Implementation of Iraqi smart home system

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Abstract :

The world of Smart Home is expanded recently, everybody in the world wishes to have a home that can think, solve problems, manage environment, guard itself, or even anticipate needs. These are desirable features in any home but high electricity failure & blackout and the Iraqi life style which system more difficult to implement, in addition to that already company standard build smart home systems are expensive, hard to install, complicated and cannot solve problems arises in our country this is because of lack of public services and most people spend more time in their homes rather than leaving it for a long time (which most smart homes depends on).

The proposed system is a simple, easy to implement, inexpensive, efficient and can be incorporated easily in Iraqi building style to manage our homes and lives.

issues such as lightening, temperature management, guarding the house and its perimeter, managing electricity, bringing the luxury of voice activation for many of the house appliances, managing water reserve are desirable features.

The main idea is to spread many sensors, actuators and electronic switches around the house connected with standard twisted pair wires that arrive to a central power management board connected to a portable PC that represent the brain of the house controlled by a sophisticated expert software that manage the whole.

1. A look at System states and behavior [1, 2]

The system has a number of states and behavior to cope with the home owner life style, it can also incorporate new states and behavior according to life's demands

1.1 Early morning (Waking Up) [1, 2, 3]

At 5:30 a.m. (or according to home owner's setting) the Smart Home system is starts working before the home owner and his family.

After a the night with the temperature turned down or up according to climate in rooms other than bedrooms to save money, the Smart Home system reads the value of the thermostat to know the actual temperature to start warming up or cooling the house. By 6 a.m., the house is in a nice temperature and now it's time to get up. As the security system is automatically deactivated, the lights in the master bedroom come on at a low level. Over the next couple minutes, they get a little brighter. Simultaneously, soft music or wake up alarm (according to home owner setting) is played into the room. The lights in the children's' rooms remain out and they don't get the serene wake-up music they don't have to get up for another half hour.

The teapot started automatically, so by the time home owner makes it downstairs, there's a fresh pot of tea ready to go. Outside, the sprinklers are already spraying, watering the garden and lawn with some water. After a few minutes, they shut off by themselves. If it had rained during the night, a sensor in the lawn would have indicated that the lawn had plenty of water, and an automated sprinkling wouldn't have been necessary. As such, the sprinkler would not have come on, saving on water usage.

1.2 During the Day [2]

After everybody are off to work the Safe Home system is armed and security concepts are engaged to protect the home from trespassing, the security alarm is set and the Smart Home turns off all the lights the kids forgot about.

There are a number of sensors keeping the house safe and secure, they are motion sensors, door and window sensors, and fire detectors, all making sure everything is safe. a number of security cameras are activated and starts recording video feed on the hard drive. If a person at least remains at home then the internal motion detectors are deactivated and temperature control is online to maintain comfortable home atmosphere to the person at home.

Potential disaster could threaten the house while everyone was away at work the washing machine or toilet seat or any other plumping has overflowed onto the bathroom floor. Luckily, when this potential disaster occurred, a sensor detected the spill and immediately shut off the water from the main pipe. This way water didn't keep shooting out, seeping into other parts of the house, and causing untold and expensive damage.

During the day, the home owner checks his house periodically via his web browser. His Smart Home controls are linked via web software, so he can check the status of various items in his home, even while he's at work. Noticing that he can control home's features or watch the security camera feed from the web browser.

1.3 Arriving Home [2]

At 3:30 p.m. (or according to home owner setting) , the heater or cooler automatically turns on, warming or cooling the home, the lights are activated and the security system is disarmed allowing doors and windows to be opened

1.4 A Relaxing Evening [1, 2]

After dinner, the family is ready to unwind after a long day at school and work. When everyone is gathered around the television, things go smoothly. Those times are few not recurrent and far between, however, As such, the home owner watches television

in the family room the lights automatically dim to a level he's preset for watching movies. The kids are upstairs reading and listening to the stereo. The stereo, it should be noted, is physically situated next to the television set the owner is watching.

However, the audio is piped to various speakers located throughout the house and are controlled remotely, so she can listen to whatever she wants, without having to go into the family room.

Smart Home computer is always connected to the Internet, so various Smart Home functions can be monitored and managed from anywhere there is a web browser. Occasionally, the owner uses his laptop with its wireless connection to tweak elements of their Smart Home system.

