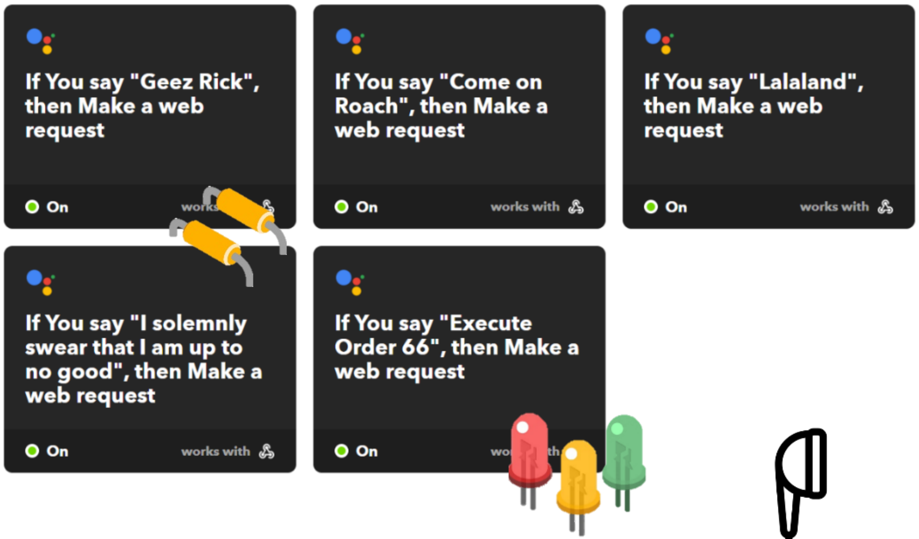
If You say "Geez Rick", then Make a web request

If You say "Come on Roach", then Make a web request

If You say "Lalaland", then Make a web request

If You say "I solemnly swear that I am up to no good", then Make a web request

If You say "Execute Order 66", then Make a web request

EMBEDDED SYSTEMS LAB. REPORT VIII

HACETTEPE UNIVERSITY COMPUTER SCIENCE DEPARTMENT

TEAM NAME:

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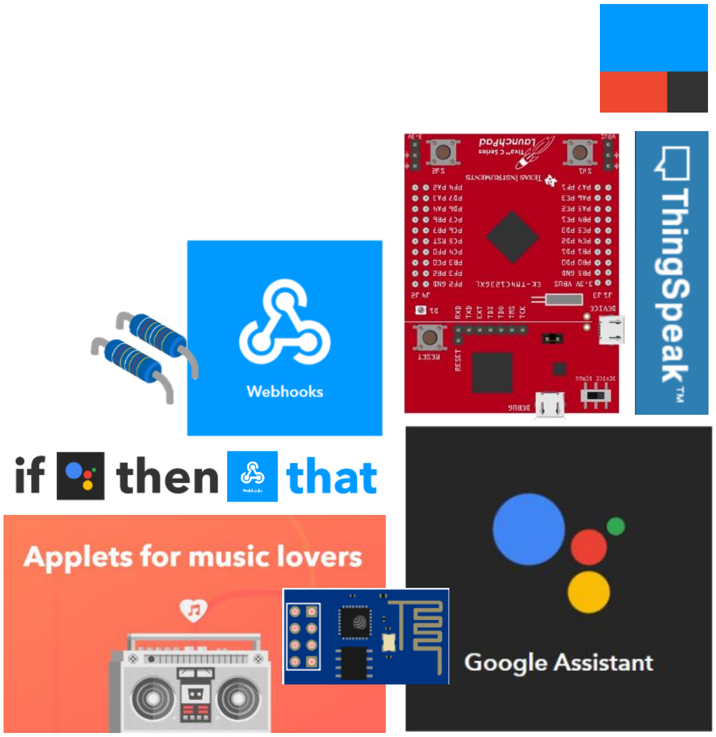
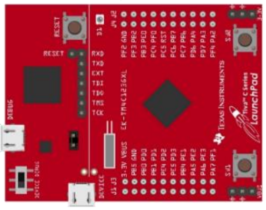


