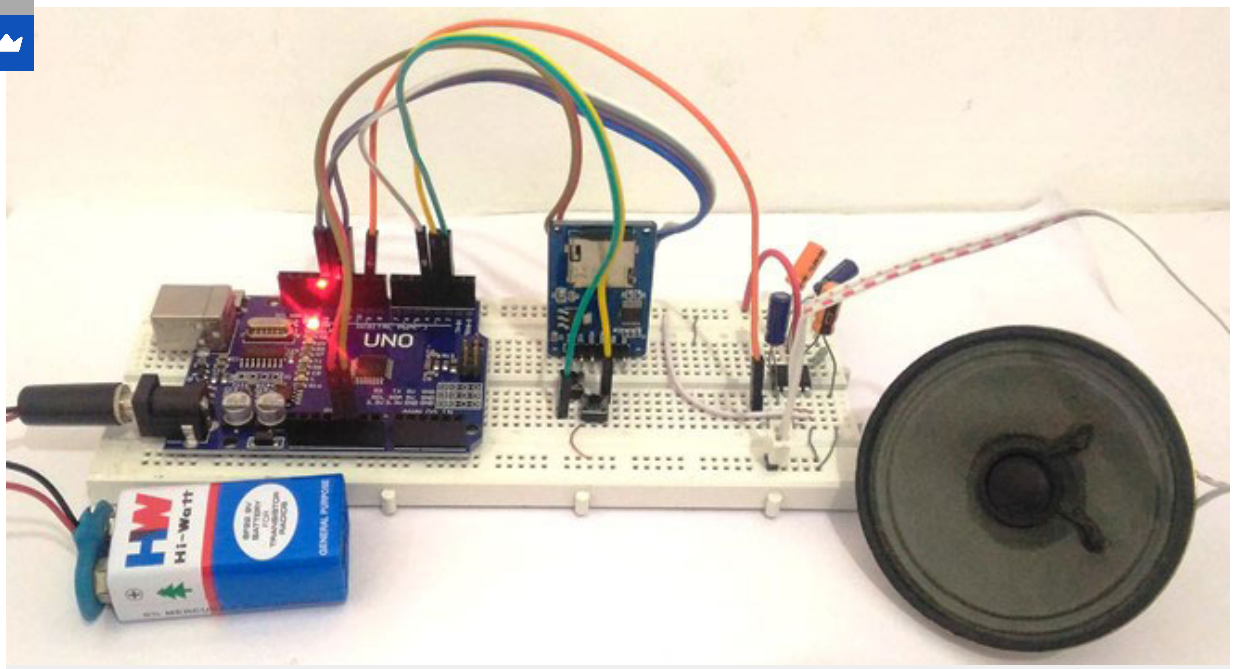
ARDUINO

imple Arduino Audio Player and Amplifier with LM386

Aswinth Raj Jun 26, 2017 101



Simple Arduino Audio Player and Amplifier with LM386

Adding sounds or music to our project will always make it looks cool and sounds much more attractive. Especially if you are using an Arduino and you have lots of pins free, you can easily add sound effects to your project by just investing in an extra **SD card module** and a normal speaker. In this article I will show you how easy it is to **Play music/add sound effects using your Arduino Board**. Thanks to the Arduino community who have developed some libraries to build this in a fast and easy way. We have also used IC LM386 here for amplification and noise cancelation purpose.

Hardware Required:

1. Arduino UNO
2. SD Card Reader module
3. SD card
4. LM386 Audio Amplifier
5. 10uf Capacitor (2 Nos)
6. 100uf Capacitor (2 Nos)
7. 1K,10K Resistor
8. Push buttons (2 Nos)
9. Breadboard
10. Connecting Wires

Getting ready with your WAV audio files:

For **playing sounds from SD Card using Arduino**, we need audio files in .wav format because Arduino Board can play an audio file in a specific format that is wav format. To make an **arduino mp3 player**, there are a lot of mp3 shields are available which you can use with arduino. Or else to **play mp3 files in arduino**, there are websites which you can be used to convert any audio file on your computer into that specific WAV file.

So to convert any audio file into wav format, follow the below steps:

