Smart Domicile

Switch Board and Automatic Lights Control Via Bluetooth

Submitted to Electrical Department of University of Engineering and Technology as semester project of MPS Lab

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DECLARATION

We hereby declare that this project is submitted to the University of Engineering & Technology, Lahore as semester project for MPS Lab. This is also needed to certify that the project is under the 3rd year 5th semester of UET, Lahore. We also declare that this project is not submitted elsewhere for any purposes.

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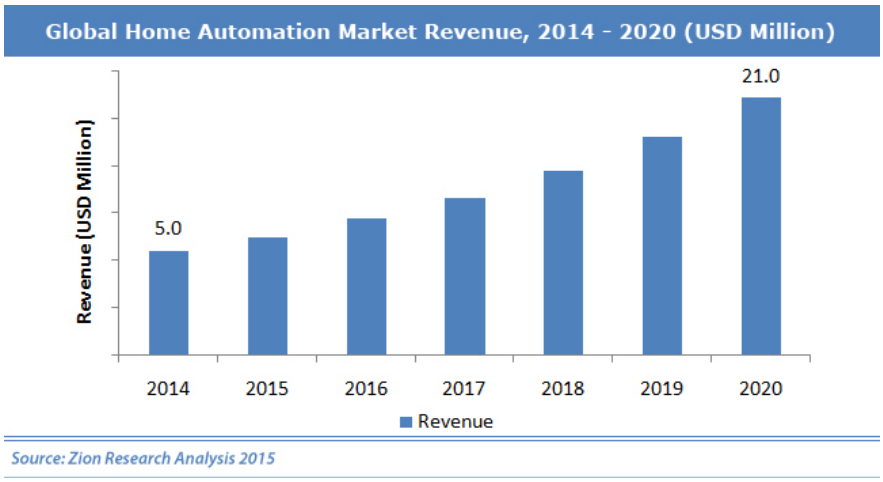
Chapter 1

Introduction

Home automation or domestics is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things.

A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet.



According to this chart we can see that the Global Home Automation Market Revenue has growing so fast comparing with the earlier stages of this technology. Smart phones brought the aid to connect this technology with the people.

Home automations systems not only give you the benefit of control everything from another place but they can be optimized so that you can save more energy while having the comfortable control methods available.

In this report we have prototyped a Home automation switching system for bulbs with the wireless control.

Chapter 2

Motivations, Related Literature and Problem Statement

There are a lot of Home automation modules are available in the market now. It gives you the freedom to control your home in your way. But still most of the community is afraid to go for this technology assuming these things are very expensive and not safe at all. So, we wanted to show that these things are just simple technology which can be implemented using a small number of electronic items.

We saw a huge number of videos on this topic on social media tech pages, YouTube and many more websites. So that we could collect many information from the comments and responses for those contents and we could get a good idea on what people expect from to learn about this Home automation technology.

Our problem is to make a Bluetooth Controlled Improved Home Automation System which user gets more benefits than just switching on/off each device.

