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Green Home Test Platform applying Photovoltaic Power Generation and USN

HBE-Green-HomeNet

- Makes Up Generation System using Photovoltaic in Green Energies
- Controls Appliance Control by configuration of Solar Panel with 60W
- Tests Power Generation and Monitoring by using Smart meter
- Applies LED lamp for real Energy reduction Test
- Understands Green-Home Network using Photovoltaic Power Generation
- Provides various Test Samples and API for writing PC Application Program

Introduction

- HBE-Green-HomeNET uses Stand-alone Generation System using Photovoltaic as Power Source of Home Network for the test of actual Power Generation and Consumption process.
- This is composed by developing Smart meter which expresses and shows Power in the process of Energy Generation and Consumptions. And by applying LED bulb to the product, it is possible to built actual Green-Home System. Also, this provides various actuators controlled by USN in order to educate actual Stand-alone Photovoltaic System.
- HBE-Green-HomeNET provides various test contents of Energy Reduction from the beginner's course to applied/intensified course. We can correct the contents of Green-Home Network from the test using nesC auto generated tool(EasyTinyOS) to the test using ZigbeX Studio, Eclipse based developing environment tool, and write new application program.
- HBE-Green-HomeNET is modularized and can extend various option sensor modules., so it is effective to Project class, Creative Engineering Design and Capstone Design subject because this can.

Features

- **Power Generation Test using Photovoltaic**
  - Understands Features of Solar Cell
  - Tests Stand-alone Photovoltaic System Design
  - Tests Energy Generation and Consumption Monitoring with Smart meter
  - Tests Energy Generation and Consumption Monitoring with Ubiquitous Sensor Network(USN)
- **Green-Home Network Test using USN**
  - Available of USN Programming with nesC code Generating Device(EasyTinyOS)
  - Available of USN Programming with ZigbeX Studio, Eclipse based Developing Environment Method
  - Tests Appliance Control and Green-Home Network Build with Energy reduction Technology
  - Provides various Test Samples and API for writing PC Application Program

Configuration and Names

HBE-Green-HomeNET is composed of Photovoltaic System including Battery, Inverter, Charging Controller, and Green-Home Control Modules. With HBE-Green-HomeNET, we can do various tests of Energy generation, consumption and reduction based on Ubiquitous Sensor Network(USN) , the heart of Green Energy technology.

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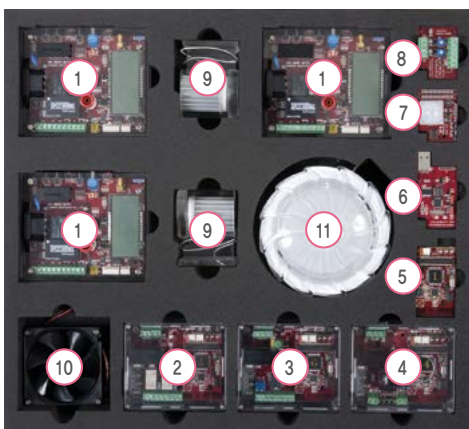
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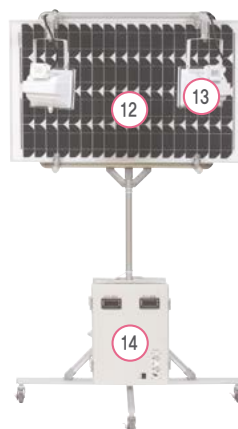
Photovoltaic System(Option)

1. Smart Meter	7. Home Sensor Module	12. Solar Panels
2. MC(Motor Control) Board	8. DIO Module	13. Halogen-emitter
3. Dimmer Board	9. AC LED Lighting	14. Integrated Control Box
4. AC Input Board	10. DC FAN	
5. Control node(HBE-ZigbeX Mote)	11. Lamp	
6. HBE-USB-ISP		