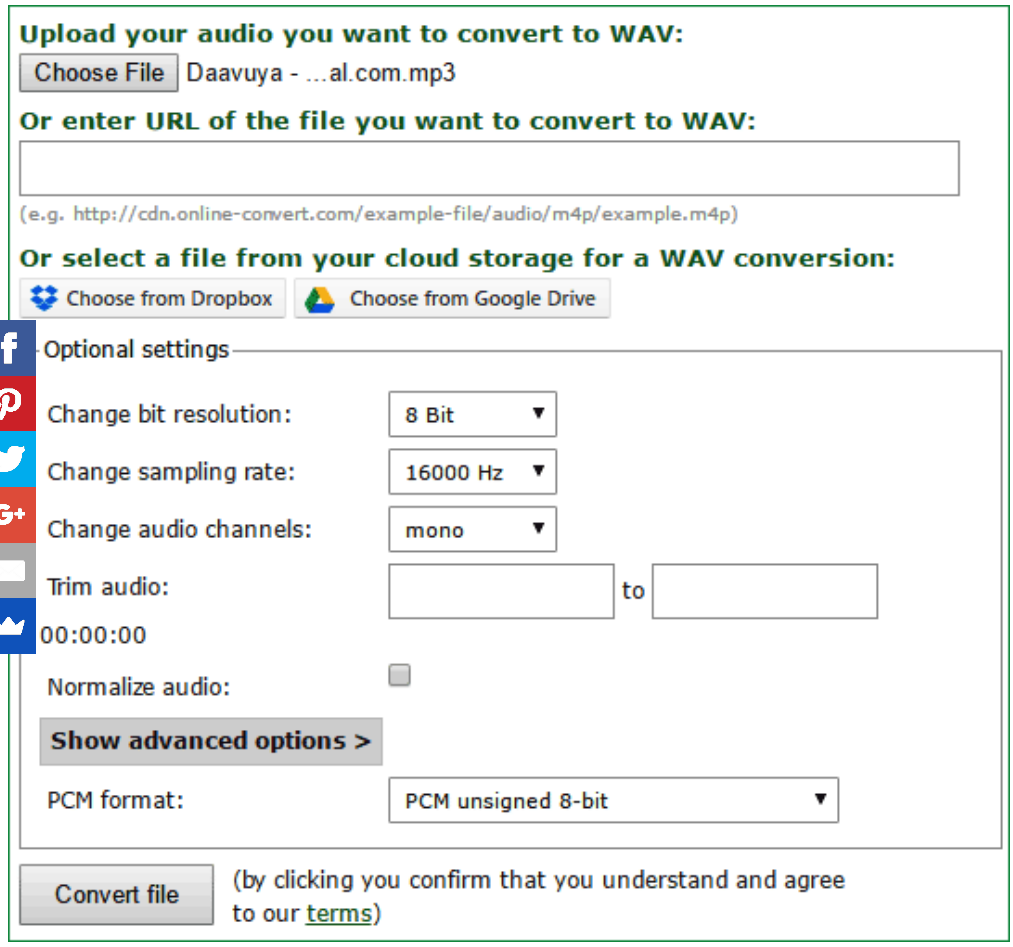
Step 1: Click on "Online Wav Converter" to enter into the website.

Step 2: Arduino can play a wav file in the following format. You can toy around with the settings later, but these settings were experiment to be the best in quality.

Bit Resolution	8 Bit
Sampling Rate	16000 Hz

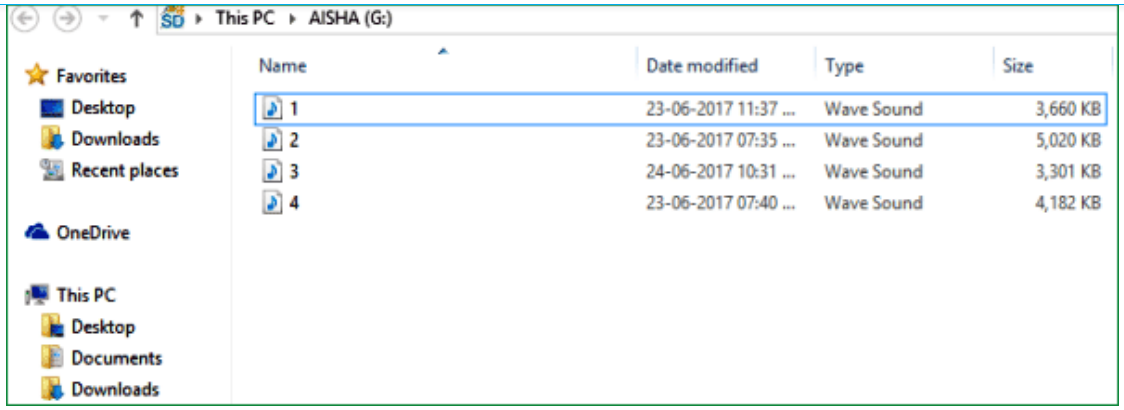
PCM format	PCM unsigned 8-bit

Step 3: In the website click on “choose file” and select the file you want to convert. Then feed in the above settings. Once done it should look something like this in the below image



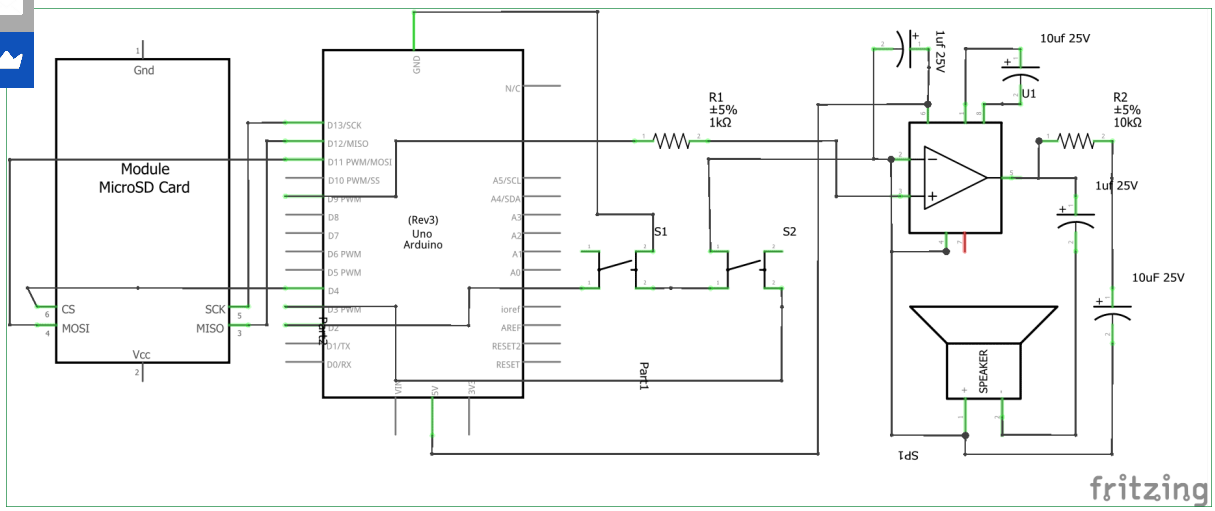
Step 4: Now, click on “Convert File” and your Audio file will be converter to .Wav file format. It will also be downloaded once the conversion is done.