1.5 At night time (Going to Bed) [3]

Time for bed, once everyone is tucked in, the security system is again set and vigilant for any signs of trouble. If the owner quite ready to go to sleep yet, so he sits up in bed and reads. He turns on the bedroom light immediately over his side of the bed, just a little bit so he can read, but not enough to keep his wife awake.

Meanwhile, music plays softly in the background. It doesn't take long for the owner to be lulled asleep, in spite of his best efforts to get through his book. The Smart Home, however, has been programmed to be aware of the owner's nocturnal reading habits and—at a certain time—turns off the stereo and lights, completely.

2. Smart Home Basics [4]

There is a definite, concrete distinction between what someone needs and what someone wants. Abraham Maslow demonstrated this with his famous "Hierarchy of Needs" in 1943. At the top of his list are such physiological needs as air, food, water, and heat—truly, things we need.

As the list progresses, it gets a little more esoteric with things like "self actualization" and "esteem needs." So what does this foray into Philosophy 101 have to do with Smart Homes? Let's be honest: no one needs their home lighting wired to the garage door opener. No one needs to be able to check their house's temperature from a web browser on the other side of the world. Nowhere on Maslow's Hierarchy of Needs are "integrated home security systems" listed. Of course, it could be argued that's just because Maslow didn't live in this day and age. True, we don't *need* any of the stuff Smart Homes have to offer, but some of us sure do want them. There are a number of benefits inherent to Smart Homes.

First—and for many it's an important consideration—a Smart Home can save money. This is achieved through savings in heating, cooling, water, and other utility costs. Additionally, Smart Homes offer more enhanced security measures, reduce a number of rote tasks, and offer an increase in entertainment. So if we want to smarten up the Smart home system, we want to increase the number of sensors and the diversity of sensor types in addition to increase the programming effort to cope with the daily demand of the home owner, home automation projects that can do anything from control stereo to cascade lights on and off as you walk through the house at night. We can make the Smart Home as simple or as complex as we'd like.

For example, if we just want to be able to dim the lights in the bedroom without having to get out of bed, that is a simple enough project, and it would cost a considerable amount of money. If we don't mind getting out of bed to dim the lights, this will cost a lot less.

2.1 Power source [4, 5]

One of the most important issue in the safe home system implementation in Iraqi community is the power source, this is because the safe home system as any electronic system depends on electricity, a simple yet efficient part of the safe home system concerned in managing the power of the home, at first some modification must be done on the standard gasoline generator if the owner can't afford a larger diesel generator with self starter, any way the gasoline

generator's oil level sensor is connected to the safe home system to monitor the level of the oil inside it, also equipped with a fuel level sensor to inform the safe home system with the level of the fuel in the generator, so if the fuel is low the system will activate an external fuel pump submerged into a larger external tank to refill the generators tank, this will enable the system to maintain the electricity to longer time. See figure 1.1