· Smart Meter Configuration and Name
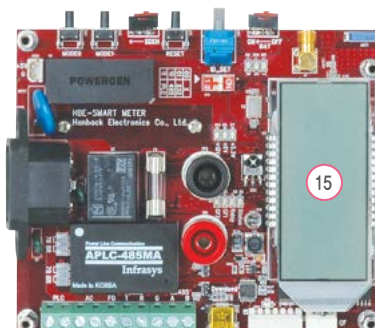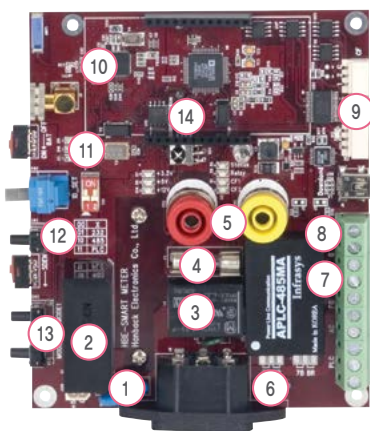
1. AC IN	6. PLC	11. Communications channel selector switch
2. AC/DC Converter	7. RS-232	12. Reset
3. Relay	8. RS-485	13. Mode switch
4. Fuse	9. CPU Download Port	14. IR Receiver
5. AC OUT	10. RF Part	15. Segment LCD

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Module Specification

| Item	Description
Smart meter	AC-DC Converter : - Input : AC100~240, Output: DC 5V 1.0A AC Meter : max. 250VAC 10A (2500W) Relay : 250VAC 10A 1ch USN module : Atmel Atmega128, CC2420 IR : Transmission/Receive module each 1EA Wireless Communication : RS-485
AC Input Board	AC-DC Converter : - Input : AC100~240, Output: DC 5V 1.0A Relay : - Operation Voltage : +5V - Allowable Voltage : ~250V/5A ZigbeX Mote(USN module) : - MCU : ATmega128A, 128KB RAM, 4KB EEPROM - RF : CC2420(2.4GHz, DSSS, 0dB, SPI) - Sensor : Temperature/Humidity Sensor, CdS Sensor, Infrared Sensor, RTC
Motor Control Board	AC-DC Converter : - Input : AC100~240, Output : DC 5V 1.0A Motor drive : Input Max 50V, Current Max peak 2A ZigbeX Mote(USN module): - MCU : ATmega128L, 128KB RAM, 4KB EEPROM - RF : CC2420(2.4GHz, DSSS, 0dB, SPI) - Sensor : Temperature/Humidity Sensor, CdS Sensor, Infrared Sensor, RTC
Dimmer Board	AC-DC Converter : - Input : AC100~240, Output : DC 5V 1.0A Brightness Control using Triac,Max 250V AC, 5A ZigbeX Mote(USN module) : - MCU : ATmega128a, 128KB RAM, 4KB EEPROM - RF : CC2420(2.4GHz, DSSS, 0dB, SPI) - Sensor : Temperature/Humidity Sensor, CdS Sensor, Infrared Sensor, RTC
DIO Option Module	2 External Interrupt Ports of Atmega128 3 switches using transistor controlled by S/W 3 input, 3 output Input 2.9-12V Output : EXT VCC 3.3V-12V Input : available general Input or Interrupt Input
Home Sensor Module	PIR(Motion Sensor) -Sensor : Nisera RE200B -Range : X138 Degree/Y125 Degree Reed Switch -Sensor : H.K Industry KR2S -Operation Volt : 0.3-VCC

