

# **Domotics and the Automated Home**

## **Part I. – The Introduction**

Imagine a house that alters its environment based on how its occupants interact with it. Imagine having a remote control that operates most of the systems in your house, and then imagine having a computerized servant available at your vocal command. These dreams have transformed into realistic, obtainable goals that a person can likely install alone.

Referred to as a smart home, an active home, an intelligent house, and many other colloquial terms, domotics, and the automated home, is an emerging technology that is more frequently being installed in residential housing. Home automation stems from building automation, the concept of applying automation techniques to systems and electronic equipment. Home automation is a field within building automation pertaining specifically to the automated control of electronics and security systems in residential housing.

There are many benefits of automation. Some benefits may be more obvious than others. Of course, automation is designed to make life easier by providing instant access to multiple resources. This is accomplished with the use of a central controlling system, allowing everything to be controlled from a single point. Furthermore, additional controls can be used to communicate with the central system from a remote location. A second benefit is that automation provides a means of shaving minutes off of one's daily routine. This can be done in a variety of manners and is customizable by the operator. It is normally accomplished through the use of timers and the installation of sensors. These instruments allow an automation system to run itself without user input by understanding occupancy and time of day. A third benefit is that automation allows an easy way to trim the utility bills. No longer worry about lights being left on and appliances running unnecessarily because scheduling can be made so that all, or only some, electronics are turned off. Moreover, some monitoring systems include methods to track electric usage. Other benefits can be realized through a fully integrated automation system such as multimedia accessibility, entertainment, video monitoring, increased security, and remote access.

Automation has become appealing to people of all ages, as most systems are designed for ease of use and flexibility of system peripherals. Younger people will find the multimedia engagement very fascinating as multiple systems can be controlled with the touch of a button, or better yet through vocal commands. Older people will be more interested in automated lighting and appliances and with the integration of a security system and video monitoring.

## **Part II. – System Options**

Advancements in communications' and electronics' technologies now allow for household lighting and appliances to be automated. This can be accomplished in a few ways:

The first is to put low-voltage, control wiring in the electrical wiring of the house. This is the most difficult, but it is also the most reliable. Only a certified electrician should do this type of installation, and it is best to install before construction is completed. Wires are fed from a control board that can then be controlled by remote controls and timers. This can cause problems in an existing structure as walls, ceilings, and floors are potential barriers to easy installation. Installation after the studs are in place is the optimal time in order to prevent unforeseen costs that arise from extra labor, extra wiring, and the destruction and repair of drywall.

A second option requires a powerline adapter that connects the control center to the existing wiring of the house. Modules are placed on lighting, appliances, and other electronic equipment to allow for control over individual systems. Currently, no standard exists to relate how different devices communicate through existing power lines, but several protocols are emerging to fill this void.

A third option, probably the easiest but the least reliable, requires the use of a two-way transmitting module that attaches to the control center. This technology uses radio frequencies to connect all the modules together. Devices are tuned to a specific frequency where signals can be transmitted. Drawbacks with this mode of operation are a limited range of reception and the possibility of mixed signals through radio interference.

Additionally, most automation technologies can be intertwined to work alongside each other. The best home automation systems will incorporate all of these technologies to reach the desired end-goal of complete automation throughout the property.

Domotics uses controllers, sensors, and actuators to accomplish the automation desired. The controller is the unit used to control the functions of the system and can be individually operated with a simple command, or it can be activated through a series of events designed to activate a system. Sensors detect a change of state in the system and report change as a signal to the central controller, which can alter its use through actuators. An actuator is the mechanical device that drives the movement of a mechanism or system.

The brain of the automation system is operated through a local control point, which can be a computer with automation software installed or a control panel with a LCD display. This is the access point for all of the automated systems, and all commands run through this point, operating the individual controllers, sensors, and actuators. The central access point is then made available through the use of remote access points, in the form of switches, remote controls, and display monitors. In fact, some systems have voice recognition enabled, and – with the use of microphones and speakers – can communicate system status and control individual systems through vocal guidance. In fact technology advancements have made available a system that can be operated and monitored via telephone from anywhere across the world, granting a user twenty-four hour access.

Home automation is designed around the idea of making life easier and more enjoyable for the user. While all of the technologies claim to be the end-all resource for automation, many devices have been found to be unreliable. Many companies will also proclaim the unlimited abilities available with a particular system but will fail to mention the numerous additional accessories that must be purchased. All-in-all automation is a great technology with exceptional intentions, however, many nuances still overly complicate the systems, leaving them unreliable at times. Be sure to do the research on the automation system and the manufacturing company before making a single purchase.

### **Part III. – An Example of System Performance**

Pretend for a moment that an automation system has already been installed and fully programmed in a household. A system that is well integrated can process a vast amount of automated functions and can alleviate stress throughout the day by simplifying every day tasks. This example will be a fictional day in the life of James and Jessica Smart.

It is early Monday morning and the Smart house is dark and quiet. The only noticeable noise is the pleasant whisper of the ceiling fan whirling continuously. At six, James' radio alarm will announce to him that the day is ready to begin. This is the same time that James' automated morning routine is scheduled to start. As James rises from his slumber, the bathroom light has already been turned on and dimmed to seventy-five percent brightness and the bathroom fan has been engaged. The Smarts' home automation system is also preparing coffee and turning on the radio, because James likes to listen to the morning news and traffic report while enjoying a cup of coffee before he leaves for work.

James finishes his coffee, checks what time it is, and notices he is running late. James pushes a button on the kitchen's remote control pad to turn off the coffee maker, the radio, and the lights he had manually turned on, he grabs a few things, and rushes out the door. James races out of the driveway and down the road towards work, regrettably forgetting to shut the garage door in his haste to leave. No worries though.

A few minutes pass when Jessica is awoken by the home automation system's voice alert stating, "Excuse me, I believe that the garage door has been left open." She acknowledges the alarm and vocally commands that the door be closed by saying, "Please close the garage door." (Many of the voice-activated systems are customizable with personalized questions, answers, and phrases entered by the user.) Jessica Smart has several errands to run today and decides to get right to them. She decides to input a grocery list while she is getting ready. As Jessica repeats the items she needs from the store, the computer saves the information in a printable form for easy retrieval. Jessica then prints the list and is off to do her errands.

The Smart home has automated several scenarios to initiate at different points throughout the course of the day. On Jessica's way out she presses the security system key on her keychain remote control. This not only activates the security system, but also cuts power to all the unnecessary appliances and turns down the HVAC demand through the interactive, programmable thermostat. Other simple tasks also can be automated to run while out of the house. The Smart's sprinkler system is automated to turn on and water the lawn, dependant on user-defined rules and the current weather forecast. The Smart's video monitoring system records any activity inside and outside of the house.

Both James and Jessica have installed transmitters within their cars that notify the automation system that they have arrived home. This allows a more personalized greeting and scenario based on whom is arriving. If James pulls into the garage, the computer might say, "Hello James, how was your day?" At this point James could have several user-defined phrases that are at the computer's control, leaving the possibility for more interactivity. Because the system knows who has pulled into the garage, it can set up defined mood and lighting scenarios. When Jessica comes home in the evenings, the porch lights, garage light, and kitchen lights all turn on, as well as some smooth jazz – for relaxation – quietly playing in the kitchen.

When it is time to for a rest, James or Jessica can have a simple verbal command to activate a "sleep" scenario. All the lights will turn off and the ceiling fan will begin its innocuous whirling whisper. The automation system will be put into a standby mode yet still remain active, awaiting its next command.