4 August 2015

MT8870 DTMF - Dual Tone Multi Frequency Decoder

Project Description

We will be using an MT8870 DTMF module with an Arduino UNO to control a small servo motor in this project. The DTMF module gives the Arduino super-powers and allows you to control the Servo motor in so many ways. For example, this tutorial will show you how to control the servo motor using:

- a YouTube Video
- a voice recorder
- A web application (Online tone generator)
- A smart phone app (DTMF Pad)
- A touch-tone phone to cell-phone call

All of these control methods will take advantage of the same exact Arduino code/sketch. But how??? The MT8870 DTMF decoder is quite a neat little module that allows you incorporate DTMF technology into your arduino projects. DTMF stands for **D**ual-**T**one **M**ulti-**F**requency. DTMF tones are commonly associated with touch-tone phones and other telecommunication systems. When you press the number "1" on a touch-tone phone, two sine waves with frequencies: 697Hz and 1209Hz are combined to produce a unique DTMF signal which can be transmitted through the phone line. The MT8870 DTMF module can take this signal as an input, and decode it to produce a binary output.

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

The DTMF module does not care how you produce the DTMF tone. However, if it receives this tone, it will decode it. We can take advantage of this feature to supply the module with tones from different sources. The module has a 3.5mm port for line input. Providing you can connect your DTMF source to this line input in some way, it should work. I must warn you, however that this is a line input and NOT a microphone input. If you wanted to use a microphone, you will need to boost or amplify the signal before sending it to the DTMF module.

You will need the following parts for this project

Parts Required:

- Arduino Uno or compatible board
- ICStation MT8870 DTMF decoding module
- Jumper Cable (Male to Female)
- Hobby Servo Motor
- A cable to connect DTMF source with MT8870 DTMF Module's 3.5mm port
- A voice recorder (optional)
- 2 x touch-tone phones / smart phones (optional)

Software/Apps Required

- Arduino IDE
- DTMF Pad by IEIRISOFTWARE LAB. (for iOS devices)
- DTMF Tone Generator by Andrew M. Knott (for android devices)
- Online Tone Generator
- A YouTube video with DTMF tones