Step 5: Finally format your SD card and save your .wav audio file into it. Make sure you format it before you add this file. Also remember the name of your audio file. Similarly you can select any of your four audios and save them with names 1, 2, 3 and 4(Names should not be changed). I have converted four songs and have saved them as 1.wav, 2.wav, 3.wav and 4.wav like shown below.



Circuit and Hardware:

rcuit Diagram for this **Arduino Audio File Player** is simple. The complete circuit diagram is shown in the Image below.



As we know our audio files are saved into the SD card, hence we **interface a SD card reader module with our Arduino**. The **Arduino and SD card** communicate using the SPI communication protocol. Hence the Module is interfaced with the SPI pins of the Arduino as shown above in the diagram. It is further listed in the **table below.**

Arduino	SD card module
+5V	Vcc
Gnd	Gnd
Pin 12	MISO (Master In Slave out)
Pin 11	MOSI (Master Out Slave In)

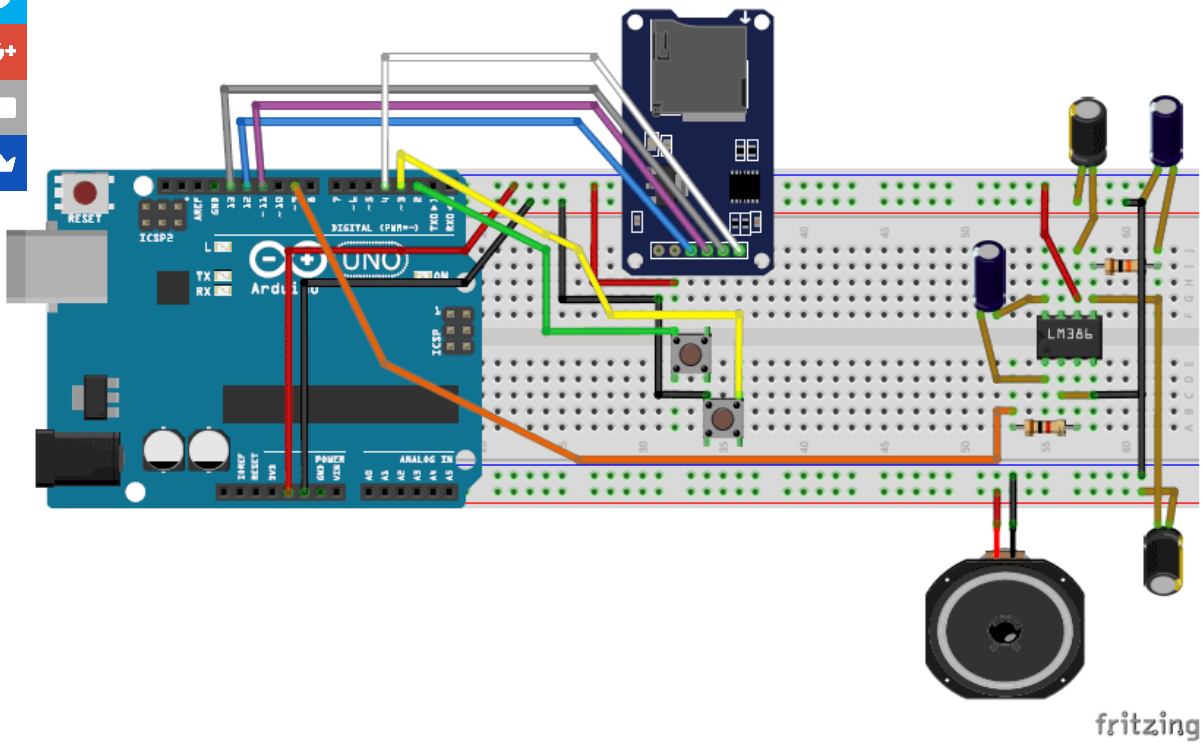
Pin 4	CS (Chip Select)

Now the Arduino will be able to read the music file from the SD card and play it on the pin number 9. But the audio signals produced by the Arduino on pin 9 will not be audible much. Hence we amplify it by using the LM386 Low voltage Audio amplifier IC.

The amplifier shown above is designed for a Gain of 200 and the Vdd (pin 6) is powered by the 5V pin of the Arduino. If you want to increase/decrease the sound you can increase/decrease the voltage provided to this pin. It can withstand a maximum of 15V. Learn more about this 200 gain amplification configuration for LM386 here.

