be ready in the autumn. "The software will of course also then be available for use in other countries and regions," says Krol. He also explains the aim behind the research, describing how the system will constantly assess the situation in the background until it perceives a danger, at which point it will independently issue a warning comprising the relevant coordinates and the contact details of the person with responsibility for the area concerned. This contact person is then to be automatically warned of the impending in-

cident via text message, giving them time to take appropriate action, evacuating the populace or locking down the area concerned.

Researchers still have a few challenges to overcome before this vision can be realized, however, including how to integrate the online weather data into the system and how to analyze the data received. "There's no doubt that the bulk of the work lies in answering the question of when a situation can be said to become critical. Given that setting rigid threshold values only allows for a binary yes or no answer, offering protection only against the worst case scenario, we have opted to model the problem using fuzzy logic," explains Krol. This means qualifying the threshold values of the various contributory factors, allowing us to link the variables. In this way, we can get as realistic as possible an assessment of the risk posed."
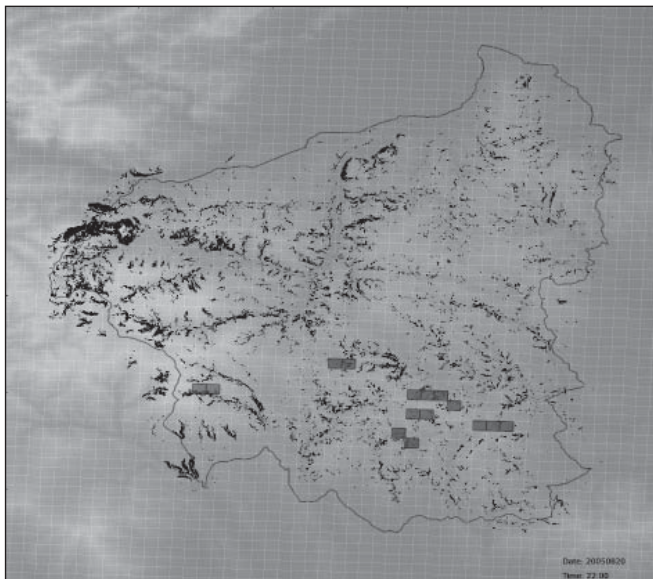
An example of one of the risk maps for Burgenland in Austria. The red boxes mark areas with an elevated risk of landslides. (© Fraunhofer IOSB) | Picture in color and printing quality: www. fraunhofer.de/press

Open software platform to bring down energy costs

For years now, electricity and heating bills have constantly been on the rise, and 2013 is no different – prices are shooting up. Germans are keen to do something about it. A survey conducted by inspection company Dekra revealed that one in two people is turning down the central heating, while the great majority are cutting back on cooking and laundry and actively looking to reduce consumption. This is where a new software platform comes in: it makes it easier to find a smart approach to energy issues, not only for homeowners and tenants but also for business and industry, and helps to bring down costs. Connecting energy users and producers with the control centers of grid companies and energy suppliers, this free Java-based framework for energy management is called OGEMA (Open Gateway Energy Management Alliance). The name is shared by the OGEMA 2.0 project, in which – with funding to the tune of five million euros from Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) – the Fraunhofer Institutes for Wind Energy and Energy System Technology IWES in Kassel, for Solar Energy Systems ISE in Freiburg, and for Integrated Circuits IIS in Erlangen are taking the solution to the next level.

"Our system lets customers track future variable electricity prices and allows them to fit their consumption to the energy on offer. This ability is becoming increasingly important with the switch to renewables," says Dr. -Ing. David Nestle, Head of department 'Energy Management' at IWES, who describes the software platform as "basically an interface between the 'smart grid' and the 'smart building'." OGEMA apps receive variable electricity tariffs and automatically calculate the optimum times to run connected devices such as a refrigerator, freezer or washing machine. This allows consumers to turn on, say, their dishwasher at the most economical times – especially when there is an oversupply of wind energy. Air-conditioning units, radiator thermostats, heat pumps and photovoltaic facilities can also be operated automatically by the apps. There are, for instance, applications running on OGEMA that let consumers know whether they would be better off using the electricity generated by their PV facility themselves or putting it on the grid. This information is presented to customers on a display. Other apps, meanwhile, turn off the heating in office buildings when rooms are not being used – say at the weekend, or when employees are out on the road. Another good use for OGEMA in a business context is for flexible control of combined heat and power plants to increase their profitability. As an example, reducing heat output for a short time to below predicted demand would avoid some electricity generation; this could be offered to the market as negative balancing power, giving rise to additional revenues.

