Lighting up the lives of the elderly -- adaptively (Video)

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(PhysOrg.com) -- Artificial light affects us in subtle ways. At its best, ambient lighting can relax, soothe or excite, but used poorly it can drain us of energy and disrupt sleep. What if lighting could adapt automatically to meet our individual needs?

The result, say a team of European researchers, would be an improvement in the general wellbeing of anybody who spends long periods in artificially lit buildings, particularly the elderly and the infirm, but also factory and office workers.

“Studies have shown that the quality and type of lighting can have a significant impact on our health and comfort,” explains Edith Maier, a researcher at Vorarlberg University of Applied Sciences (FHV) in

Austria.

Maier coordinated the EU-funded Aladin project which brought together academic and industrial partners from Austria, Germany, Hungary, Italy and Romania to develop an innovative ambient lighting system that adapts intelligently to individual needs and wishes.

The system uses information from biosensors worn by the occupants of a room or building to determine what users are doing and then changes the lighting accordingly. The researchers' goal is to use the technology to improve the wellbeing of the elderly, people suffering from age-related illnesses and people with reduced mobility, many of whom spend a lot of time confined indoors.

"Poor lighting can accentuate existing vision problems and reading difficulties among the elderly, it can cause depression and disrupt sleep cycles," Maier says. "By automatically adapting the lighting in a room to what people are doing, many of these psychological and physiological problems can be reduced."

Most adaptive ambient lighting systems in use today do not take individual needs and activities into account. They rely instead on a preset-time cycle to brighten and dim during certain periods of the day. In contrast, the Aladin system uses data from sensors in a glove worn by users to measure their heart rate and skin conductance response - the electrical resistance of the skin which goes up during periods of activity and down while at rest. Fed wirelessly into a control system, the bio-data lets the system know automatically when to switch between a brightly lit "active setting" and a more subdued relaxation mode.

Soothing to sleep, awakening refreshed

"If someone is trying to concentrate on a task, such as reading a book or

sewing, the light in the room will intensify, but if they are simply relaxing or trying to sleep it will dim," Maier explains.

And just as a sunny day brightens our mood, the system could be used to gradually awaken users to a cool, bright light in the morning so they get up feeling refreshed, and lull them to sleep with a subtle glow in the evenings. The system settings can be changed by users via an easy-to-use interface accessed through a TV screen and remote control.

The Aladin researchers are also studying ways in which different intensities and colours of light can be used to assist mobility in a building, such as by automatically highlighting obstacles and dangers. "This could be particularly useful for people suffering from dementia who can easily become disorientated," Maier notes.

More than a hundred people participated in a series of lab and field tests conducted in Austria, Italy and Germany. The trials showed that elderly people quickly learnt how to use the system and, over the course of three months, experienced improvements in their general wellbeing, including less trouble reading and less disturbed sleep patterns.

Though the prototype system was designed to be installed in a single room in a private home, Maier believes that the real market for the technology is in care homes and residential buildings built specifically for the elderly.

One reason is cost. Building and installing each prototype system cost between €10,000 and €12,000, and even taking into account economies of scale Maier expects a commercial version to run to €5,000 for an individual installation. On the other hand, in a large building, such as a block of apartments or a care home, the price of the installation per resident would be reduced considerably.

With Europe's population ageing, many more care homes and elderly residences are being built, creating a large market for technologies that can improve the quality of life for elderly people and keep them active and less dependent on others for longer.

Maier sees the Aladin system initially being used as part of building management systems that control not only lighting but also temperature, communications and safety. She also sees potential for the concept to be used in factories and offices to help improve the productivity of workers and even in vehicles to help keep drivers alert and awake.

"Because the Aladin system is built using an open and modular architecture it can easily be integrated with other systems," the project coordinator notes.

Project partners are currently in talks with several lighting companies with a view to developing the Aladin prototype into a commercial product. They plan to showcase the results of their work to an international audience at the Human-Computer Interface International (HCII) conference in San Diego in the United States in July.

The Aladin project received funding from the ICT strand of the European Union's Sixth Framework Programme. Edith Maier and Guido Kempter of the University of Applied Sciences, Vorarlberg, Austria contributed to this release.

More information: www.ambient-lighting.eu/

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