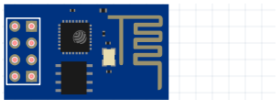
IOT WITH ESP8266

ESP8266 can read information from the internet only through API calls. To communicate with the **Google Assistant**, we have used the **IFTTT** services, which configure the assistant to listen for a command. **Webhooks** service makes a web request through **ThingSpeak** API once the command is received. After receiving json content, ESP8266 send it to TM4C through serial communication. **We will be using this communication to play songs with voice commands!**

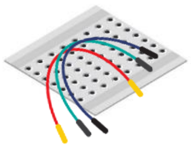
STEP1: EQUIPMENT



TM4C123G:



ESP8266:



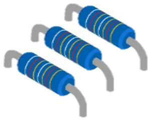
BREADBOARD AND WIRES:

HEADPHONE JACK:

3 or 5 pin stereo jack

RESISTORS:

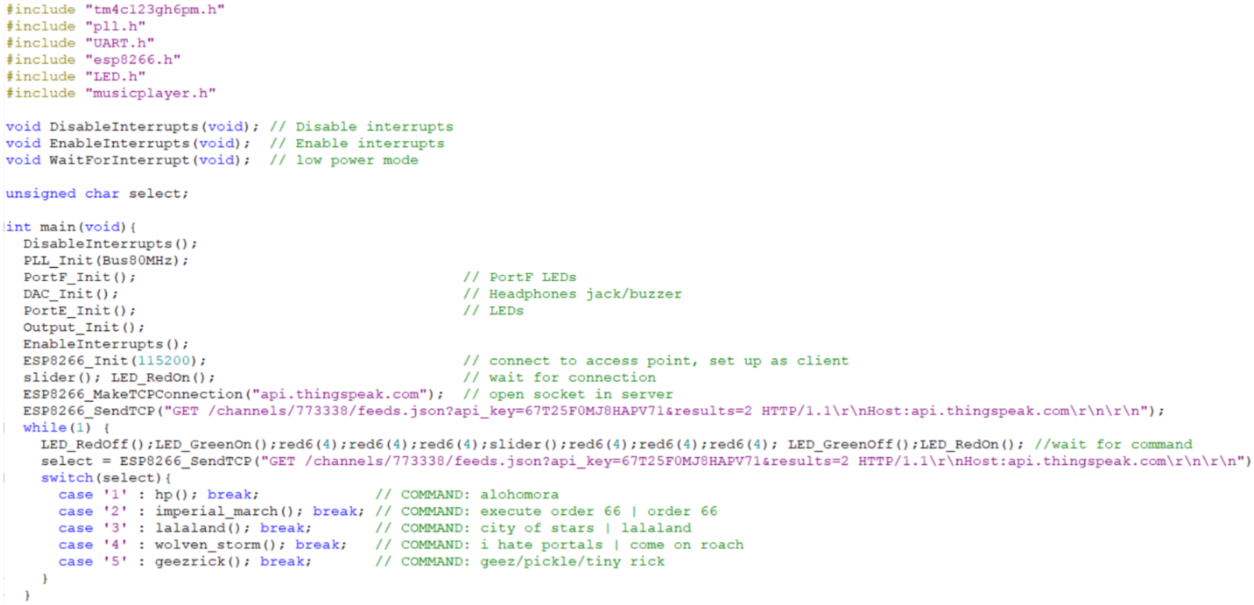
Three 1.5K resistors



Three 12K resistors

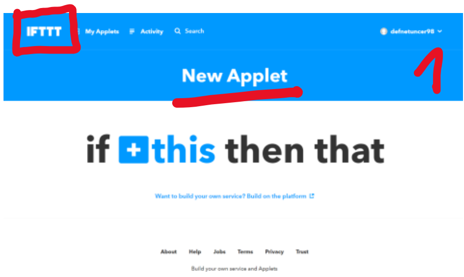
STEP2: INITIALIZATION

PORTF and **PORTE** is used for LEDs, **PORTD** for music and **PORTB** for esp8266.



```
#include "tm4c123gh6pm.h"
#include "pll.h"
#include "UART.h"
#include "esp8266.h"
#include "LED.h"
#include "musicplayer.h"

void DisableInterrupts(void); // Disable interrupts
void EnableInterrupts(void);  // Enable interrupts
void WaitForInterrupt(void);  // low power mode

unsigned char select;

int main(void){
  DisableInterrupts();
  PLL_Init(Bus80MHz);
  PortF_Init();                                     // PortF LEDs
  DAC_Init();                                       // Headphones jack/buzzer
  PortE_Init();                                     // LEDs
  Output_Init();
  EnableInterrupts();
  ESP8266_Init(115200);                             // connect to access point, set up as client