Open system for the home and building automation field

The apps cover a broad spectrum of different tasks; since OGEMA is an open system, all developers and producers are free to turn their ideas for using energy more effi-

ciently into software for the platform. "Our framework is comparable with other open-source projects such as Android. That's what marks it out from the rest: within home and building automation, all the existing systems are proprietary," says Nestle. The OGEMA Alliance and an industry working group were formed with the aim of driving the development of software and the transfer of the research results into the market. Participants in the working group receive regular updates on the project's progress and learn how they can program applications for the platform. OGEMA 1.0 can already be downloaded free (www.ogema-alliance.org). Now Fraunhofer researchers are working on OGEMA 2.0, the finalized version of which is set to be made available in mid-2013. Among other things, it will feature new security functions and improved programming interfaces, while also making it easier to install apps in future.

Implementing OGEMA is inexpensive for users, with minimal hardware requirements. The platform runs on what is known as an embedded PC & web server, which can be purchased for around 30 euros, and which can be accessed via smartphone, PC, tablet or laptop. In initial field studies, the energy management system has been a success. One example is the Model City Mannheim project, a winner of the E-Energy Technology Competition organized by Germany's Federal Ministry of Economics and Technology: here, the system was tested in around 500 homes and families gave it very high marks in their concluding survey. At Hannover Messe 2013 from April 8 to 12, researchers from the IWES, the ISE and the IIS will be presenting OGEMA 2.0 and running a demonstration using a simulated environment to show how consumers can benefit from the system and bring down their energy costs (Hall 13, Booth C10).

The switch to renewables is making it increasingly important for energy customers to fit their consumption patterns to the supply situation. OGEMA 2.0 helps them to do this. (© Fraunhofer IWES/ Uta Werner) | Picture in color and printing quality: www. fraunhofer.de/press

Tuned coatings ensure cleanliness

All of us are faced with the same daily battle against dirt. Nevertheless, once laziness is overcome, vacuum cleaners, dishwashers or washing machines can relatively quickly restore order in our homes. However, keeping industrial plants and equipment clean is a different kind of challenge entirely. In such cases, the devil is often in the detail, as is the case in, for example, milk pasteurization processes. Dissolved milk proteins tend to build-up in pipes, boilers or heat exchangers of the equipment being used. After one working shift they are already soiled to such a degree that the entire plant has to be shut down for cleaning. This translates into huge costs for manufacturers. Such deposits, that are referred to by experts as "fouling", can disrupt production processes. Studies suggest that this results in costs of between 5 and 7 billion euros per year in Germany alone.

Tailor-made for every requirement

At the Surface trade fair (8 to 12 April, Hall 3, Stand D25) in Hanover / Germany, the Fraunhofer Institute for Surface Engineering and Thin Films IST, based in Brunswick (Braunschweig) / Germany is exhibiting a range of technologies that prevent fouling within plants in the first place. Special coatings prevent proteins, salt crystals and calcium carbonate deposits from sticking to the surfaces of plants or system components. The difficulty in achieving this is that the types of deposits vary depending on the materials used to manufacture the plant and the liquids used. Scientists have now found a way to adapt the coatings for a wide variety of different industrial applications and loads. They achieved this by "custom tuning" the structures and surface energy of the coating surfaces. One important variable in this formula is the surface energy of the coating. It determines to what extent deposits are able to cake on. "The range of properties relating to these layers range from high wear protection through to an extreme anti-fouling effect. With the help of special process technology, we are now able to create practically any desired property", explains Dr. Martin Keunecke, Head of Department for New Tribological Coatings at IST.

The coatings are made up of carbon and other elements and are just a few micrometers thick. That corresponds to approximately 50 times thinner than a human hair. Both extremely hard and durable, carbon layers are characterized by excellent anti-corrosion and anti-wear properties. Their surface energy, and thereby cohesive properties, can be further reduced by integrating non-metallic elements such as fluorine and silicone. This leads to an additional anti-fouling effect. "Depending on the type and quantity of the elements used, we are able to control the properties of the coatings in a targeted way", explains Dr. Peter-Jochen Brand, Head of Department for the Tribology Transfer Center at IST. "This is necessary because industrial plants are subjected to a wide range of differing stresses resulting from liquid substances. Just consider milk processing or fruit juice manufacturing in the foods industry, paint production in the

chemical sector, production of medications in the pharmaceuticals industry or the transportation of crude oil."