HBE-Green-HomeNET Software

HBE-Green-HomeNET Software is composed of Sensor node program and PC application program for the monitor.
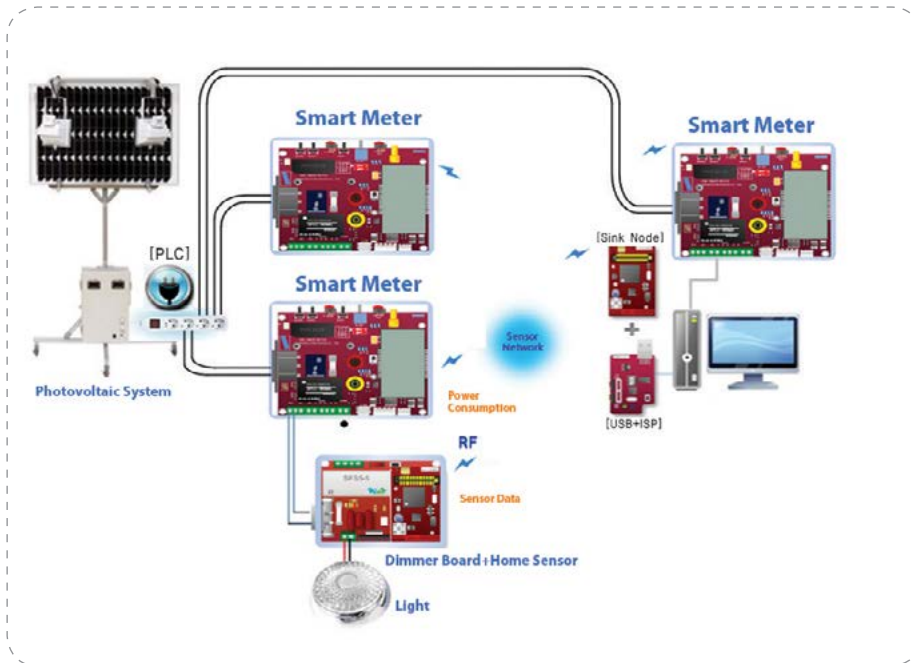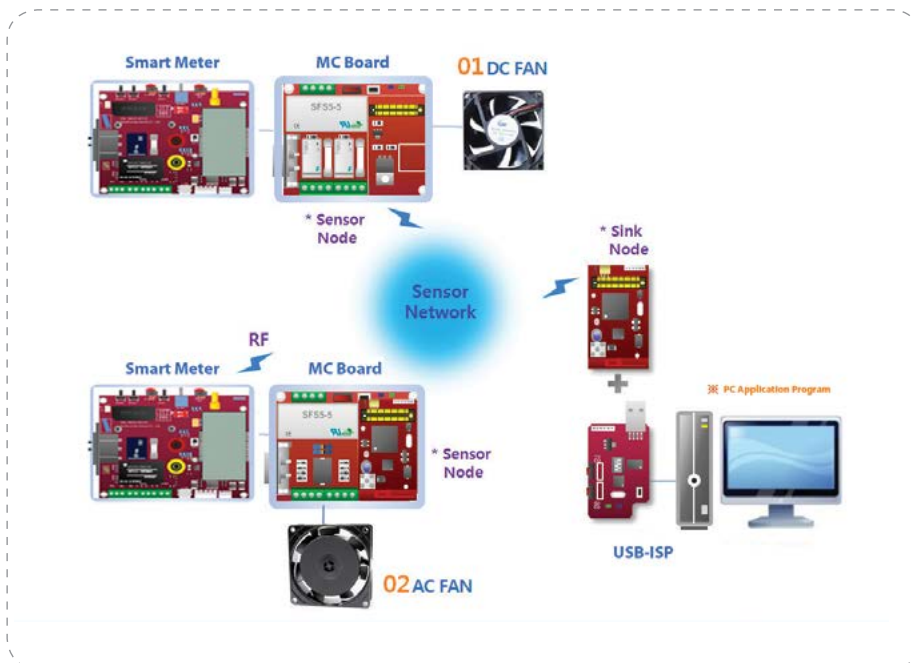
· Sensor Node Program