  slider(); LED_RedOn();                            // wait for connection
  ESP8266_MakeTCPConnection("api.thingspeak.com");  // open socket in server
  ESP8266_SendTCP("GET /channels/773338/feeds.json?api_key=67T25F0MJ8HAPV71&results=2 HTTP/1.1\r\nHost:api.thingspeak.com\r\n\r\n");
  while(1) {
    LED_RedOff();LED_GreenOn();red6(4);red6(4);red6(4);slider();red6(4);red6(4);red6(4); LED_GreenOff();LED_RedOn(); //wait for command
    select = ESP8266_SendTCP("GET /channels/773338/feeds.json?api_key=67T25F0MJ8HAPV71&results=2 HTTP/1.1\r\nHost:api.thingspeak.com\r\n\r\n")
    switch(select){
      case '1' : hp(); break;             // COMMAND: alohomora
      case '2' : imperial_march(); break; // COMMAND: execute order 66 | order 66
      case '3' : lalaland(); break;       // COMMAND: city of stars | lalaland
      case '4' : wolven_storm(); break;   // COMMAND: i hate portals | come on roach
      case '5' : geezrick(); break;       // COMMAND: geez/pickle/tiny rick
    }
  }
```

STEP3: SET UP CONNECTION

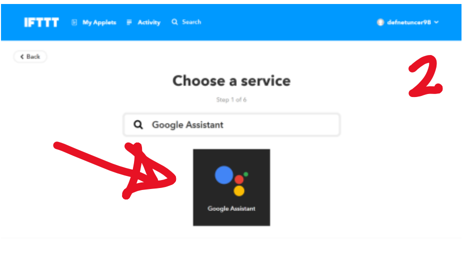


New Applet

if + this then that

Want to build your own service? Build on the platform

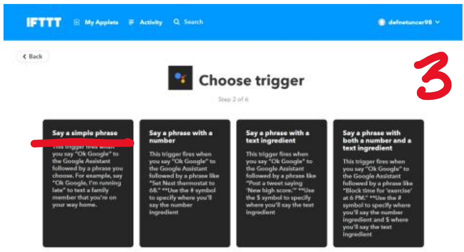
Build your own service and Applets



Choose a service

Step 1 of 6

Google Assistant



Choose trigger

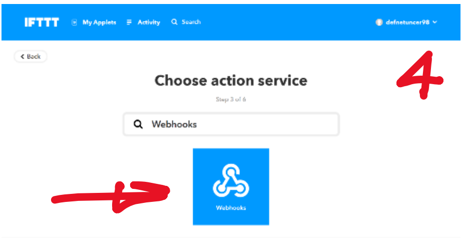
Step 2 of 6

Say a simple phrase
This trigger fires when you say "Ok Google" to the Google Assistant followed by a phrase you choose. For example, say "Ok Google, I'm running late" to text a family member that you're on your way home.