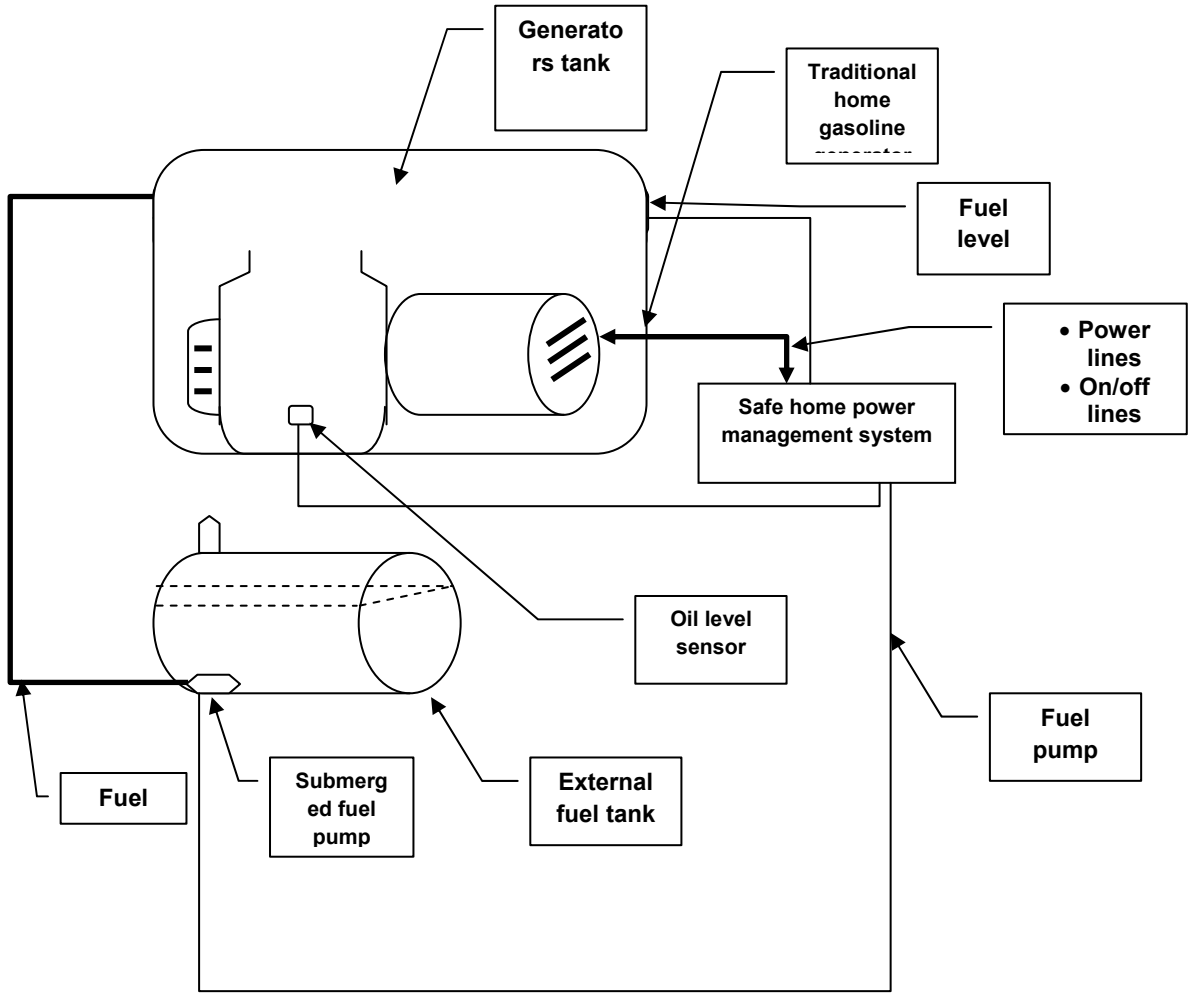

Figure 1.1
Power management system with gasoline generator

If main electricity is present then the system will send a signal to the power management board to change to the main power and disconnect from the generator line and turn off the generator, notifying the owner with the current state of power.

Another way regarding to the issue of refilling the generator is by putting a fine pipe inside the carbonator of the gasoline generator connected to a traditional gas container piped together with electrically controlled solenoids to divide the gas source into independent units see figure 1.3. The system controls the open/close of the solenoids to manage the gas reserve in an efficient way.