Strong demand for anti-fouling solutions

Industry currently uses carbon-based coatings primarily in order to reduce friction and wear. Although already in great demand, anti-fouling applications are still in their infancy. For this reason, Keunecke and Brand are anticipating fresh momentum from the market as a result of their innovation. The scientists will demonstrate the versatility of their new anti-fouling coatings at the Hanover trade fair by way of a recreated fountain. Here, water runs over the variously tuned surfaces and forms – depending on the degree of the anti-adhesive effect – different droplet patterns. "Now that we understand how to individually configure the layers, the next stage involves tackling the question of how to most efficiently produce the coated equipment. Anti-fouling already works extremely well for external surfaces, however, internal coating, for example for pipes, is anything but straightforward. For this reason, we are now collaborating with industry and research partners to create new manufacturing processes", concludes Keunecke.

Water droplets on a steel surface with anti-fouling coating. (© Fraunhofer IST) | Picture in color and printing quality: www.fraunhofer.de/press

Non-glaring photovoltaic installations

The pilot is about to land the plane, when he is suddenly blinded by glaring brightness created by a large-scale photovoltaic installation reflecting the sun. These blinding events create major safety hazards in the vicinity of airports. They also increase the potential for accidents when near highways. For this reason, before a photovoltaic installation may be constructed, engineers calculate, for some selected days in the year, when and where the interfering light reflections occur, especially if airports, highways or larger residential areas are close by.

In the future, this will be easier and more comprehensive: with software that creates a three-dimensional depiction of the glare at the touch of a button. It is developed by researchers at the Fraunhofer Institute for Applied Information Technology FIT in Sankt Augustin, Germany together with their colleagues from the State Office for the Environment, Protection of Nature and Geology in Mecklenburg-Western Pomerania and various solar planners. "The software creates a 3D view from all sides for any time of the day or time of the year," says Alexander Wollert, a scientist at the FIT. "We recreate the entire scene in a three-dimensional room, with a map, elevation profile, sun, three-dimensional buildings and photovoltaic installations." The researchers also simulate the course of the sun and the blinding for each time unit and in any direction. They take into account the elevation of various ground surfaces as well as obstacles, such as trees or noise barrier walls.

Determining the reflections

The planners can randomly move the installation around the monitor screen and immediately determine when and where it will cause problems. They determine at what position of the sun, at what time of the day and during which season the solar modules cause glares, and in which directions the reflections point. For example, do they affect residents, how often and how intense? And what can be done to prevent glares? For example, the planners of the installation can change the orientation and tilt angle of the elements. If that is not enough to mitigate the effects, the software can simulate modules with a somewhat more matte surface. They reflect the sun far less than traditional models; however, they are also more expensive.

The researchers have set up and tested the software for the region around the Frankfurt airport. Building on that, they are now developing a version that is intended to help the operators of photovoltaic installations throughout Germany. "The software downloads its map material dynamically from the Federal Agency for Cartography and Geodesy," explains Wollert. "It automatically downloads the required map material from there, as well as analogous contour maps. The software combines this information into a three-dimensional view of the respective surroundings, which form the basis

for all further calculations." Wollert expects the software to be operational in the coming year.

The application is also of interest for private installations, because sometimes lawsuits are filed when neighbors feel bothered by the glare. In the future, the software could help avoid this problem. Used as service for engineers or planning agencies the peace among neigbors could be preserved.
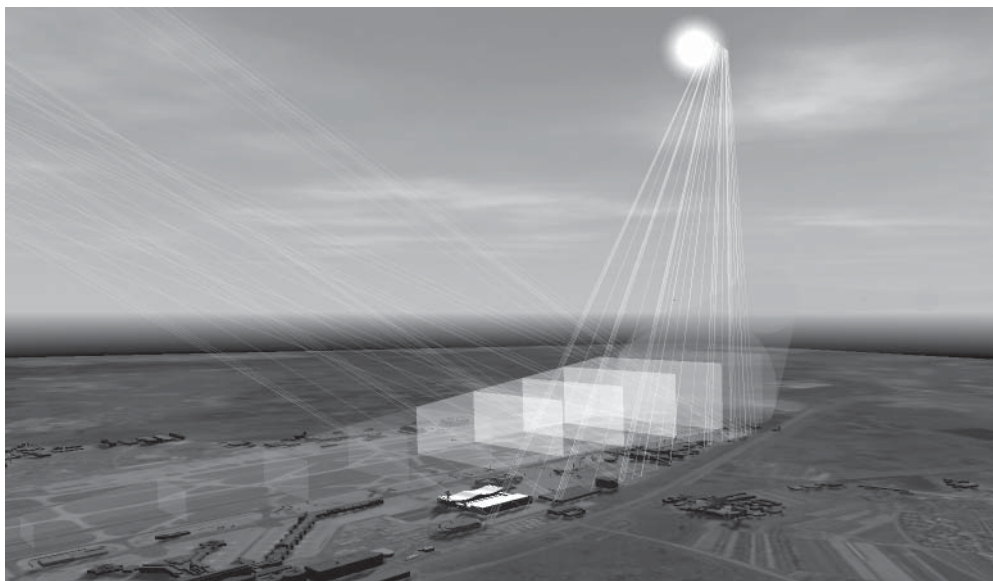
A new type of software calculates where and when planned photovoltaic installations can cause glare – such as the region around Frankfurt airport. (© Fraunhofer FIT) | Picture in color and print-ing quality: www.fraunhofer.de/press