Say a phrase with a number
This trigger fires when you say "Ok Google" to the Google Assistant followed by a phrase like "Set Nest thermostat to 68." **Use the # symbol to specify where you'll say the number ingredient

Say a phrase with a text ingredient
This trigger fires when you say "Ok Google" to the Google Assistant followed by a phrase like "Post a tweet saying 'New high score.'" **Use the $ symbol to specify where you'll say the text ingredient

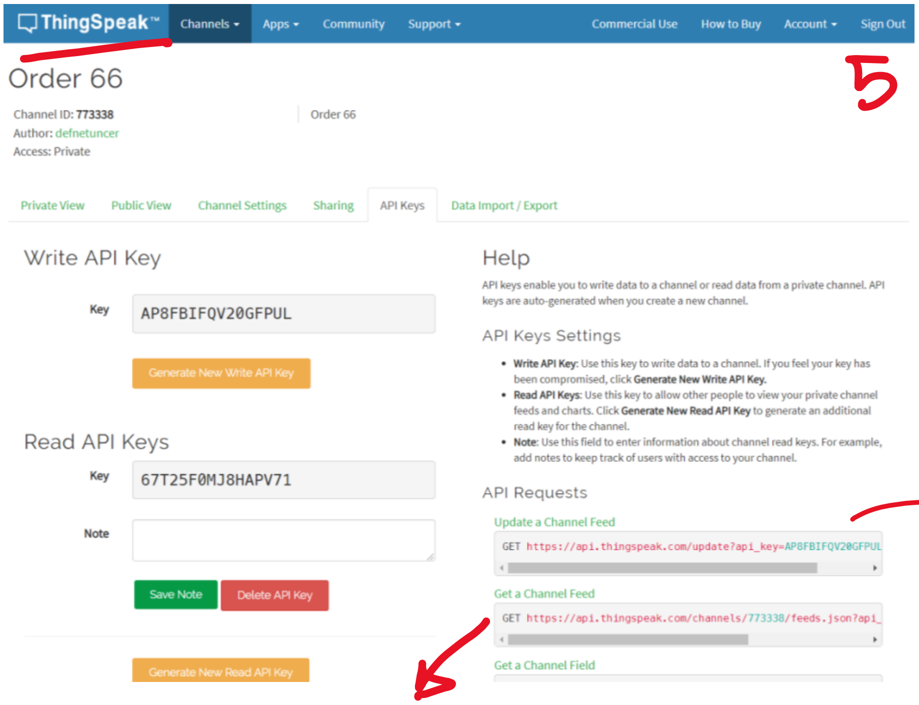
Say a phrase with both a number and a text ingredient
This trigger fires when you say "Ok Google" to the Google Assistant followed by a phrase like "Block time for 'exercise' at 6 PM." **Use the # symbol to specify where you'll say the number ingredient and $ where you'll say the text ingredient



Choose action service

Step 3 of 6

Webhooks



Order 66

Channel ID: 773338
Author: defnetuncer
Access: Private

Order 66

Write API Key

Key: AP8FBIFQV20GFPUL

Read API Keys

Key: 67T25F0MJ8HAPV71

Note:

Help

API keys enable you to write data to a channel or read data from a private channel. API keys are auto-generated when you create a new channel.

API Keys Settings

- **Write API Key**: Use this key to write data to a channel. If you feel your key has been compromised, click **Generate New Write API Key.**
- **Read API Keys**: Use this key to allow other people to view your private channel feeds and charts. Click **Generate New Read API Key** to generate an additional read key for the channel.
- **Note**: Use this field to enter information about channel read keys. For example, add notes to keep track of users with access to your channel.

API Requests

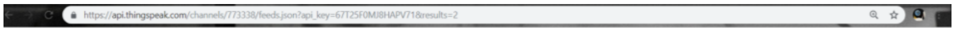
Update a Channel Feed

```
GET https://api.thingspeak.com/update?api_key=AP8FBIFQV20GFPUL
```

