INTELLIGENT HOME ENERGY MANAGEMENT SYSTEM INCLUDING RENEWABLE ENERGY BASED ON MICAZ'S

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Abstract
As the numbers of large-sized electric home appliances are increasing, the home energy consumption is also increasing proportionally. To reduce the home energy cost, it is necessary to consider both energy consumption and generation. In this application intelligent home uses renewable energies. The problems of home energy management systems are solved by implementing energy saving method and renewable energy sources. Energy sources are connected to the grid via battery and inverter, the output of battery is connected to microcontroller. For displaying the battery voltage and availability of energy source microcontroller is connected to LCD. Some units will be consumed whenever load is connected, consumed units will be calculated with the help of microcontroller and it is displayed on the LCD.

Keywords: Home Energy Management System, ZigBee, Renewable Energy, Power Line Communication, Microcontroller, Inverter.

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1. INTRODUCTION:

Now a days in home areas world most considerable topic is energy saving and generation of power by smart home energy management system by using solar panel and wind turbine. Usage of wireless devices is increasing day by day so this application helps us to know the energy consumption and generation.

Energy management systems can be used to control devices like lighting systems and High Voltage Alternating Current units across multiple locations, such as office buildings, grocery, retail, restaurants sites.

Energy management systems also provide metering and monitoring functions, which allows them to take decisions regarding energy activities across their sites.

Energy management includes planning and energy related production and consumption units.

1.1 Existing System

Architecture of Home Energy Management System

Including Renewable Energy

A home has two parts concerning energy:
consumption and generation. Numerous home appliances and lights are in the energy consumption part.

Renewable energies such as solar and wind energies are in the energy generation part. Because a home consumes and generates energy, a control device like a home server needs to monitor and control both energy consumption and energy generation to minimize the energy cost. Fig. 1 shows the system architecture of smart HEMS that considers energy-consuming home appliances and lights and energy-generating solar and wind energy resources.

In the section of energy consumption, the energy consumed by home appliances and lights is monitored through an energy measurement and communication unit (EMCU) that is installed in each outlet and each light. The EMCU will measure the energy and power consumption of home appliances and lights.

1.2 Proposed system

1.2.1 System Architecture

Although numerous efforts are taken for home energy management systems, still energy management can achieve more energy-efficient home than before.

A new architecture for energy efficient home is proposed here. In the energy generation part we will add more natural power generators: With solar and wind energy we will also add tiles energy, garbage and mechanical power generators. By adding these renewable energy sources one can reduce the cost of electricity. The proposed renewable energy sources are eco- friendly and they are very cost effective. The tiles energy is produced by unique tiles which are made up of recycled materials. And also the tiles energy does not contain any toxic chemicals as in batteries. The tiles energy will be best suited in areas where more footsteps fall. Most garbage finds their way to water or land without proper treatment, due to which environment pollution is increasing. By using garbage energy one can avoid the water pollution and air pollution.

Power saving technique: Home appliance like geyser/fridge/AC/FAN is automatically controlled. In this module along with controlling the home appliances, the power consumption is also controlled as per usage.

For example: At home as we switch ON the geyser for number of times, it will make water hotter than our requirements. So this leads to wastage of power, in this format load/geyser will switch OFF once the set temperature of water is heated. By this method we can save the power consumption.

2. ARCHITECTURE:

2.1 Transmitter Block Diagram
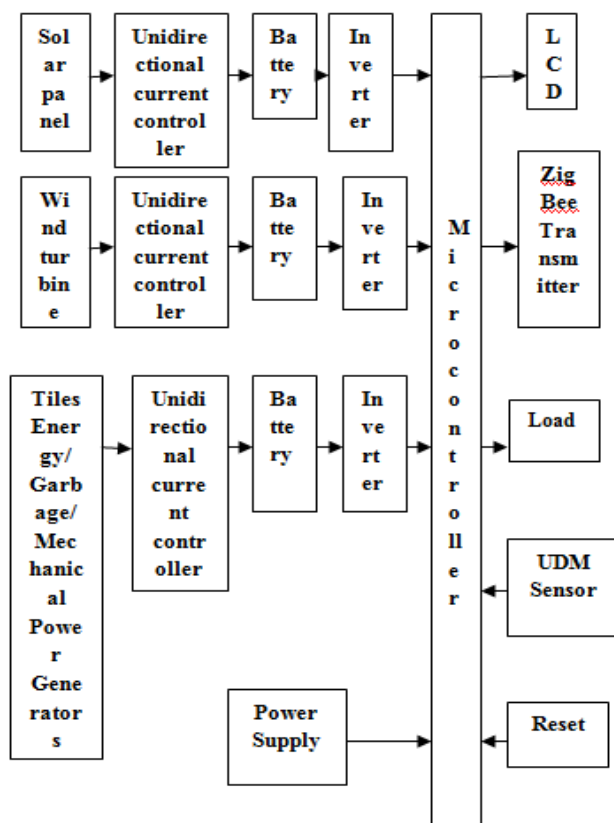
2.2 Receiver Block Diagram

Solar Panel: Solar panel is a device made up of photo voltaic cells. This device converts source of light available from the sun into electricity. By using Maximum Power Point Tracking using two LDR and a DC motor power generation can be increased.

Wind turbine: Wind turbine is wind driven turbine, which converts kinetic energy from wind into electricity.

Battery: To store the power from solar panel and wind turbine the 12v battery is used.

Inverter: Inverter is used to convert the supply from 12v to 230v for providing the home appliances from renewable sources.

ZigBee: ZigBee is wireless device used for transmitting and receiving purpose. Its range is 100m.

LCD: Liquid crystal display is electronic display panel comprising molecules of liquid crystals which consists the light modulating properties.

UDM sensor: Ultrasonic Distance Measure sensor is small, light weighted distance measuring device. It is easy to set up and is compatible with all cameras and lenses. UDM measures the distance between sensor plane and objects by sending ultrasonic pulses and measuring the time taken to bounce back. UDM sensor has stable, non-contact, precise and accurate distance measurement from about 2cm to 4 meter.

Fig -1: prototype set up

Hardware Used:

- Microcontroller
- Zigbee
- Battery
- Power supply
- RS232
- LCD
- Inverter

Software Used:

- KEIL software
- embedded C

Applications

- Energy cost can be reduced
- Increase the power generation
- Energy Monitoring
- Know the cost of energy usage

3. CONCLUSION

The intelligent home energy management system works well in real time. Solar energy and wind energy are tremendously available in nature, so there is enough production of power to supply the home appliances. The cost of the implementation is low and also the system reduces the cost of the power. To save the energy for upcoming future generations, home appliances are kept off during peak hour to maintain energy management.

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