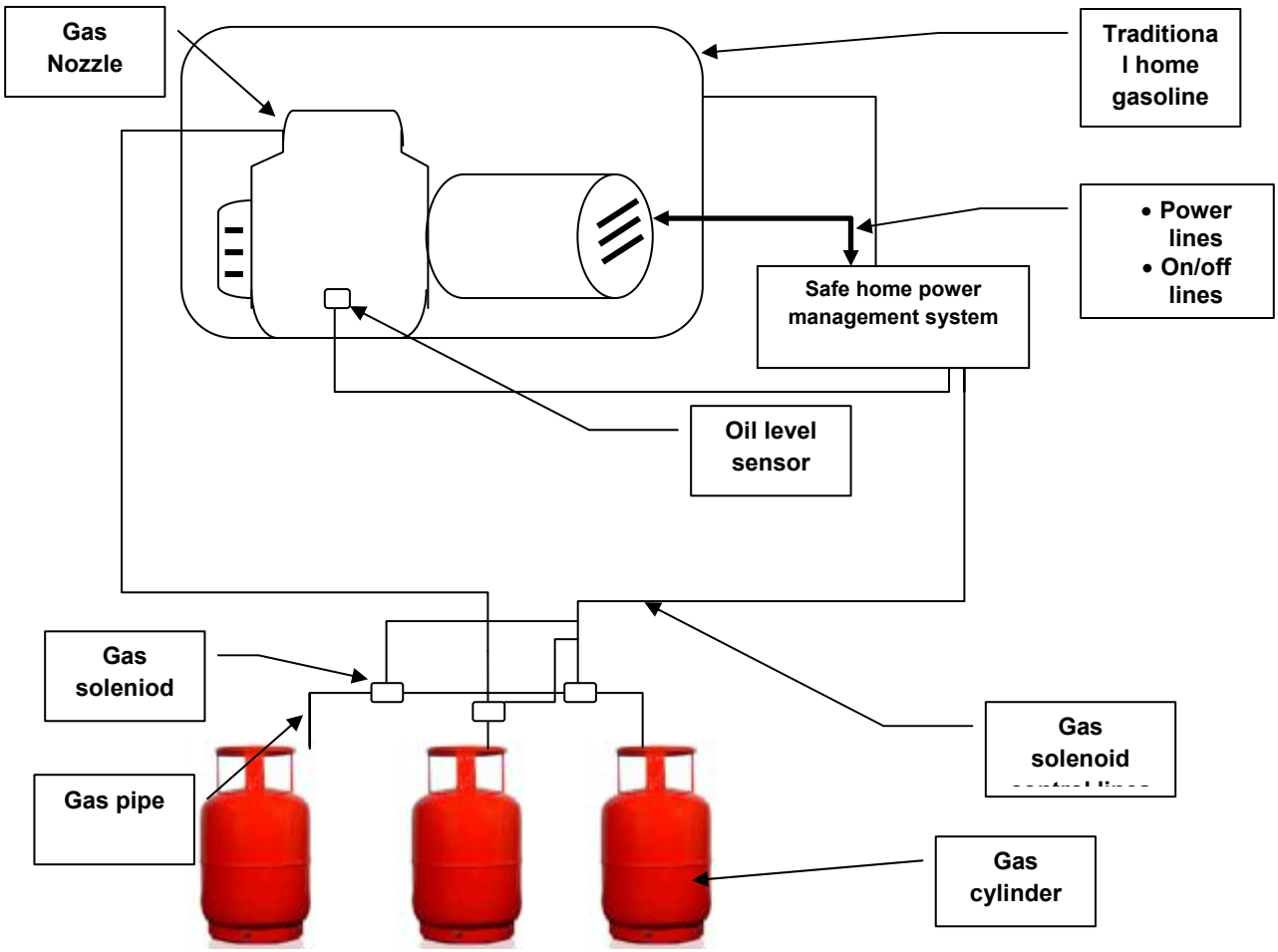

Figure 1.2
Power management system with gasoline generator modified to consume natural gas

Figure 1.3
Gas control solenoid

2.2 Wiring [6, 4]

Possibly the most frightening aspect of Smart Home modification comes when the notion of wiring is brought up. Snaking wire through the house is a chore. However, you don't have to put new wiring in your home for each and every operation. The fact is that new wiring will be necessary for only very actions. For example, if we want to automate a specific set of switches we have to install a LAN cable to that switch, it's a good idea to install some coaxial cable and speaker wire between your home entertainment center and the rest of the rooms, it is also helpful to have installed some Cat 5 cabling when connecting your computers into a home LAN. We use twisted-pair cabling every day, but the name might not pop out and bonk you on the head. The general category—twisted-pair—is used for both telephone and computer networks. It is simply pairs of wires twisted together and encased in an insulating sheath.

Twisted-pair cable is used for a number of Smart Home functions. The cabling is usually 22 or 24 gauge, depending on the function. It is used for

- **Security systems and sensors**
- **Speaker wire**
- **HVAC systems**
- **A/V controls**
- **Computer networks**
- **Telephones**

Twisted-pair wire comes with different numbers of wires, depending on the type we buy. The number of wires in the cable will depend on how many systems you need to connect.

Twisted pair comes in two types see figure 1.4:

- **STP (shielded twisted pair) A two-pair cabling medium encased in shielded insulation to limit electromagnetic interference of signals.**
- **UTP (unshielded twisted pair) A four-pair cabling medium not encased in shielding. UTP is used in most computer networks.**