We also have two push buttons connected to the pin 2 and 3 of the Arduino. These switches are used to play the next track of the song and play/pause the music respectively. I have used these buttons just to demonstrate its abilities; you can play the song whenever required. Check the Demo Video at the end.

u can assemble this circuit completely over a Breadboard as shown in the picture below

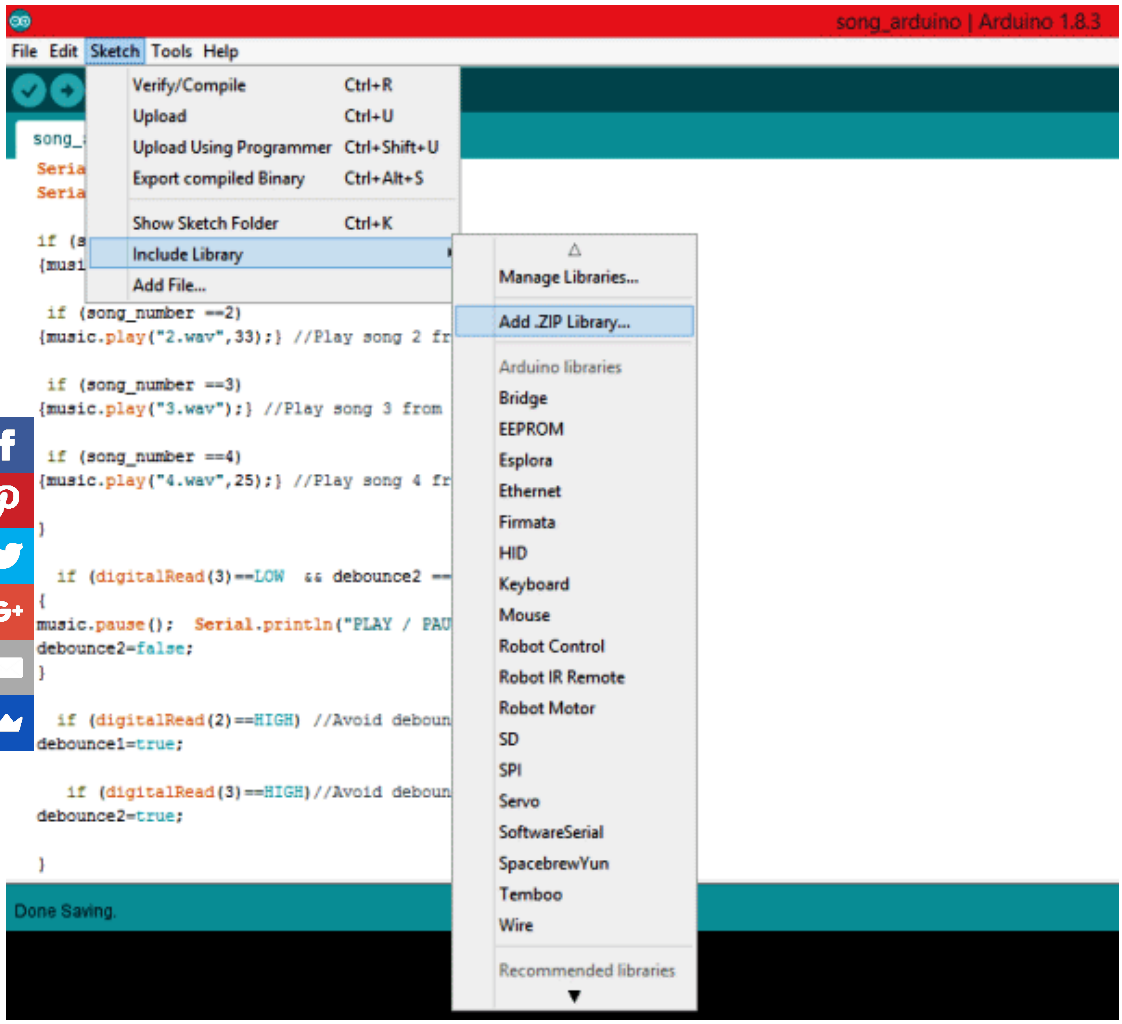


Programming your Arduino:

Once we are ready with the Hardware and the SD card, we are just one step away playing those songs. Insert the card into your SD card module and follow the steps below.

Step 1: As said earlier we will be using a library to make this project work. The link for the library is given below. Click on it and select “Clone or download” and choose download as ZIP.

Step 2: Add this Zip file into your Arduino IDE by selecting Sketch->Include Library -> Add .ZIP Library as shown below and select the ZIP file that we just downloaded.



Step 3: The complete program of the **arduino music player project** is given at the end of this article, simply copy it and paste it in the Arduino Program. Now, click on Upload and get ready to play your audio files.

The program is self explanatory since they have the comment lines. But, I have also explained the ability of the TMRpcm library below.