Chapter 3

Proposed Approach

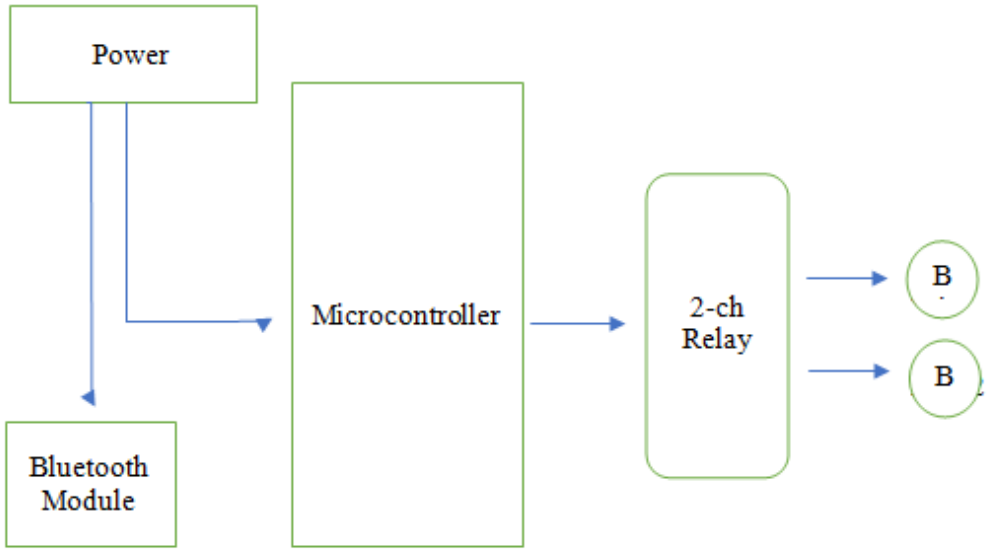
Abstract

This project is mainly based on Home automation with mobile phone communication (Bluetooth) and we use the Microcontroller ARM TM4C1233H6PM along with relays and Bluetooth modules so that we can control Bluetooth interface and controlling the Device using the Microprocessor. Bluetooth technology handles the wireless part of the communication which will work perfectly up to 10m. It delivers the received data and receives the data to be transmitted to and from a host system through a host controller interface (HCI).

In this project, relays (2 Ch 5VDC Relay Module) are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. This relay mechanism will isolate the AC power and DC power which solves a lot of problems regarding on power.

Here we are using slandered 230V/AC category bulbs as the controlled devices.