Get a Channel Feed

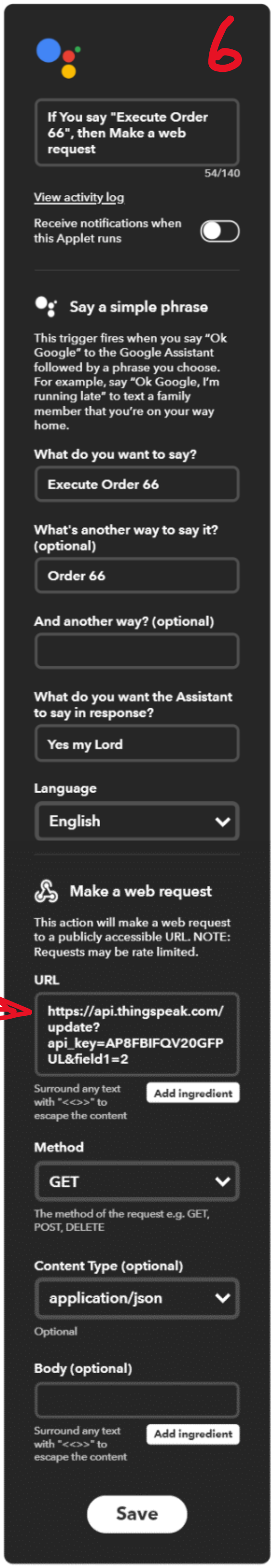
```
GET https://api.thingspeak.com/channels/773338/feeds.json?api_
```

Get a Channel Field



https://api.thingspeak.com/channels/773338/feeds.json?api_key=67T25F0MJ8HAPV71&results=2

```
{"channel":{"id":773338,"name":"Order 66","description":"Order
66","latitude":"0.0","longitude":"0.0","field1":"Switch","created_at"
:"2019-05-03T16:14:52Z","updated_at":"2019-05-
03T16:14:52Z","last_entry_id":87},"feeds":[{"created_at":"2019-05-
05T12:32:48Z","entry_id":86,"field1":"1"},{"created_at":"2019-05-
05T12:42:50Z","entry_id":87,"field1":"2"}]}
```



If You say "Execute Order 66", then Make a web request

54/140

View activity log

Receive notifications when this Applet runs

Say a simple phrase

This trigger fires when you say "Ok Google" to the Google Assistant followed by a phrase you choose. For example, say "Ok Google, I'm running late" to text a family member that you're on your way home.

What do you want to say?
Execute Order 66

What's another way to say it? (optional)
Order 66

And another way? (optional)

What do you want the Assistant to say in response?
Yes my Lord

Language
English

Make a web request

This action will make a web request to a publicly accessible URL. NOTE: Requests may be rate limited.