Playing an audio file:

You can play any audio that is stored in Wav format inside the SD card module by using the line below.

```
music.play("3.wav");
//object name.play (“FileName.wav”);
```

You can use this line at places where you want to trigger the Audio

Pause an audio File:

To pause an Audio file, you can simply call the line below.

```
music.pause();
//objectname.pause();
```

Forwarding/Rewinding an Audio:

There are not direct ways to forward or rewind an Audio file, but you can use the line below to play a song at a particular time. This can be used to forward/rewind with some additional programming.

```
music.play("2.wav",33); //Plays the song from 33rd second
//objectname.play("Filename.wav",time in second);
```

tting the quality of the audio:

e library gives us two qualities to play the music, one is to play as normal mode the other to play with 2X oversampling.

```
usic.quality(0); //Normal Mode
usic.quality(1); //2X over sampling mode
```

Setting the Volume of the audio:

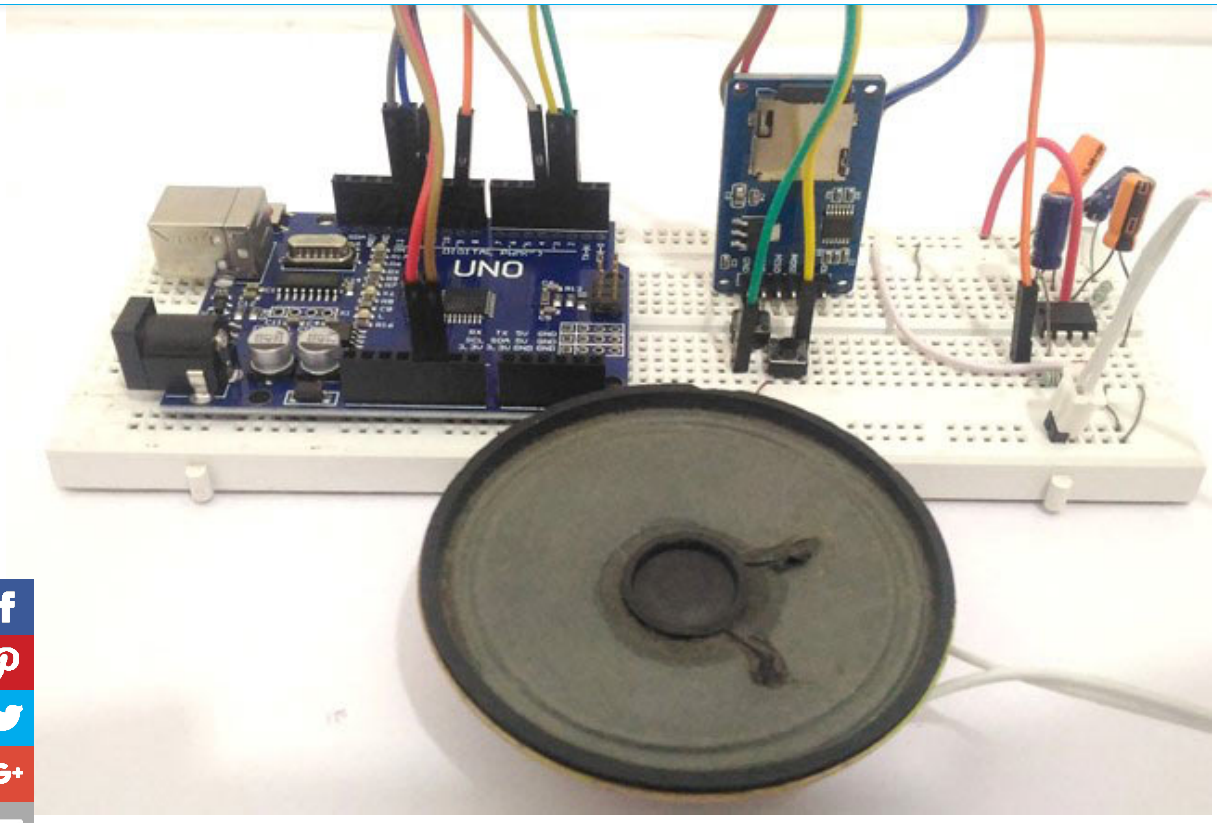
Yes, you can control the volume of the audio through software. You can simply set the volume by using the line below. Higher music volumes tend to affect the quality of the audio, hence use hardware control when possible.

```
music.setVolume(5);        //Plays the song at volume 5
//objectname.setVolume(Volume level);
```

Working of this Arduino Music Player:

After programming your Arduino simply press the button connected to pin 2 and your Arduino will play the first song (saved as 1.wav) for you. Now you can press the button again to change your track to the next song that is to play 2.wav. Likewise you can navigate to all four songs.

You can also play/Pause the song by pressing the button connected to pin 3. Press it once to pause the song and press it again to play it from where it stopped. Watch the **video below** for complete working (or maybe to relax yourself with some songs).



pe you enjoyed the project. Now it is up to your creativity to use them in your projects. You can make a speaking clock, ice assistant, talking robot, voice alert security system and much more. Let me know how you are planning to use it through the comment section and also if you have any problems in getting this thing work you can reach me through the forums or the comment section below.