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Heart muscle cells from the laboratory

During a heart attack many heart muscle cells can die within a very short period of time. Because there is little to no regeneration in the adult human heart, frequently the performance of the heart, and with it the quality of the patient's life, is reduced. For this reason, therapies that replace the dead cells with fresh ones are in demand. Since this is not possible with adult stem cells and the use of embryonic stem cells is morally questionable, the only alternative is to acquire the heart muscle cells from the progenitor cells of adult humans.

A research team from the University of California in Los Angeles (UCLA) and the Fraunhofer Institute of Interfacial Engineering and Biotechnology IGB in Stuttgart, Germany are now one giant step closer to realizing this objective. "We were able to create cardiovascular progenitor cells from the cells of adult mice and change them into functioning heart tissue," reports the IGB's Prof. Katja Schenke-Layland. To do this, day and night the researchers observed the not yet specialized cells, waiting for just the right moment to implant them into the heart muscle tissue. "In the next step we'll have to transfer this process to humans and speed it up more so that the first patients may benefit from the new method," amends Schenke-Layland.

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High-quality animal feed – efficiently produced

For most owners of dogs and cats, only the best food is good enough for their four-legged friends. It must contain all of the necessary nutrients, be healthy, high quality and long-lasting. The demands made of the manufacturers are correspondingly high. For optimized energy density they add fats to the dry pet feed. Feed is produced in various shapes by pressure, shear forces (friction) and temperature using an extrusion process, while adding water. After drying the fat were sprayed on the surface of the extrudate. This process is called coating. To achieve a fat-free surface, vacuum coating is used for very high fat contents. This is a very time-consuming production step that takes place after the extruded products have been dried.

Researchers at the Fraunhofer Institute for Process Engineering and Packaging IVV in Freising, Germany, in close cooperation with manufacturers of animal feeds and facilities, have now developed an accelerated extrusion procedure that doesn't need this time-consuming vacuum coating process step. The scientists do not spray on the fat,

but rather encapsulate it in an oil-in-water emulsion that they feed directly into the extrusion machine. The pre-emulgation is intended to protect the fats better from external influences. The experts achieve high fat contents with their method, without negatively affecting shelf life, nutritional content or the physical characteristics of the dry feed.

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Forms complete themselves

The piles of forms that companies have to send to government authorities are enormous: For example, hotels have to report their occupancy rate, the number of their employees as well as their salaries to state statistics offices, and when employees are hired or leave they have to report this to the social insurance carrier. For companies in Germany, it is estimated that there are more than 10,000 of these reporting requirements. At the same time, the companies must know the rules and regulations required by the authorities, on one hand – meaning they must know what information must be submitted and how often. On the other hand, completing the forms is work.

In the future, this could all be done automatically with the "P23R" Process Data Accelerator (Prozess-Daten-Beschleuniger, www.p23r.de). A consortium of 12 organizations from the business and science communities as well as the Rhine-Neckar metropolitan region engineered the methodical, organizational and technical elements required for this. The consortium included five Fraunhofer institutes: Experimental Software Engineering IESE, Open Communication Systems FOKUS, Software and Systems Engineering ISST, Industrial Engineering IAO and Secure Information Technology SIT. The task of P23R is to automatically prepare the relevant company data and to either send it for release to an authorized company representative or – if so desired – to the respective government authority, also independently. The architecture framework of the P23R is complete. Companies such as BASF and DATEV have already performed trial runs with the P23R.

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