Block Diagram



Chapter 4

Implementation

Components used

- TM4C123GLX Microcontroller

- 2 Channel Relay Module

- HC-06 Bluetooth Module

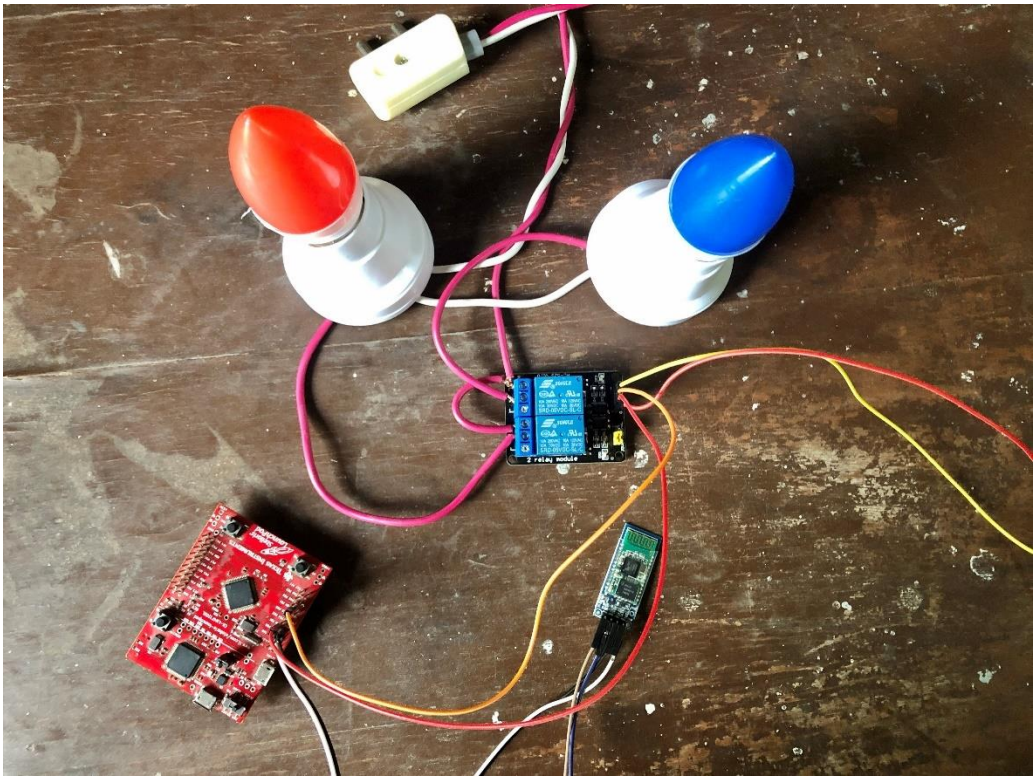
- 230V AC LED Bulbs

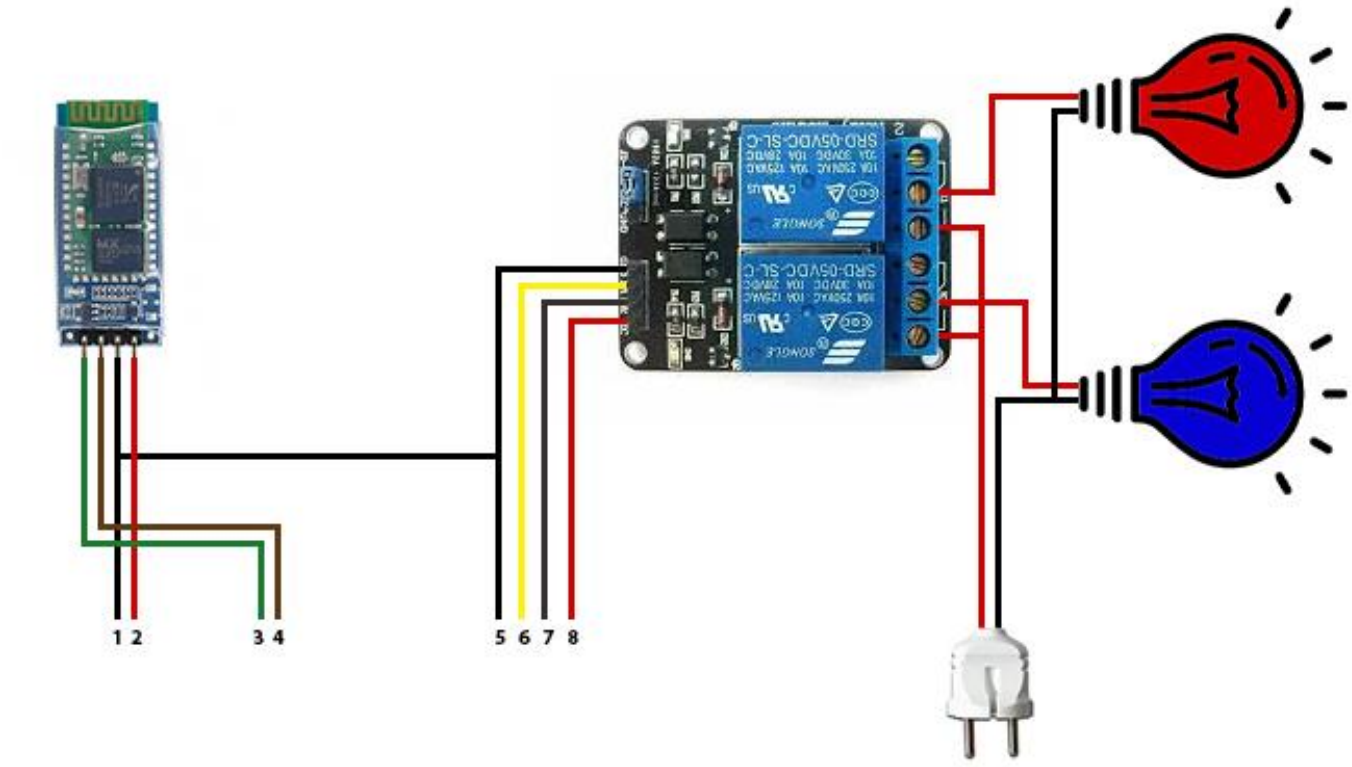
- Wire

- Connecting Cables

- 230V AC 10A Plug

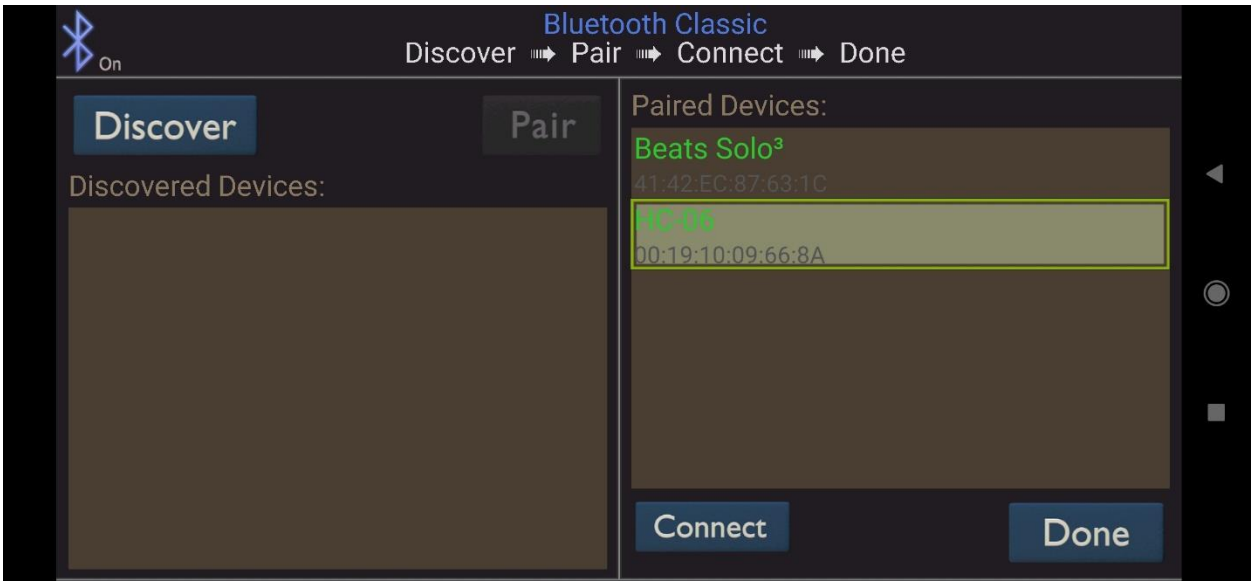
Circuit

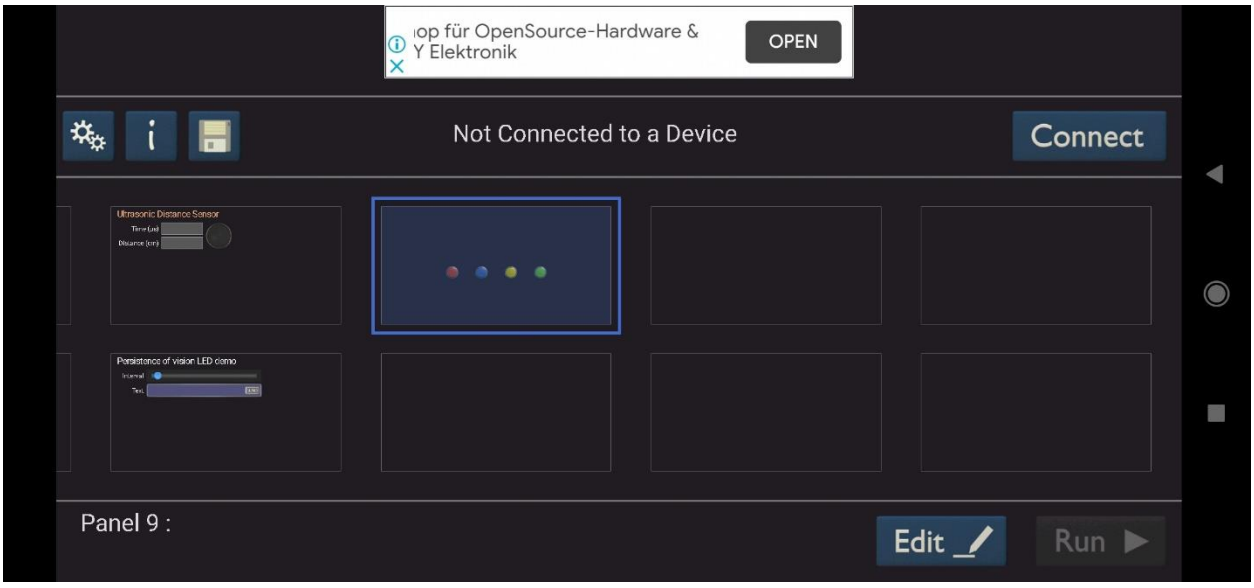


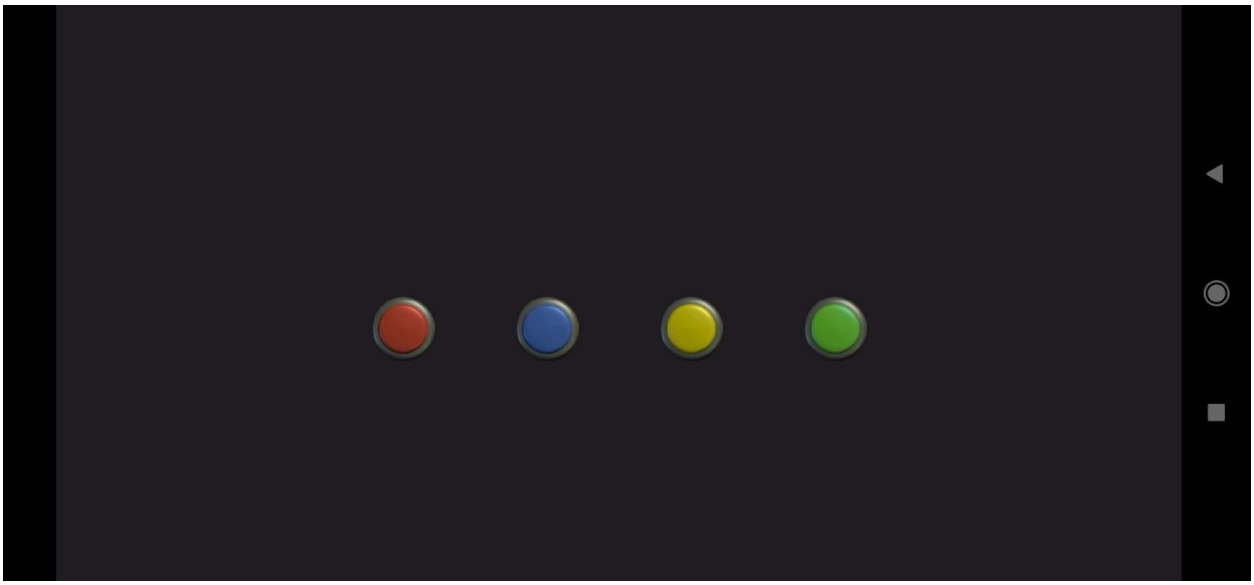


1	Ground
2	5V DC (Microcontroller)
3	Rx pin to PB1 (Microcontroller)
4	Tx pin to PB0 (Microcontroller)
5	Ground
6	In1 pin to PD1 (Microcontroller)
7	In2 pin to PE1 (Microcontroller)
8	5V DC External Power

Bluetooth Electronics Android App







- Red Bulb Button

  Keep pressing red button it turns on red bulb

- Blue Bulb Button

  Keep pressing blue button it turns on blue bulb

- Red and Blue Bulb Button

  Keep pressing yellow button it turns on both bulbs

- Colorless Bulb Button

  Keep pressing green button it turns off both bulbs

We have provided the indication by switching ON and OFF the respective color in the RGB LED on the microcontroller.

Code

```
#include "TM4C1233H6PM.h"

char readChar(void); // Initialing readChar Operation