Code

```
/*
Arduino Based Music Player

This example shows how to play three songs from SD card by pressing a push button

The circuit:
* Push Button on pin 2 and 3
* Audio Out - pin 9
* SD card attached to SPI bus as follows:
** MOSI - pin 11
** MISO - pin 12
** CLK - pin 13
** CS - pin 4

created  25 Jun 2017
by Aswinth Raj

This example code was created for CircuitDigest.com

*/
```

```
#include "SD.h" //Lib to read SD card
#include "TMRpcm.h" //Lib to play auido
#include "SPI.h" //SPI lib for SD card

#define SD_ChipSelectPin 4 //Chip select is pin number 4
TMRpcm music; //Lib object is named "music"

int song_number=0;
boolean debounce1=true;
boolean debounce2=true;
boolean play_pause;

void setup(){
music.speakerPin = 9; //Auido out on pin 9
rial.begin(9600); //Serial Com for debugging
(!SD.begin(SD_ChipSelectPin)) {
rial.println("SD fail");
urn;


nMode(2, INPUT_PULLUP); //Button 1 with internal pull up to chage track
nMode(3, INPUT_PULLUP); //Button 2 with internal pull up to play/pause
pinMode(3, INPUT_PULLUP); //Button 2 with internal pull up to fast forward

music.setVolume(5);    //   0 to 7. Set volume level
music.quality(1);       //  Set 1 for 2x oversampling Set 0 for normal
//music.volume(0);       //   1(up) or 0(down) to control volume
//music.play("filename",30); plays a file starting at 30 seconds into the track
}

void loop()
{


 if (digitalRead(2)==LOW  && debounce1 == true) //Button 1 Pressed
 {
 song_number++;
 if (song_number==5)
 {song_number=1;}
 debounce1=false;
 Serial.println("KEY PRESSED");
 Serial.print("song_number=");
 Serial.println(song_number);

 if (song_number ==1)
 {music.play("1.wav",10);} //Play song 1 from 10th second
```

```
if (song_number ==2)
{music.play("2.wav",33);} //Play song 2 from 33rd second
if (song_number ==3)
{music.play("3.wav");} //Play song 3 from start
if (song_number ==4)
{music.play("4.wav",25);} //Play song 4 from 25th second
if (digitalRead(3)==LOW  && debounce2 == true) //Button 2 Pressed
{
music.pause();  Serial.println("PLAY / PAUSE");
debounce2=false;
}
 (digitalRead(2)==HIGH) //Avoid debounce
ebounce1=true;
 (digitalRead(3)==HIGH)//Avoid debounce
ebounce2=true;
```

Video

TAGS ARDUINO UNO | ARDUINO | AUDIO | AMPLIFIER | AUDIO PLAYER | LM386 | MP3 PLAYER | MUSIC PLAYER

‹ PREVIOUS POST

Interfacing SSD1306 OLED Display with Arduino

NEXT POST ›

How to Send Data to Web Server using Arduino and SIM900A GPRS/GSM Module

COMMENTS

Pat

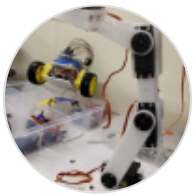
Aug 22, 2017

Log in or register to post comments

Hi,

Just curious what speaker you are using for this project? It sounds very nice.

Pat



Aswinth Raj

Aug 23, 2017

Log in or register to post comments

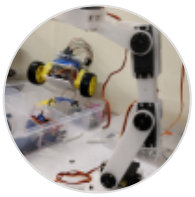
Hi Pat,

This is a normal 8 ohm speaker. There is nothing special with the speaker, because I have

Thanks

Pat
Aug 30, 2017 Log in or register to post comments

The part list says you need a 10uF and 100uF capacitor but the diagram shows 1uF and 10uF in the circuit....which is the correct combination?



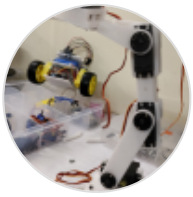
Aswinth Raj
Sep 01, 2017 Log in or register to post comments

Hi Pat,

I have tested the circuit will both the combinations and they worked fine. You can use either one and the performance will be the same.

Orri
Sep 04, 2017 Log in or register to post comments

So I use the 100uF instead of the 10uF and the 10uF in stead of the 1uF?

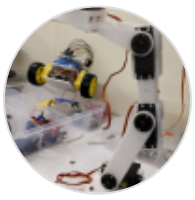


Aswinth Raj
Sep 04, 2017 Log in or register to post comments

yes

Lorenzo
Sep 02, 2017 Log in or register to post comments

hey, I see in your fritzing pic you put the ground in the + line and the + in the ground line, but the speaker's black wire is connected to the breadbard's blue line (where is connected 5V) and the red wire to the red line (where is connected gnd). Where should I connect amplifier pins?



Aswinth Raj
Sep 03, 2017 Log in or register to post comments

Yes the firtzing pic has a small representation problem. But, the connections are correct and will work as expected.

I have mistakenly swapped the positive and ground rails (representation) of the breadboard with the actual positive and ground rails of the circuit. This will not be a problem since the logic of the connection remais the same.

but the speaker's black wire is connected to the breadbard's blue line (where is connected 5V) and the red wire to the red line (where

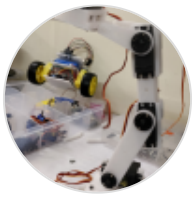
No, You have completely misunderstood the circuit. The upper positive and ground rails are only powered by +5V and ground. The lower potive and ground rails have not other connection other than the speaker itself.

You can know more about audio amplifier circuit from here. https://circuitdigest.com/electronic-circuits/lm386-audio-amplifier-circuit

miles
Sep 11, 2017 Log in or register to post comments

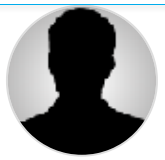
Hi I had one other comment but it has not posted yet so please disregard it. I'm getting the following error how should I resolve it?

/Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino: In function 'void loop()':
/Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:54:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]
{music.play("1.wav",10);} //Play song 1 from 10th second
^
/Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:56:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]
{music.play("2.wav",33);} //Play song 2 from 33rd second
^
/Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:58:22: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]
{music.play("3.wav");} //Play song 3 from start
^
/Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:60:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]
{music.play("4.wav",25);} //Play song 4 from 25th second }
^
Sketch uses 12676 bytes (39%) of program storage space. Maximum is 32256 bytes.
Global variables use 1118 bytes (54%) of dynamic memory, leaving 930 bytes for local variables. Maximum is 2048 bytes.
avrdude: ser_open(): can't open device "COM1": No such file or directory
Problem uploading to board. See http://www.arduino.cc/en/Guide/Troubleshooting#upload for suggestions.



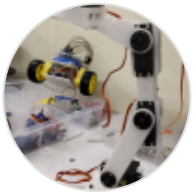
Aswinth Raj
Sep 13, 2017 Log in or register to post comments

Hi Miles, The above problem is not because of the program but because of your PORT settings. As the error states "can't open device "COM1": No such file or directory" Meaning



ahmed
Sep 21, 2017

I have the same problem ,, have you solved it??



Aswinth Raj
Sep 22, 2017

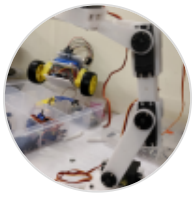
Have you tried the above solution?

Hrishikesh Morankar
Sep 21, 2017

Hey!! can you please update this project with arduino mega board without the buttons which you've used in this circuit.Also if I removed the buttons is it possible to play multiple files ?

Luke Barker
Sep 29, 2017

Will this work without the LM386 and go direct to head phones?



Aswinth Raj
Sep 29, 2017

Yes Luke, LM386 circuit is only for the speaker

Noam
Oct 09, 2017

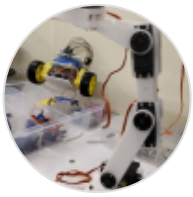
Hi,

I was able to purchase pololu microSD card breakout board with a 3.3V regulator and level shifters and I am getting error (SD Fail)

Is it related to Module vendor ?

Best regards

Noam

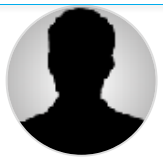


Aswinth Raj
Oct 09, 2017

So you have a 3.3V module with 5V level shifter right?

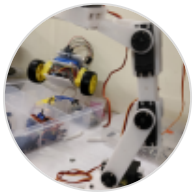
Make sure the level shifter is working by manually measuirng voltage.

The can be either because of your connections or because of your module



rami
Oct 11, 2017

code eroor



Aswinth Raj
Oct 11, 2017

What error did you get rami?

fitri hanun
Oct 13, 2017

Hi. i got this error /Users/milesrichie/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino: In function 'void loop()':

/Users/fitrihanun/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:54:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]

{music.play("1.wav",10);} //Play song 1 from 10th second

^

/Users/fitrihanun/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:56:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]

{music.play("2.wav",33);} //Play song 2 from 33rd second

^

/Users/fitrihanun/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:58:22: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]

{music.play("3.wav");} //Play song 3 from start

^

/Users/fitrihanun/Documents/Arduino/sketch_sep10a/sketch_sep10a.ino:60:25: warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]

{music.play("4.wav",25);} //Play song 4 from 25th second }

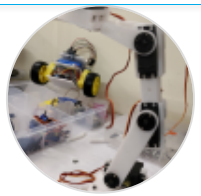
^

wjane
Mar 15, 2018

Do you know how to solve it?

ANAND
Oct 15, 2017

hl,can i use this library with atmega 8 mcu.I tried it but it shows some error.like "exit status 1 Error compiling for board Arduino NG or older."



Aswinth Raj
Oct 16, 2017

Sorry ANAND,

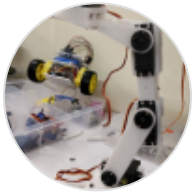
The libraries will not support Atmega8, you should have to upgrade your hardware for this project

jim
Oct 23, 2017

Mr Raj. it was a wonderful example. I am thinking to revise the code, but this time using only a single button to turn on and off the music. Here is what i want, im going to used a toggle switch (on and off). When the button is closed(permanently closed) ,the music will play. When the button is press again the button will be open and the music will stop. However, i wanted to play the music from start again when the button is closed again. Can you help me on this. many thanks

bitman
Oct 25, 2017

Hello,
Has anyone tried playing the wav clip stored in onboard flash, without the sd card?
Thanks



Aswinth Raj
Oct 25, 2017

Hi Bitman,

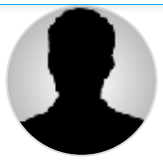
I have not tried it yet. But yes it should work even without a SD card module

Kyle
Nov 07, 2017

Hi, I am looking to build something like this, but with an option to play one of four .wav files. Is it fairly simple to instead have four buttons to play an audio track, and another to stop. Pressing of any button halting any other .wav file and playing just the programmed .wav file?
Would appreciate any help as it is for a non-profit group that I help out

Nagarajan
Nov 21, 2017

Sir, Will you please give me a sample coding for arduino program to play the audio files one by one at exact pre- scheduled time interval and switch off as the song ends.



hi i think ive wired everything correctly but no sound is coming out except an occasional tap? and my lm386 chip is getting really hot.
im trying to make it so that i can move the buttons off away from the breadboard if possible.