Arduino Sketch

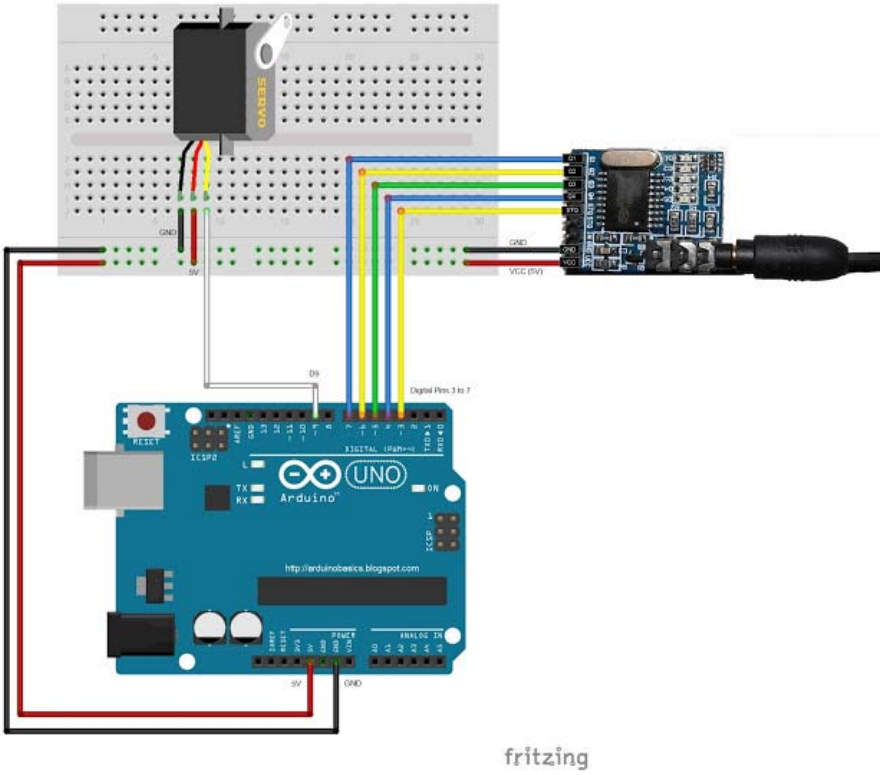
Upload the following sketch to the Arduino.

```
1   /* ============================================================================
2            Project: MT8870 DTMF Servo sketch
3             Author: Scott C
4            Created: 4th August 2015
5        Arduino IDE: 1.6.4
6            Website: http://arduinobasics.blogspot.com/p/arduino-basics-projects
7        Description: This project will allow you to control a Servo motor using
8                     The DTMF signal is received through the 3.5mm port of the D
```

```
9                   decoded output to control the position of the Servo. A SG-5
10  ============================================================================
11  //This sketch uses the Servo library that comes with the Arduino IDE
12  #include <Servo.h>
13
14
15  //Global variables---------------------------------------------------------
16  Servo SG5010;              // The SG5010 variable provides Servo functionality
17  int servoPosition = 0;     // The servoPosition variable will be used to set t
18  byte DTMFread;             // The DTMFread variable will be used to interpret
19  const int STQ = 3;         // Attach DTMF Module STQ Pin to Arduino Digital Pi
20   const int Q4 = 4;         // Attach DTMF Module Q4  Pin to Arduino Digital Pi
21   const int Q3 = 5;         // Attach DTMF Module Q3  Pin to Arduino Digital Pi
22   const int Q2 = 6;         // Attach DTMF Module Q2  Pin to Arduino Digital Pi
23   const int Q1 = 7;         // Attach DTMF Module Q1  Pin to Arduino Digital Pi
24
25
26  /*============================================================================
27  setup() : will setup the Servo, and prepare the Arduino to receive the MT8700
28  ============================================================================
29  void setup() {
30    SG5010.attach(9);             // The Servo signal cable will be attached to
31    SG5010.write(servoPosition);  // Set the servo position to zero.
32
33    //Setup the INPUT pins on the Arduino
34    pinMode(STQ, INPUT);
35    pinMode(Q4, INPUT);
36    pinMode(Q3, INPUT);
37    pinMode(Q2, INPUT);
38    pinMode(Q1, INPUT);
39  }
40
41  /*============================================================================
42  loop() : Arduino will interpret the DTMF module output and position the Servo
43  ============================================================================
44  void loop() {
45    if(digitalRead(STQ)==HIGH){        //When a DTMF tone is detected, STQ will
46      DTMFread=0;
47      if(digitalRead(Q1)==HIGH){       //If Q1 reads HIGH, then add 1 to the DTM
48        DTMFread=DTMFread+1;
49      }
50      if(digitalRead(Q2)==HIGH){       //If Q2 reads HIGH, then add 2 to the DTM
51        DTMFread=DTMFread+2;
52      }
53      if(digitalRead(Q3)==HIGH){       //If Q3 reads HIGH, then add 4 to the DTM
54        DTMFread=DTMFread+4;
55      }
56      if(digitalRead(Q4)==HIGH){       //If Q4 reads HIGH, then add 8 to the DTM
57        DTMFread=DTMFread+8;
58      }
59      servoPosition = DTMFread * 8.5;   //Set the servoPosition varaible to the
60    }
61    SG5010.write(servoPosition);        //Set the servo's position according to
62  }
```

Fritzing Sketch

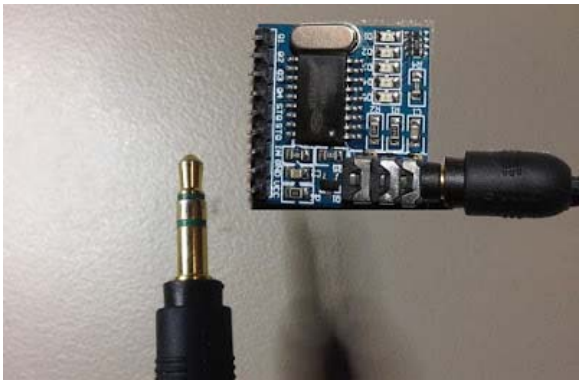
Connect the Arduino to the MT8870 DTMF module, and to a Servo.
Use the following Fritzing sketch as a guide.



(Click the image above to enlarge it)

Discussion

You will need to connect a cable from the DTMF module's 3.5mm port to that of your smart phone, computer, voice recorder or any other DTMF source of your choice.