int main()
{
  char c;

  SYSCTL->RCGCUART |= (1<<1); // Enabling UART 1
  SYSCTL->RCGCGPIO |= (1<<1)|(1<<3)|(1<<4); // Set clock to B D F

  GPIOB->AFSEL = (1<<1)|(1<<0);  // Enable PB0 and PB1 ( Tx and Rx Pins)
  GPIOB->PCTL = (1<<0)|(1<<4);
  GPIOB->DEN = (1<<0)|(1<<1);

  UART1->CTL &= ~(1<<0); // UART 1
  UART1->IBRD = 104;  // Setting the serial speed
  UART1->FBRD = 11;
  UART1->LCRH = (0x3<<5);
  UART1->CC = 0x0;
  UART1->CTL = (1<<0)|(1<<8)|(1<<9);

  GPIOF->DIR = (1<<1)|(1<<2);  // LED Pins PF1 and PF2 set as OUTPUTS
  GPIOF->DEN = (1<<1)|(1<<2);  // Enabling Digital Functions
  GPIOF->DATA &= ~((1<<1)|(1<<2));  // Set data as LOW

  GPIOD->DIR = (1<<1); // PD1 set as OUTPUT
```

```
GPIOD->DEN = (1<<1); // Enabling Digital Functions
GPIOD->DATA &= ~(1<<1); // Set data as LOW

GPIOE->DIR = (1<<1); // PE1 set as OUTPUT
GPIOE->DEN = (1<<1); // Enabling Digital Functions
GPIOE->DATA &= ~(1<<1); // Set data as LOW



while(1)
{
  c = readChar(); // Calling readChar function

  switch(c)  // Switch Case for char "c"  // BULB CONTROL
  {
  case '1': // BLUE
    {
      switch(GPIOD->DATA & 0x02)
      {
      case 0x02:
        GPIOD->DATA = ~(1<<1);
        break;