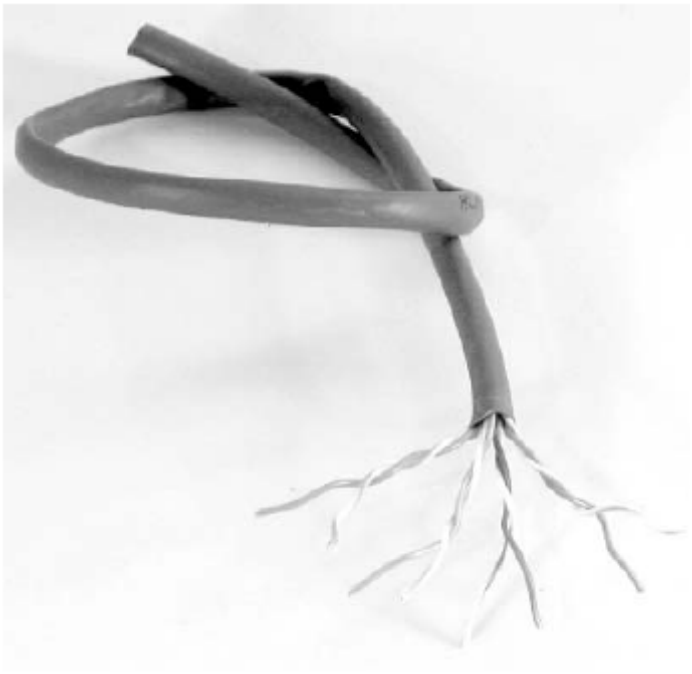

Figure 1.4 typical twisted pair cable

In the smart home system we use UTP type because the cables carries voltage signals to activate the 5 volt relay rather than carrying data see figure 1.5, so interference voltage dose not affect the wiring of the smart home system.

Each electricity switch is equipped with a relay corresponds to the device or the switch that we want to automate using our smart home system, this relay are connected via the twisted pair cable this enables us to operate 7 devices per one cable wire (one for ground) all the twisted pair cables arrive to a central control board that is responsible for managing and controlling the home, its contains a buffer to maintain the status of the device been activated or deactivated. The safe home system management software reads the contents of this buffer to know the status of the entire home.

Figure 1.5 the relay

2.3 Water reserve management [4]

In order to bring comfort to the home owner one of the facilities that this smart home system has is managing the water reserve of the home using the water container at the roof of the house and water level sensor to know the level of the water in addition to a water pump, each time the water level in the tank is running low the system activates the water pump to fill the tank with water, of course this is done when the power consumption of the whole house and the water pump will no exceed the power subscription with outside generator or power source, otherwise the pump will be active.

2.4 Security [3, 6]

What would a Smart Home be without a security system? Though most security systems are designed as stand-alone units—whether they are monitored or not—many can be controlled as part of a Smart Home set up, For example, if you're at work, you can use your web browser to check on your home security system. If one of the sensors is tripped, not only can you set your security system to contact the monitoring station, but it can also turn on your TV, stereo, the exterior lighting, and anything else you want to do to scare off would-be intruders (or at least aggravate your neighbors).

There are also measures you can take to make your home look lived in, even if you're out of town or working late. Setting up some lights on a preset schedule is a preventive measure you can take for the cost of just a few amounts.

There are several different types of sensors that can be connected to your security system. Sensors include the following:

- **Motion**
- **CO**
- **Glass break**
- **Open door/window**
- **Smoke**

Take into consideration how these detectors and sensors are to be used in the home and where they are to be placed. For example, we should place a smoke detector on each level but do we place motion detectors covering each door, or will open door sensors be sufficient? Next, you should decide how you want to be notified if one of the sensors is tripped. Will it be enough for you to have the monitoring company notified if the alarm is tripped, or do you want an e-mail sent to your office, or a text message sent to your cellular telephone? You could also have cameras set up outside that can be monitored over the Internet to show who is coming and who is going.

2.5 Garage Door [6, 4]

A garage is in the same quasi–Smart Home category as the home's exterior. While not conventionally thought of as part of the house, a garage door can still be made into a smart place.

Have you ever gotten up in the morning and stepped out into the garage only to find that the door has been open all night? A Smart Home can help ameliorate that mistake and make sure you don't go to bed with the garage door wide open.

Even better the simple act of opening the garage door can be the signal to turn on other devices in your home. For instance, when you open the garage door, the entryway lights can automatically activate, and some nice music can come on, welcoming you home.

One problem in our society is the absence of electricity which it's a problem we have to tackle in all aspects of the smart home system, in regard to the garage door we use an air motor assembly this is because we can store compressed air into the air tank when the generator is active and use this compressed air to use it when there is no electricity to open and close the garage door during electricity failure.

2.6 Home Entertainment [4]

We live in a day and age where there's a TV and stereo in every room of the house. But, if you don't want to buy a TV, VCR, DVD player, video game console, stereo, and satellite dish receiver for each and every room yet still want that availability, the Smart Home can help you. By distributing the signal from your home entertainment system throughout the house. Also a video feed from the security cameras will be piped into to the entertainment system to be viewed in the desired room.