When you power up your Arduino, the Servo motor should turn all the way to the left to it's zero position. Once the DTMF module receives a DTMF signal, it will identify the relevant frequecies as described in the table at the beginning of this tutorial, and produce a binary like output. You will notice the DTMF module's onboard LEDs light up when a tone is detected. Onboard LED (D5) will turn on for the length of the DTMF tone it just received, and turn off when the tone has stopped. On the other hand, the onboard LEDs (D1 to D4) will light up depending on the tone received, and will remain lit until the module receives another tone. The onboard LEDs are a visual representation of the voltages applied to the DTMF module's pins (Q1 to Q4, and STQ). Q1 matches D1, Q2 matches D2 etc etc. and STQ matches D5.

You will notice that there are two STQ pins on the DTMF module. The STQ pin that is closest to Q4 will only go high when a DTMF tone is detected, and will remain high for the duration of the tone. The other STQ pin is the exact opposite. It will switch LOW when a tone is received and remain LOW for the duration of the tone. When there is no tone, this STQ pin will remain HIGH. The table below provides a summary of the DTMF module outputs, with a blue box representing a voltage applied to that pin (HIGH), whereas a black box indicates no voltage applied (LOW).

Signal Received	Q1	Q2	Q3	Q4	STQ	STQ
(no signal)						
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						
*						
#						
A						
B						
C						
D						

In order to follow this project, you need a source of DTMF tones. You can produce DTMF tones using a touch-tone phone, or through the use of a DTMF Pad app. If you are feeling creative, you can create a DTMF song/tune like the one I posted on YouTube. You can see the video below:

As you can see from the video, I also recorded the DTMF tune onto a voice recorder, and was able to control the servo that way. If you are not feeling creative, you can visit this website to create DTMF

tones from your browser.

Concluding comments

This project was very fun, and shows some novel ways to control your Arduino. After completing the project, I realised that I could use this module to alert me when new emails or messages arrive on my phone or computer. If you have the ability to change the email or message notification sound to a DTMF tone, you should be able to get the module and Arduino to respond accordingly. Oh well, maybe I'll save that project for another day.

If this project helped you in anyway or if you use my code within your project, please let me know in the comments below. I would be interested to see what you did.

If you like this page, please do me a favour and show your appreciation :

Visit my ArduinoBasics Google + page.
Follow me on Twitter by looking for ScottC @ArduinoBasics.
I can also be found on Pinterest and Instagram.
Have a look at my videos on my YouTube channel.

However, if you do not have a google profile...
Feel free to share this page with your friends in any way you see fit.

Posted by Scott C at 8/04/2015 11:51:00 pm
Labels: Arduino, arduino code example, ArduinoBasics, best arduino blog, control, DTMF, Dual Tone Multi Frequency, Fun, Home Automation, IC Station, module, MT8870, project, Servo

26 comments:

DangNguyenMinh 24 October 2015 at 15:40

Wat is it module MT8870, it is IC M8870?

Reply

Replies

Scott C 24 October 2015 at 22:24

I provide a link to the module in the "Parts Required" list above..... but to answer your question, it uses a MT8870DS chip.

You can get the chip by itself here

And you can find the datasheet here

Reply

Mark Verheyen 28 October 2015 at 20:07

What is the maximum and minimum current and voltage to put on the dtmf module its for a 12V computerfan (12V and 1800mAh) could i also use a 9V battery?

Reply

Replies

Scott C 28 October 2015 at 20:53

Hi Mark - I got the module here - and on the ICStation site it says that the working voltage is 5V, but the maximum voltage is 7V.

Power Consumption: 500MW

Mark Verheyen 29 October 2015 at 04:57

ok thank u Scott, does it also work "independently" without the arduino mudule here is a site for you with cheaper modules u can get everything over there , http://www.aliexpress.com/item/wholesale-1pcs-MT8870-DTMF-Voice-decoding-module-phone-module-Drop-shipping/32307277776.html this module i wanne buy, i guess its the same, thank u for ur reply.

Scott C 29 October 2015 at 09:14

Yes - you can get it to operate without an Arduino.
As you can see from the tutorial, that I only use the Arduino to supply power and to receive the output of module.