      case 0x00:
        GPIOD->DATA = (1<<1);
        break;
      }
    }
   break;

  case '2': // RED
```

```
  {
    switch(GPIOE->DATA & 0x02)
    {
    case 0x02:
      GPIOE->DATA = ~(1<<1);
      break;
    case 0x00:
      GPIOE->DATA = (1<<1);
      break;
    }
  }
  break;

case '3':  // BOTH RED and BLUE
  {
    GPIOD->DATA = ~((1<<1));
    GPIOE->DATA = ~((1<<1));
  }
  break;

default:  // NONE
  {
    GPIOD->DATA = ((1<<1));
    GPIOE->DATA = ((1<<1));
  }
  break;
}

 switch(GPIOD->DATA & 0x02)  // LED CONTROL
```

```
    {
    case 0x02:
      switch(GPIOE->DATA & 0x02)
      {
      case 0x02:
        GPIOF->DATA = 0x00; // Both OFF – No LED
        break;
      case 0x00:
        GPIOF->DATA = 0x04;  // Blue ON – BLUE LED
        break;
      }
      break;

      case 0x00:
      switch(GPIOE->DATA & 0x02)
      {
      case 0x02:
        GPIOF->DATA = 0x02; // Red ON – RED LED
        break;
      case 0x00:
        GPIOF->DATA = 0x06; // Both ON  - BLUE and RED LED
        break;
      }
      break;



    }
  }
}
```

```
char readChar(void)  // UART READ Operation
{
  char c;
  while((UART1->FR & (1<<4)) !=0);
  c = UART1->DR;
  return c;
}
```