2.7 Utilities [4]

Security systems, computer networks, distributed audio and video signals…could anything else in the Smart Home be as sensational? Well, maybe not the utilities system, but it's still pretty useful stuff. Connecting the Smart Home to a heating, ventilating, and air conditioning (HVAC) system can both save you money and make your home a more pleasant place to live. Just about any home utility—from air to water—can be managed by the Smart Home.

2.8 Integration [5, 6]

Now that we've got all these pieces of the Smart Home in place, it wouldn't be much of a Smart Home if we couldn't manage everything from one central location. This will, most likely, be from your computer keyboard. However, when you're sitting in front of the TV, wanting to listen to music and dim the lights while activating the security system and shutting the garage door, do you really want to get up, go to your computer, and do it? Of course not. What you want is a way to do it right from where you're sitting—you want to use a remote control. Sure, every time you buy a TV, DVD player, or stereo, the remote claims to be a universal remote, but they never are. As such, you've probably got five or six "universal" remote controls on your coffee table and

the last thing you want is yet another remote control. The good news is that if you get a kicked-up enough remote control for your Smart Home, you can manage everything in the house (even your TV and DVD player) from a single, truly universal remote. The bad news is you'll need a holster to carry your new best friend around with you wherever you go. Instead of this approach the smart home system is equipped with voice command feature .

Conclusions

Smart homes can be more energy efficient through the use of processors to more effectively handle air conditioning and heating as well as lighting consider the amount of electricity that spent from leaving the lights on until daylight or fans when the room is empty, this will not only affect the bill but will decrease expenditure for the whole country. Furthermore, Smart homes control windows, shades and shutters which can reduce the power needed to change the room temperature due to sunlight in the summer or winter.

Integrating Smart homes with the security systems reduces the cost and enable the user to control the concepts of the security system by himself and merge them with actions performed by the smart home system, this is very convenient for most people to protect their homes exploiting its own integrated audio and video distribution system to record events, sound alarms or alerts the home owner with events. It is possible to apply such system in our community regardless of power failure because it has a power management system that can maintain power for the house constantly and from several sources such as green power source or what is known as solar power source so the smart home system is much evolved and sophisticated to cope with Iraqi community.

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بناء نظام المنزل الذكي للمجتمع العراقي

م.م. سعد حميد عبد

كلية المنصور الجامعة

المستخلص :

لقد توسعت وتطورت انظمة المنازل الذكية في الاونة الاخيرة ، فالجميع يود الحصول على منزل يستطيع التفكير و يحل المشاكل ويدير بيئته و يحمي نفسه او حتى يستطيع توقع حاجاته , تعتبر هذه الصفات من العوامل المرغوبة في المنازل لكن يبقى تطرف درجات الحرارة و انقطاعات التيار الكهربائي المستمر و طبيعة الحياة العراقية تجعل مثل هذا النوع من الانظمة صعبة التطبيق حيث ان الانظمة التي تصنعها الشركات العالمية غالية الثمن و صعبة النصب ومعقدة بالاضافة الى انها لاتستطيع حل المشكل التي تظهر في بلدنا نظرا لقلة الخدمات و كون الفرد يقضي اكثر الوقت داخل المنزل بدلا من ان يكون خارجه (وهي الصفة التي تعتمد عليها الانظمة العالمية). ان النظام بسيط و سهل البناء ورخيص و كفوء ويمكن دمجه في في اسلوب البناء و العمارة العراقي . بعض القضايا مثل الاضاءة والتحكم بدرجات الحرارة وحماية امن المنزل و ماحوله وادارة التيار الكهربائي والمولد واستدام الاوامر الصوتية لادارة المعدات المنزلية و ادارة خزين الماء بالاضافة الى العديد من الخدمات.

الفكرة الاساسية هي نشر عدد من المتحسسات و المفاتيح الاليكترونية و المحركات الالية وربطها باستخدام السلك الثنائي المجدول المستخدم في الشبكات والتي تربط بدورها بلوحة سيطرة اليكترونية مركزية مرتبطة الى حاسبة شخصية تمثل "عقل" المنزل يسيطر عليها برنامج متطور يقوم بأدارة المنزل ككل باستخدام نظام خبير وواجهة مستخدم بسيطه مع برنامج معالجه اللغة الاعتيادية وبرمجيات السيطرة على الكامرات لأدارة كل الحالات التي نحتجها للتحكم بمنازلنا