Remote-Controllable and Energy-Saving Room Architecture based on ZigBee Communication

Authors:
Jinsoo Han, Haeryong Lee, Kwang-Roh Park

Presented By:
Cory Engel
What is ZigBee

Protocol developed by the ZigBee Alliance and their members

Designed for low cost, low power wireless networks

ZigBee protocol features include:
- 802.15.4
- 250 kbps data rate
- Low duty cycle
- Low latency
- 128-bit AES encryption for secure data connections
ZigBee Continued

Other Features:

• Support for multiple network topologies
  • point-to-point
  • point-to-multipoint
  • mesh networks

• Collision avoidance, retries and acknowledgements

• Supports up to 65,000 nodes
Purpose

• Reduce power consumption in homes

• Found that 10% of household power is used by appliances while in standby mode

• Use a Zigbee MCU control structure
  • Aids in home automation

• Control many different home appliances
  • Customized remote control options
Standby Cut-Off Power Outlet

- Monitor power consumption through outlet
- Reconfigurable firmware for different appliances
- Relay is controlled by the MCU
Actual Implement Outlet

100 ms samples
  • averaged over 10 samples for 2 minutes
State Transition Diagram

Boot:
- Executes firmware
  - Modified for different appliances

On:
- No power monitoring
- Turns on relay
  - Allows the power to flow

Normal:
- Monitors the power consumption
  - Averaged
- Turn off relay

Off:
- Wait for turn-on command through ZigBee
IR Learning:

- Push and hold button
  - sdfgsdhfg
- Press twice
  - to configure button to an IR code
- IR used as recognition to send signals over ZigBee
ZigBee Controller

Point remote at IR receive:
• Configure buttons
  • Different buttons – different commands
• Control Lights
• Can be attached to the wall
• Buttons used to wake up outlets
Results

Tested design on a 37 in flat panel TV:

- Standby power is 550mW
- Set on firmware to 800mW
- After 2 minutes, outlet shuts off automatically
- Programmed buttons on a TV remote
- Power button
  - At TV – turns on TV
  - At ZigBee Controller – turns on outlet

Normal outlet standby = 1W
This board = 140mW
Conclusion

Successful implementation
• Reduced wasted standby power
• Remote controllable

Future:
• Link together through a home server via zigbee
• All home functions from one area/remote
  • Home Automation

Possible surge protector configuration?
References

Paper:

http://www.digi.com/technology/rf-articles/wireless-zigbee
http://www.zigbee.org/

www.google.com for images
search ZigBee