Bluetooth Home Automation

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# Purpose

The purpose of this document is to design and create a Bluetooth home automation design.

# Table of Content

# Idea/Concept

The Bluetooth home automation system would be a master and slave architecture. The original concept thought of using a system like zigbee but the price outweighs the benefits. The system would have a main central controller and satellite peripherals called hubs. These hubs are sensors, controllers, or a combination of both. The total system would allow for remote access and control for household security and savings.

The main controller would require the following for minimum implementation.

* Microcontroller with UART support
* Bluetooth Master module (start connections)
* A power source (battery if mobile or wall wart if stationary)
* User I/O interface for control and display purposes

Some advanced features/hardware could be the following.

* Additional Bluetooth chip to communicate to Bluetooth phone
* Wifi/Ethernet chip to enable communication through the internet
* Security features
  + Lock/logic mechanism
  + Timeout functions
* Real time clock for time features
* Display for navigation
* Alarm mode
* Sleep mode
* Bluetooth module with a large range
* Memory for hub information and stored settings

The main controller needs to be a master module to be able to start a connection with the satellite hub. The controller would have default settings to make connections and can be editable afterwards (security reasons).

The hub would need the following for the minimum implementation.

* Bluetooth slave module
* Microcontroller
* Power supply
* Sensor or device to control

Hubs can be used for various applications such as the following.

* Light control
* Current sensing (determine what is on at the house)
* Thermostat/Temperature sensing
* Proximity/Door/Window sensors
* Camera access
* Outlet control
* Alarms
* Locks
* Text messages

Each hub would be priced differently.

# Feasibility

The design is very feasible; getting it for the right price is the tough part. Some of the advanced features are pushing my capabilities but I respect the challenge. Most (if not all) the products are off the shelf and implemented out in the field.

# Scope

## Controller

The scope of the controller for the various phases is defined below.

### Prototype

* Switch for power on
* Power on with indicator
* Security feature for login/key
* Login validation/feedback
* Timeout feature to logout after a minute of no activity
* Connect to slave Bluetooth
* Communication capability
  + Ping command to verify connection
  + Get sensor command
  + Set control command
  + Get status command
* Display for user
* I/O functionality to connect to satellite
* Read data from satellite
* Set function of satellite

### Simple Production

### Intermediate Production

### Advanced Production

## Hubs

### DC Light Controller (LED)

#### Prototype

* On/off switch
* Fuse protection
* Polarity protection
* Bluetooth slave with power indicator
* Microcontroller with power indicator
* Manual controls for LED control
  + Red
  + Green
  + Blue
  + Brightness
* Driver connected to LED load
* Communication
  + Response to ping
  + Receive color value
  + Receive color brightness
  + Send color response
  + Send brightness response
  + Send current consumption
  + Send power statistics
* Controls
  + Set LED color
  + Set LED brightness
  + Read current consumption

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Thermostat/Temperature

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Outlet Control

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Door/Window/Proximity

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Alarm

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Locks

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

### Video

#### Prototype

#### Simple Production

#### Intermediate Production

#### Advanced Production

# Challenges

## Security

## Safety

## Efficiency

## Cost

# Design

## AC Hubs

### Light controller

### Thermostat/Temperature

### Outlet control

### Door/Window/Proximity sensor

### Alarm

### Locks

### Video

## DC Hubs

## Microcontroller

## Bluetooth

### Logic Level

### Baud rate

# Prototype

# Testing

# PCB

# Package

# Verification

# Optimization

# Add-ons/Future Goals

# Research

## Video

## Bluetooth

# Conclusion

# Pricing

# Glossary

# Acronyms

# References