URL
https://api.thingspeak.com/update?api_key=AP8FBIFQV20GFPUL&field1=2

Surround any text with "<<<>>>" to escape the content

Method
GET

The method of the request e.g. GET, POST, DELETE

Content Type (optional)
application/json

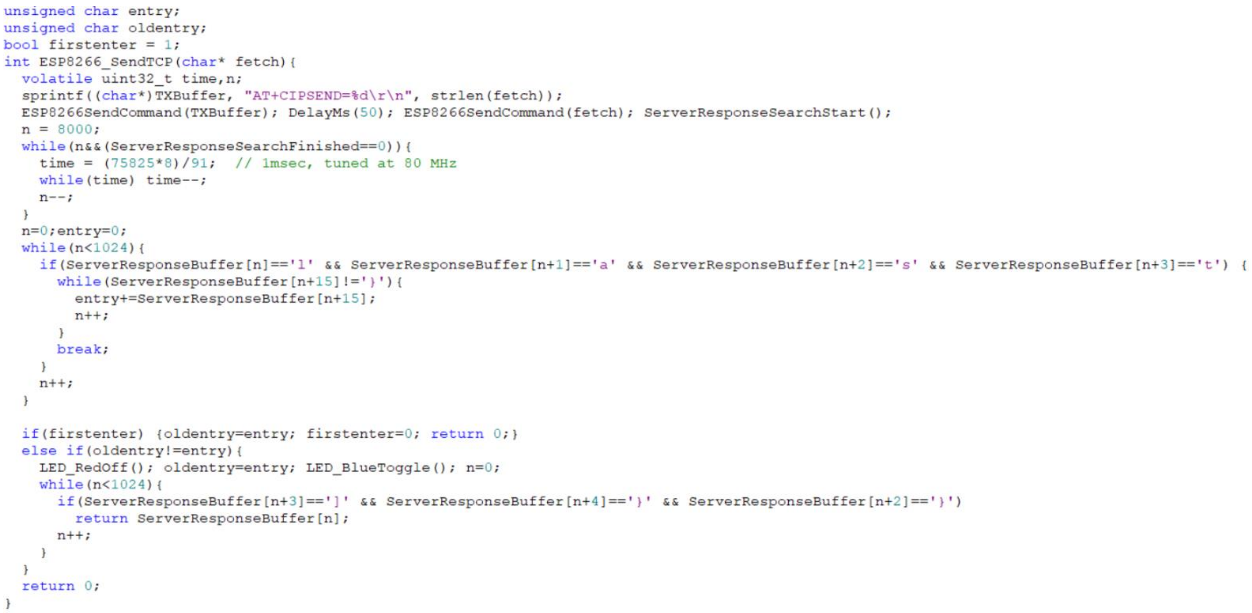
Optional

Body (optional)

Surround any text with "<<<>>>" to escape the content

STEP4: GET

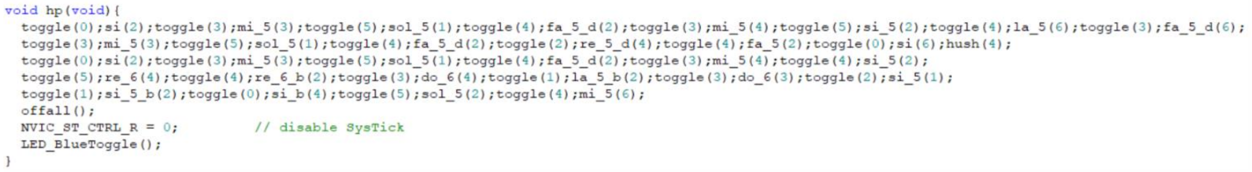
If **last_entry_id** is changed, meaning a new command has received, then **field1** is read and selected song id is sent to main.



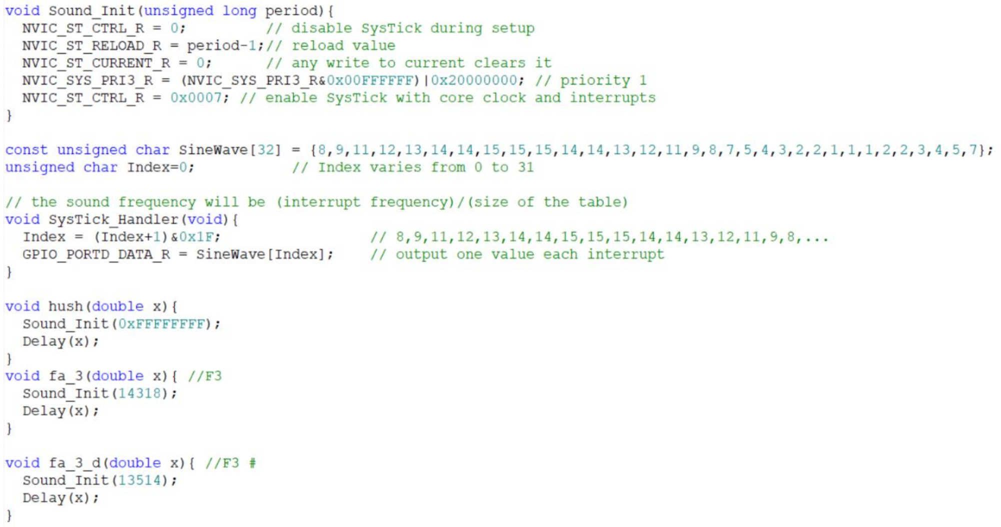
```
unsigned char entry;
unsigned char oldentry;
bool firstenter = 1;
int ESP8266_SendTCP(char* fetch){
  volatile uint32_t time,n;
  sprintf((char*)TXBuffer, "AT+CIPSEND=%d\r\n", strlen(fetch));
  ESP8266SendCommand(TXBuffer); DelayMs(50); ESP8266SendCommand(fetch); ServerResponseSearchStart();
  n = 8000;
  while(n&&(ServerResponseSearchFinished==0)){
    time = (75825*8)/91;  // 1msec, tuned at 80 MHz
    while(time) time--;
    n--;
  }
  n=0;entry=0;
  while(n<1024){
    if(ServerResponseBuffer[n]=='l' && ServerResponseBuffer[n+1]=='a' && ServerResponseBuffer[n+2]=='s' && ServerResponseBuffer[n+3]=='t') {
      while(ServerResponseBuffer[n+15]!='}'){
        entry+=ServerResponseBuffer[n+15];
        n++;
      }
      break;
    }
    n++;
  }

  if(firstenter) {oldentry=entry; firstenter=0; return 0;}
  else if(oldentry!=entry){
    LED_RedOff(); oldentry=entry; LED_BlueToggle(); n=0;
    while(n<1024){
      if(ServerResponseBuffer[n+3]==']' && ServerResponseBuffer[n+4]=='}' && ServerResponseBuffer[n+2]=='}')
        return ServerResponseBuffer[n];
      n++;
    }
  }
  return 0;
}
```

