

Ambient intelligence

Wired environments keeping the human firmly in the loop

Nils Leffler

Homes and offices epitomize the integration of the *human in the loop*. Technology is being used more and more to provide for comfort, entertainment and security needs, and to enhance productivity. During office hours, workers rely on modern computer technology to provide a whole range of services, from e-mail to electronic reservation systems for rooms and equipment. Such services must function efficiently in an integrated network, allowing users in different locations to communicate with one another and access centralized resources. At home, the simple act of recording a favorite television program should not involve hours of pouring over complicated user manuals. Design requirements for intelligent devices are dominated by ease of use, but they also include reliability, energy efficiency and affordability. New technologies are being wired into homes and offices to provide ambient intelligence, with the human clearly in the center.



Ease of use

Ambient intelligence refers to an emerging technology that “will increasingly make our everyday environment sensitive and responsive to our presence” according to a recently published book [1], it will transform homes and offices into “intelligent” environments. “This vision requires technology invisibly embedded in our everyday surroundings, present whenever we need it that will lead to the seamless integration of lighting, sounds, vision, domestic appliances, and personal healthcare products to

enhance our living experience”. Lights will be switched on and off, and blinds will be moved up in response to a range of stimuli, including human activity. Such automation will provide enhanced comfort and productivity, and will reduce energy consumption. It will also provide better communication and security.

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In keeping with the modern trend for user-friendly intelligent technology, ABB’s company, Busch-Jaeger Elektro GmbH, has launched easily programmable touch sensitive display units **1** combined with a range of motion sensitive switches **2** and alarm units under the brand of “Smart&Lean”. These products can be incorporated into networks to control everything from music and lighting to blinds and security alarms. The units monitor human activity using infrared motion detectors, and each has a number of operating modes to satisfy the specific needs of its allocated area. These adjustable modes range from fully automated to fully manual. Heating and cooling functions can be integrated into the system alongside lighting controls, with individual thermostat settings being specified via the central display unit. Key to the success of these devices is their ease of use, combined with elegant design **3** and longevity.

Lighting settings need to be controlled for a number of reasons. Aside from creating the right ambience at a dinner party, building managers may want to reduce electricity consumption by installing timed off-switches in corridors and other communal areas. Or they may want to reduce the risk of accidents by providing motion-sensitive on-switches in dark stairwells. Whatever the reasons, programming the appropriate settings must be quick and easy, and more than one setting must be available. A reading room and a living room have very different

lighting requirements. But what if the reader wants to read in the living room? The change from one condition to the next should be achieved by the touch of a single button.

The integration of a music system under similar control would further enhance the desired ambience in a room. The incorporation of a service record, listing of maintenance schedules and equipment renewal dates, would enhance the efficiency and safety of many buildings.

Safety and security

For most people, home is a sanctuary in which peace of mind resides. Unfortunately, this is not universally true and demand for better home security systems is increasing. The integration of additional functions alongside ambience settings in an intelligent environment can provide considerable benefits to the home owner. Such features are now easing their way onto the market. Functions include “door unlocked” and “window left open” warnings and alarms for security motion detectors **4**, along with the more standard alarms and audio features. A more advanced feature allows lighting and blind settings to be recorded in a home over a week of normal occupancy. This sequence can then be replayed during periods when the home is unoccupied. The “simulated presence” provided by this function gives the absent occupier a feeling of comfort, knowing that the house appears to be in use. The application of video surveillance equipment takes security monitoring to a higher level, even allowing remote surveillance of properties.

Energy efficiency in the future

As demand for electricity continues to grow, periods of peak load are becoming more difficult to handle. To avoid black outs caused by excessive demand on limited supplies, electricity generators offer cheaper tariffs to encourage off-peak use. By incorporating this information into the integrated control systems of homes and offices, significant savings can be made. On a larger scale, control systems of the future will allow functions to be prioritized so that non-essential services can be reduced or suspended

1 Display unit – house overview



2 Movement sensitive switch



3 Display unit – profile



4 Alarm unit



launched a range of Lean&Smart devices that can be networked to control lighting, blinds, screens, room heating and cooling, alarms and intercoms. Embedded sensors measure temperature, light levels, wind speed and human activity, giving rise to audible/visible alarms or mechanical responses. The network is based on the ABB's i-bus EIB that allows the integration of environmental control, entertainment and security systems, and more. It is configured via a user-friendly, ergonomically designed touch panel through a series of easy to read screens.

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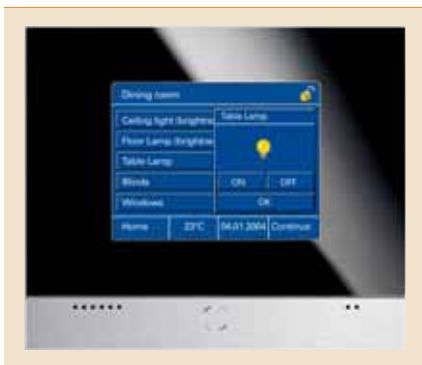
The system operates under the guiding principle that technology should serve the user – not the other way around. This guarantees that ambient intelligence will enter homes and offices unobtrusively, relieving the human occupants of tedious responsibilities, while keeping them firmly in charge of the loop.

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Reference

[1] E. Aarts, J. Ecarneao, True Visions, Springer-Verlag Berlin Heidelberg 2006

5 Display unit – house panel, drilled down to a single room



areas 5 and can be configured to meet the needs of individual end users.

The information bus, on which the system is based, is the ABB i-bus EIB. For programming and commissioning purposes, a multimedia/SD (secure digital) card is the preferred medium, but modifications can also be handled via the EIB bus and a simple computer-EIB interface (RS 232 or UBS).

The infrared motion detector in each Busch-Jaeger comfort switch has a range of 170 °C, so little escapes its attention. The switches use two-wire technology combined with an external input to provide convenient integration into any cross-connection. The system is inherently safe and can be installed with minimal disruption to existing services.

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Conclusion

The intelligent building is gradually becoming a reality, but its success depends on the development of systems that are easy to use. ABB Busch-Jaeger has taken on this challenge and

when the risk of network overload is imminent. To implement these features, each individual appliance must be accessible remotely and low-priority appliances must be distinguishable from more essential equipment such as alarm systems, computers and freezers. This will allow electricity providers to define schedules for each level of equipment, and to shed loads accordingly. The same information bus used for the integration mentioned above would provide the backbone necessary for such energy efficient use of equipment.

Technology from Busch-Jaeger

The Busch-Jaeger system is centered on a fully graphical, LCD panel 5. The touch-sensitive panel is used to display and operate up to 210 switching and control functions via overviews and drill-down screens. The screens define individual rooms or