· PC Application Program

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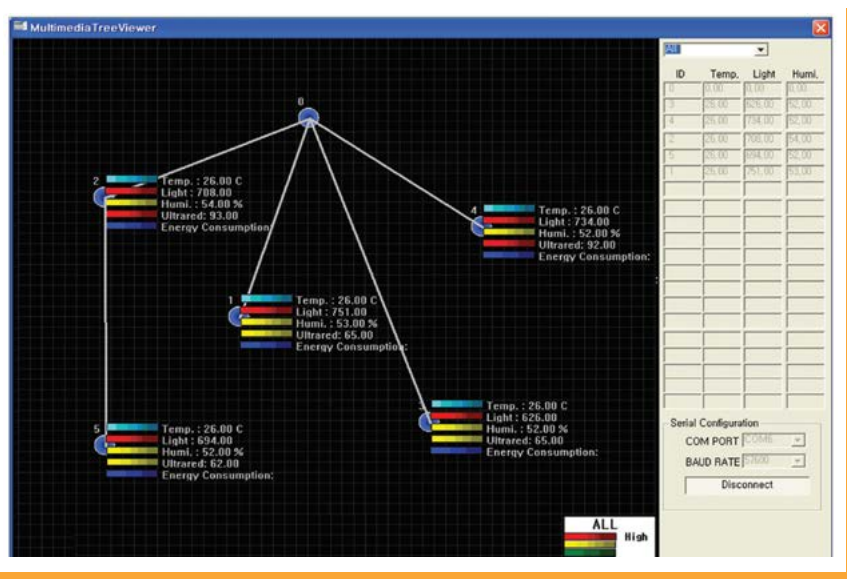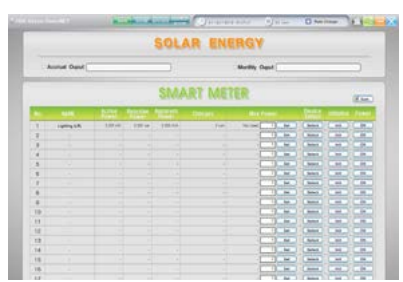
Main Experiment

· **Light Control Experiment using Dimmer Board and Home Sensor**

· **FAN Controlling Experiment using Smart Meter and MC Board**

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Contents

HBE-Green-HomeNET can build education environment for Green-Home Network System in Energy Reduction Technology at home using Sensors, Power Generation Process using Solar Cell, and Monitoring using USN and also do USN test based on TinyOS and Eclips. Especially EasyTinyOS and ZigbeX Studio tools are self-developed software and we can study efficiently TinyOS/nesC, the heart of Sensor Network Education.

Contents of Education	
HBE-Green-HomeNet network system using the Green Home	1. Smart Grid?
	2. USN and Smart Meter
	3. Configuration of system and setting of development environment
	4. Sensor practice I
	5. Sensor practice II
	6. Communication practice
	7. Controlling relay
	8. Controlling brightness of lamps
	9. Saving power for light with Illuminance sensor
	10. Saving power with PIR sensor
	11. Utilizing cumulative amount of use
	12. Setting timer
	13. Controlling electric energy
	14. Controlling power with electricity rate
	15. Automatic meter reading

· ZigbeX Studio™

To develop TinyOS program operated in the mote for USN, we should install and set up Tool Chain, Cygwin and other tools from TinyOS.net. This makes USN education tough. ZigbeX Studio is self-developed tool by Hanback Electronics Co.,Ltd. , which simplifies USN developing environment for ZigbeX/ZigbeX II users.
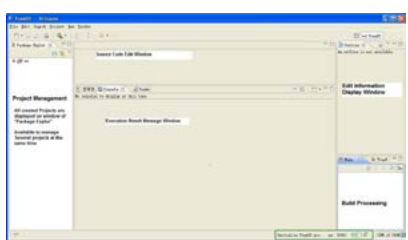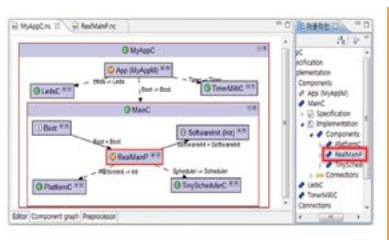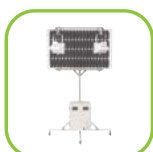

Product Components

HBE-Green-HomeNet   User's Manual and Product CD   Photovoltaic System(Option)   AC Power Cable   USB Cable (A to B Type)   Blocking Filter