Functions Used

UART

GPIO

Digital Write

Digital Read

Switch Cases

Chapter 5

Conclusion

Problems and Solutions

- Relay couldn’t draw power from the Microcontroller

  Our main problem was the relay module, It was not responding sometimes. We replaced the module with a new one and still we got the same problem.
  Then we tried to give power using an Arduino UNO Microcontroller. There we noticed that 3.3V DC is not enough to drive the relay module correctly. Then we had to connect a 5V DC external connection and try that out.
  Then we tried to connect the negative of the external power source with the ground of the microcontroller. And It have us positive result.
  As relays used in the 2-channel relay module are 5V DC relays, we need to give it 5V DC to operate correctly.

- Program uploading failed when Tx and Rx pins are connected with the Bluetooth Module

  Uploading code to the microcontroller got failed for few times and then we removed all the connections and tried to upload by adding each one by one. Then we notice it gives and error when Tx and Rx pins are connected. So, we need to disconnect Tx and Rx pins before uploading the code.

Conclusion

Budget	
Microcontroller	3500PKR
Relay Module	300PKR
Bluetooth Module	450PKR
Connecting Cables	100PKR
USB Cable	300PKR
Rechargeable Battery	600PKR
Bulbs	150PKR
Holder/Plugs	100PKR
Breadboard, Jumper etc.	100PKR
Extra Bluetooth	450PKR

Home automations are making our life easier. As the technology changes with the time we need to move on to the latest trends.

Savings:

Smart thermostats and smart light bulbs save energy, cutting utility costs over time. Some home automation technologies monitor water usage, too, helping to prevent exorbitant water bills. Certain devices even offer rebates.

Safety:

Many home automation technologies fall under the umbrella of home security. Consumers purchase these devices because they want to make their homes safer and more secure. Automated lighting thwarts would-be burglars, and motion sensors help people enter doors and walk hallways late at night. Security cameras offer benefits through either remote monitoring of package deliveries or real-time video of home inhabitants or unwanted visitors.

Convenience:

Because home automation technology performs rote tasks automatically, end users experience great convenience. Lots of smart gadgets are compatible with one another, and you can set different triggers between devices to automate regular home processes.

For instance, you could set your smart locks to turn on your smart lighting when you unlock the front door.

Control:

Consumers also choose smart home devices to better control functions within the home. With home automation technology, you can know what's happening inside your home at all times.

Comfort:

Some people use smart technology to record shows or to play music throughout the home. Connected devices can also help create a comfortable atmosphere—they provide intelligent and adaptive lighting, sound, and temperature, which can all help create an inviting environment.

Peace of Mind:

Finally, many consumers invest in home automation technology for peace of mind. A new mom or dad can check on their little one thanks to smart cameras and other technologies. Or, if you can't remember whether you closed the garage after you left, you can verify remotely with an app.

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