

HOME AUTOMATION

What Is It And How Does It Affect Future Housing?

Home automation involves an integrated system of monitors that automatically operate different functions such as lighting, heating, cooling, ventilation, appliances, entertainment, and security. The homeowner can program, control, and monitor the house by keyboard, "touch screen" controls, and even by telephone. Such systems for the residential market require mass production and simple installation.

Types of Systems

The three types of home automation controls are individual control devices, distributed-control systems, and centrally controlled systems.

Individual control devices manage only one appliance or function such as programmable setback thermostats, motion detectors, occupancy sensors, photocell lighting controls, and timers. Individual control devices are used in a wide variety of successful applications. These range from outdoor lighting to security sensors. The VCR when programmed is also considered an individual control device.

A distributed-control system uses standard electrical wiring, telephone wire, video wire, radio frequency signals, and infrared signals. Microchips must be installed in appliances or outlets to allow communication over regular home electrical wiring. A central controller is not required although keyboard entry is possible using telephones or personal computers. Homeowners can use a television set to monitor the system's status.

Centrally controlled systems route signals between a central computer and appliance controllers or sensors. This system can control all appliances whether microchips are present or not. If the controller fails, however, the whole system fails. In a "smart" home system, a central control system allots incoming household electricity to a distribution unit in each room of the house. The distribution unit or network box only provides power upon request by a "smart" appliance. "Smart" appliances have microprocessor chips that enable them to "communicate" their identity, power demands, and functional status to the network box when the appliance is plugged in. If the system determines that all is well, the network box

sends power to that outlet. If the network senses potential danger, such as a frayed cord, or appliance incompatibility, power is denied to the outlet. An outlet is only "live" when used by a compatible appliance.

Natural gas outlets can also be placed throughout the house, using easy-to-install semi-rigid stainless steel piping. Gas appliances such as a stove, outdoor grill, or clothes dryer could be "plugged in," accessing gas from the system as needed. The network is constantly monitored for leaks, improper connections, and other malfunctions. If a problem is detected, gas is denied to the outlet. Another feature of this system is that the interactive household system would automatically detect smoke and shut off the flow of gas from the main valve preventing gas-fueled house fires or explosions.

Energy Savings from Home Automation Systems

Security, fire safety, and home entertainment systems figure prominently in the marketing of this "space-age" technology. The home automation systems should save significant amounts of energy because of features such as automatic shut-off sensors and occupancy sensors. There are also potential indirect savings through utility load-shifting programs or time-of-use rates.

Photosensor, Occupancy, and Remote Control of Lighting and Appliances

Individual device controllers were the first energy saving applications in home automation systems. Occupancy sensor technologies save energy and money by limiting lighting, appliances, and heating and cooling use when rooms or zones are unoccupied for a certain length of time. A photosensor adjusts the lighting in a room to take advantage of daylight; heating, cooling, and ventilation systems (HVAC) can be adjusted to account for passive solar heat gains. Such systems connected to a home automation system can also be turned on by telephone, so the home is comfortable when the owner arrives.

Load Shifting and Load Management

One energy-saving option is peak-load shifting. Many "smart" appliances can be programmed so that homeowners can take advantage of lower utility rates at times when the demand on the utility is low. In the near future, home automation systems will communicate with local utility companies so that certain appliances such as washers, water heaters, and HVAC systems are automatically deactivated during the peak demand periods. Many utilities are experimenting with real-time pricing methods that involve directly tying the marginal price of electricity to the marginal cost of producing it. Your home automation computer would receive the real time price of electricity or gas from the utility. It would then operate the house in the most cost-effective way based on preprogrammed instructions.

Staged Power Return

Another utility interactive feature that home automation supports is an option for staged power return after blackouts. Because it requires a great deal of energy for utilities to restart a power plant after a power failure, a staged return of power is important. Utilities will be able to control the rate at which power returns, first issuing electricity to essential home appliances, such as heating or refrigeration, then to the remaining appliances.

Thermal Storage

The storage and release of thermal energy by computers is a common strategy for commercial and industrial facilities. Home automation systems would make it more feasible to operate such systems. The heat that can be generated by conventional or renewable means during off-peak hours can be

stored. Chilled water tanks or ice storage provide a similar function in summer cooling seasons.

Zoned and Programmable HVAC

Home automation systems that control temperature within different zones of a home operate as programmable thermostats and regulate household temperatures on a room-by-room basis, instead of the whole house. For example, rooms in which the family spends a great deal of time can be allotted heat on a more regular basis than seldom-used rooms. When hooked up to occupancy sensors, the zones are only activated when occupied.

In one high-tech application, people carry sensors that are programmed to their personal preferences. The system reads the sensors when people enter a room and adjusts the environment accordingly. The possibilities are limited only by the imagination.

Air Quality

A home automation system could control the ventilation and the humidity as well as the heating and cooling systems. In many tightly constructed, energy-efficient homes, most of the air quality issues could be solved.

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