STEP5: MUSIC

We have implemented 35 different musical notes and 5 songs!

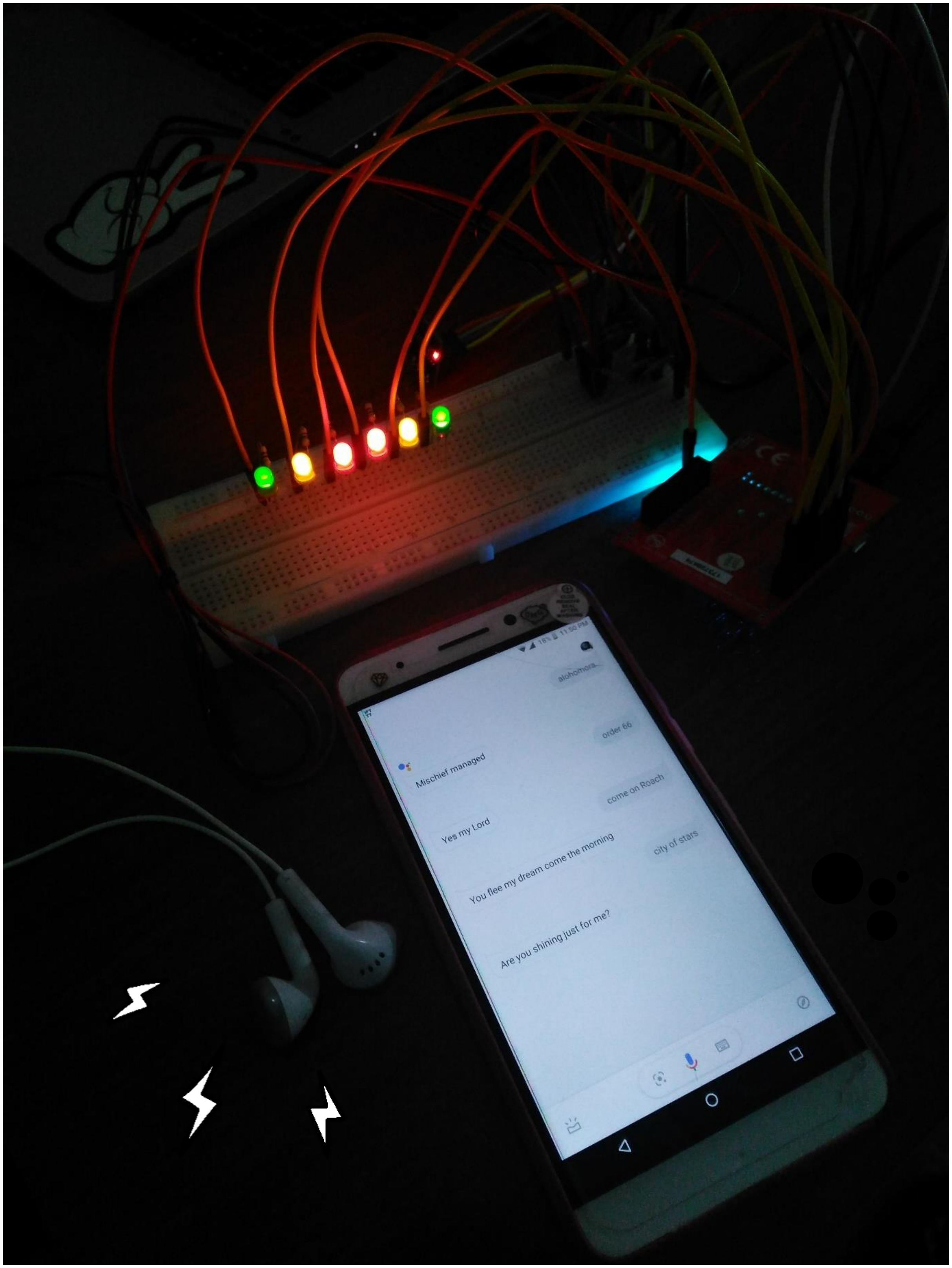


```
void hp(void){
  toggle(0);si(2);toggle(3);mi_5(3);toggle(5);sol_5(1);toggle(4);fa_5_d(2);toggle(3);mi_5(4);toggle(5);si_5(2);toggle(4);la_5(6);toggle(3);fa_5_d(6);
  toggle(3);mi_5(3);toggle(5);sol_5(1);toggle(4);fa_5_d(2);toggle(2);re_5_d(4);toggle(4);fa_5(2);toggle(0);si(6);hush(4);
  toggle(0);si(2);toggle(3);mi_5(3);toggle(5);sol_5(1);toggle(4);fa_5_d(2);toggle(3);mi_5(4);toggle(4);si_5(2);
  toggle(5);re_6(4);toggle(4);re_6_b(2);toggle(3);do_6(4);toggle(1);la_5_b(2);toggle(3);do_6(3);toggle(2);si_5(1);
  toggle(1);si_5_b(2);toggle(0);si_b(4);toggle(5);sol_5(2);toggle(4);mi_5(6);
  offall();
  NVIC_ST_CTRL_R = 0;         // disable SysTick
  LED_BlueToggle();
}
```



```
void Sound_Init(unsigned long period){
  NVIC_ST_CTRL_R = 0;         // disable SysTick during setup
  NVIC_ST_RELOAD_R = period-1;// reload value
  NVIC_ST_CURRENT_R = 0;      // any write to current clears it
  NVIC_SYS_PRI3_R = (NVIC_SYS_PRI3_R&0x00FFFFFF)|0x20000000; // priority 1
  NVIC_ST_CTRL_R = 0x0007; // enable SysTick with core clock and interrupts
}

const unsigned char SineWave[32] = {8,9,11,12,13,14,14,15,15,15,14,14,13,12,11,9,8,7,5,4,3,2,2,1,1,1,2,2,3,4,5,7};
unsigned char Index=0;           // Index varies from 0 to 31

// the sound frequency will be (interrupt frequency)/(size of the table)
void SysTick_Handler(void){
  Index = (Index+1)&0x1F;                 // 8,9,11,12,13,14,14,15,15,15,14,14,13,12,11,9,8,...
  GPIO_PORTD_DATA_R = SineWave[Index];    // output one value each interrupt
}

void hush(double x){
  Sound_Init(0xFFFFFFFF);
  Delay(x);
}
void fa_3(double x){ //F3
  Sound_Init(14318);
  Delay(x);
}

void fa_3_d(double x){ //F3 #
  Sound_Init(13514);
  Delay(x);
}
```

STEP6: ACTION!



alohomora

order 66

Mischief managed

come on Roach

Yes my Lord

city of stars

You flee my dream come the morning

Are you shining just for me?