Mark Verheyen 29 October 2015 at 14:48

ok thanks scott

Reply

Mark Verheyen 29 October 2015 at 14:59

just to get things clear on the site its 500mw ,500MW is it then 500milliwatt or 500Megawatt

Reply

Replies

Scott C 29 October 2015 at 18:39

1 watt = 1000 milliwatts
1,000,000 watts = 1 megaWatt

Watts = Voltage x Amps

eg. 1 Watt = 1V x 1A

Therefore if the module uses 5V, it would have to draw 100,000,000 Amps to make 500 MegaWatts.

Alternatively, 0.1 Amps (or 100 mA) to make 500 milliwatts.

The amount you can draw from a 5V line on the Arduino is less than 1A (I think 200 mA from memory - but you may need to check that)... so I would safely assume that the power rating is in milliwatts (not Megawatts)...

I hope that helps to clarify.

Reply

Mark Verheyen 29 October 2015 at 16:20

i wanne send u a sheme that i made on Paint its about your project, how can i send it to you?

Reply

Replies

Scott C 29 October 2015 at 17:54

Hi Mark - I don't know what a sheme is.
But if it is a picture - can send it via the Arduino basics forum
It just has to be less than 2MB in size.

Reply

Mark Verheyen 29 October 2015 at 18:37

ok i did it thanks http://arduinobasics-forum.1116184.n5.nabble.com/DTMF-Module-td341.html#a343

Reply

Bohdan Myroniv 25 April 2016 at 16:30

Hello Scott,

Could you please tell me how to deal with it in order if I want to use microphone, like connect microphone to 3.5 jack and then enter number on phone so MT8870 will understand ?

Thank you so much in advance

Reply

Replies

Scott C 25 April 2016 at 17:21

You cannot connect a microphone unless you have some sort of amplifier.

Bohdan Myroniv 25 April 2016 at 17:23

Which kind of amplifier do I need ?

Scott C 25 April 2016 at 18:56

A microphone amplifier

Scott C 25 April 2016 at 18:57

http://www.learningaboutelectronics.com/Articles/Microphone-amplifier-circuit.php

Bohdan Myroniv 25 April 2016 at 19:21

Oh, thank you so much for your help !

Scott C 25 April 2016 at 19:49

Or you could probably find a shop that sells a kit or one that is already made... just 5 mins looking on the internet and I found this one - but I am sure you could probably find others?

http://vakits.com/electret-microphone-amplifier-kit-1695

Reply

Bohdan Myroniv 25 April 2016 at 19:56

I found this one, with build-in ports for microphone and speaker. Seems like I can just connect microphone and work with it... they suggest to use mic with filtering system. What do you think about this one ?

http://www.dfrobot.com/index.php?route=product/product&product_id=1150#.Vx4FLTB96Hu

Reply

Replies

Scott C 25 April 2016 at 23:29

I don't know... you could contact dfrobot and see if it meets your needs. I only make recommendations of products I have tried. I am not smart enough to know if that one would do what you need it to or not. :)

Bohdan Myroniv 25 April 2016 at 23:31

hah, yes ! Thank you so much anyway ;)

Reply

Rahul Kishore 11 September 2016 at 23:13

I want a program for 4 wheel and what Arduino is best for more speed

Reply

Replies

Scott C 12 September 2016 at 08:34

The best way to get a program is to DIY.
Teensy is pretty quick.

Reply

thi ledinh 23 February 2017 at 02:38

help me out, pls. i'm trying to connect dtmf 8880 to arduino. but it's not work. so. could u give me some advice?? guys.

Reply

Replies

Scott C 23 February 2017 at 17:25

I am not familiar with the dtmf 8880. My only advise with these modules is to ensure that you have the volume turned up on your phone or whatever device that is creating the DTMF noise.
All my knowledge about these modules is contained within this tutorial. So if this tutorial does not help you, then it is unlikely that I will be of any use.

Reply

Enter your comment...

Comment as: Unknown (Goo ▾ Sign out

Publish Preview Notify me

Feel free to leave a comment about this tutorial below.
Any questions about your particular project should be asked in the ArduinoBasics forum.

Comments are moderated due to large amount of spam.

This Week's Most Popular Posts

433 MHz RF module with Arduino Tutorial 1

Relay Module

Simple Arduino Serial Communication

HC-SR04 Ultrasonic Sensor

433 MHz RF module with Arduino Tutorial 2

Get Email Notifications of My Latest Posts

Email address... Submit

Subscribe To ArduinoBasics

Posts

Comments