Lowering Standby Power Consumption Via Proximity Detection

Berna Saracoglu
Kevin Harrison
Leslie Hodges
Eric Hosey
Nathan Kelly
• Founded in 1911
• Major Brands
  – Jenn-Air, KitchenAid, Maytag
• Employs 70,000 worldwide
  – Headquarters in Benton Harbor, MI
  – Grossed $19 billion in 2008
• Eco-friendly productions
• Community service
  – Habitat for Humanity & Hurricane Katrina
• Appliances that can smoothly enter an energy ethical standby mode
• Founded in 1992
  – United States Environmental Protection Agency and the Department of Energy

• Strict efficiency guidelines

• Statistics for 2008
  – Greenhouse gas reduction
    • 29 million car equivalent
  – Utility Bills
    • Savings of $19 billion
The Partnership

- Partnered August of 1998
- Whirlpool surpasses guidelines
  - Energy and water consumption
- 590 ENERGY STAR rated appliances
- Whirlpool’s Awards
  - Partner of the Year Awards
  - ENERGY STAR Sustained Excellence
The Goal

“When you walk into your kitchen, your kitchen turns on”

• Smoothly entering and exiting an energy ethical standby mode lowers energy consumption
  – Anticipated ENERGY STAR standards

• Detection of user presence
  – Proper use of standby mode

• Low-to-Mid range and high end options
  – Laundry and kitchen appliances
  – Cost differences
  – User experience
• Sensing Device
  – Choice of appropriate sensor for application and price range
    • Kitchen & laundry
• Interfacing
  – Communication on bus between control boards
    • Existing architecture
• Wireless Communication
  – Communication between appliances
• Power
  – Less than 1 watt in standby mode
• Size
  – Fit aesthetically into appliance and room
• Cost
  – Limitations dependant on product range
• Flexibility
  – Adapt intelligently to different environments
  – Current & future appliances
• Accuracy
  – Necessary for ultimate project goal
  – Interference with appliance functionality
• Safety
  – Product used by general public
Low to Mid Range

- Power consumption and cost are priority
- Individual IR sensors
  - Detect presence in front of appliance
- Separate PIR sensor
  - Capable of in-room detection
  - Send hi/low signal to appliances

High End

- Cost of lower concern
- Ultrasonic Sensor
  - Detect presence
  - Calculate proximity
  - Information density
- Wireless communication between appliances
  - No need for external detection device
Passive Infrared
Range up to 60 ft

Active Infrared
Range
< 1in. to ~ 4 ft

Ultrasonic
Range up to 40 ft.
• Energy efficiency
  – Eco-friendly
  – Standby mode
• Low-to-mid range & high end solutions
  – Sensors & Microprocessors
• Enhance user experience
  – Features & functionality
Any Questions?