Log in or register to post comments

robert linder
Nov 30, 2017

Log in or register to post comments

update the heating problem is fixed but no music is playing when i press the buttons only a tap. checked sd card is being read ok and files are found but still cant get music to play. any suggestions would be helpful

robert linder
Nov 30, 2017

Log in or register to post comments

ok final update before my head explodes!
im getting a warning about the files when i compile which reads;
warning: deprecated conversion from string constant to 'char*' [-Wwrite-strings]

{music.play("1.wav");}
repeats for other files
ive looked on the forums and responses just make me more confused as i dont know how to apply the changes they suggest out of the context theyre suggested in. (if that makes sense)
something along the lines of making the song files constants?
could this be why my files wont play?

AISHA
Dec 04, 2017

Log in or register to post comments

I not sure how you ended up on his error. But was the code working for you properly the first time. I assume the Amplifier was heating mostly because of a wrong connection. When you rectified the correction the IC might have been completely burnt. So try replacing the IC, incase if you dont have one ignore the amplifier part they will still work just fine but sound will be low. I tried compiling the same code given here, yet dint get the error you are speaking about

SimK
Jan 04, 2018

Log in or register to post comments

Hi,
How would you connect a speaker using bluetooth module HC06? I am unsure of how to do this.
Thanks :)

Recai

Hi. How is it possible to for arduino to give smooth analog signal for music since it can only produce pwm? Can you answer me please. I am confused.

Log in or register to post comments

AISHA
Jan 11, 2018

Log in or register to post comments

It is because of the library

TMRpcm.h

This produces analog signal to play music. You have dive deep into how the library works to understand how the signal is produced.

jim
Jan 13, 2018

Log in or register to post comments

Hello Mr. Raj.

I was successful in doing the same. However, everytime i press the buttton to play the music i can a loud ticking sound in which i believed coming from the switch. Is there anyway i can eliminate this "click" sound.

Thanks

AISHA
Jan 15, 2018

Log in or register to post comments

Yes you can add a delay after every time the arduino reads the switch

Mahesh
Jan 18, 2018

Log in or register to post comments

I am use the headset if u need any amplification

AISHA
Jan 23, 2018

Log in or register to post comments

No i don't think you will need amplification for Headphones. Let me know how it turns out !

Anant Maind
Jan 19, 2018

Log in or register to post comments

Default test file provided in library plays well.But another file not playes properly even i have convered as per your suggestion like

1. into .wav

2.sample :1600Hz

3.Channel :Mono

4.Bits 8

Advance pcm format :PCM unsigned 8 bit

AISHA

Jan 23, 2018 Log in or register to post comments

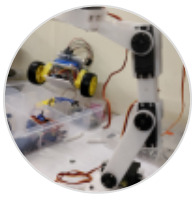
Not play properly in the sense? Are you getting wired sounds? or is it just mute?

Awan

Jan 24, 2018 Log in or register to post comments

hello sir my name is awan first sorry to interrupt your time, what kind a speaker when you use in this project because from this tutorial I can't rise up my volume and noise everywhere when I play the music

thanks



Aswinth Raj

Jan 24, 2018 Log in or register to post comments

You can use any speaker, you can also use your computer speakers.

Try with a simple speaker first, if you are satisfied remove the small speaker and replace it with a bigger one. The model of speaker will not affect the working of the circuit. All the best

Mr Manjunatha

Jan 27, 2018 Log in or register to post comments

SD fail

KEY PRESSED

song_number=1

PLAY / PAUSE

(in serial monitor)

the memory card is ok and formatted also.

I am getting this errors

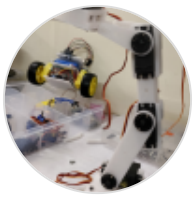
please reply for me as soon as possible

AISHA

Jan 30, 2018 Log in or register to post comments

A.M.L
Feb 01, 2018 Log in or register to post comments

hey thanks, but i have a problem ..... when i push the push button first time , track 1 play but when i push it the second ,track 2 didn't play please tell me why and thank you



Aswinth Raj
Feb 05, 2018 Log in or register to post comments

Sounds odd, it should have played. Make sure the button is working properly

Michael McGuire
Jul 08, 2018 Log in or register to post comments

The code has a "}" in the wrong place. Move the second to last "}" above the line "if (digitalRead(3)==LOW && debounce2 == true) //Button 2 Pressed"

henry
Feb 06, 2018 Log in or register to post comments

Can you specify where the error is in the fritzing diagram? I am trying to build this circuit based off the fritzing, but earlier comments make is seem like the fritzing is inaccurate.

AISHA
Feb 07, 2018 Log in or register to post comments

You can build it, if you have any problem use the forum. The circuit diagram is good

jun sarte
Feb 12, 2018 Log in or register to post comments

i have a problem when i am trying to change track it will not work when i press again the button

ahamed Maududi
Feb 14, 2018 Log in or register to post comments

It plays only noise .No playback.what can be the error??

SimK
Feb 15, 2018 Log in or register to post comments

Hi,

How would you connect a speaker using bluetooth module HC06? I am unsure of how to do this.

Thanks :)