



Text to Speech using Arduino Uno

Lalit Kumar¹, Mahesh Kamthe², Namrata Mohakud³, Pankaj Sharma⁴, Kamlesh Singh Yadav⁵

Assistant Professor^{1,2}, B. Tech^{3,4,5}

Department of Electronics & Communication Engineering
MIT School of Engineering, Pune, India

Abstract:

The system uses an open source hardware Arduino as a module to generate the phonetics of the text given as an input to the Arduino in the form of source code. The code is compiled and written using a smartphone application. Then the code is processed by the Arduino and the corresponding phonetics are created which are available in the library of the Arduino. Then the amplifier circuit comprising of IC LM386 is used in its maximum gain for the amplification of the output and clear sound. The output of amplifier is then provided to the speaker which gives the output audible to human ears. The goal of this project is to make the impaired people enable a new to speak out their voice with the help of this device.

Keyword: Text to speech analysis, Arduino UNO, Amplifier, Speaker, Android phone

1. INTRODUCTION

Our project here is aiming to create a conversion between two differently abled people. As a person having a speaking disability wants to share his views with a person who's visually impaired it won't be possible due to their physical disabilities. As the person who can write can provide the input to the Text-to-speech module using a keyboard and the module recites the written input provided by the person. The output of the processor is provided to an amplifier for clear and higher volume and then the signal is passed to the speaker which converts it into a voice signal audible to a human ear. The secondary use of the circuit can be used to convert e-books into audio books easily by just copy and pasting the contents of e-book into the input module of the circuit. Text-to-speech converts normal text into speech. This tech enables the system to speak out the text in a human voice. This system changes normal text written into speech and it allows the system to speak out the text in a human voice. The first level of this system is pre-processing which is also called the normalization. The second level includes the conversion of normalized text into grammars or into the phonetic copies. And the stage is the correction of grammars into spoken voice. This stage is achieved by different techniques such as recording the voice of human for various words/statements or by creating basic sound frequencies and store them as phonemes.

2. COMPONENTS

Arduino Uno

The Arduino Uno[1] is an open-source microcontroller board based on the microchip ATMEGA328p. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits. This board has 14 digital I/O pins (6 capable of PWM output), 6 analog I/O pins, and is programmable with Arduino IDE (Integrated Development Environment), via type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

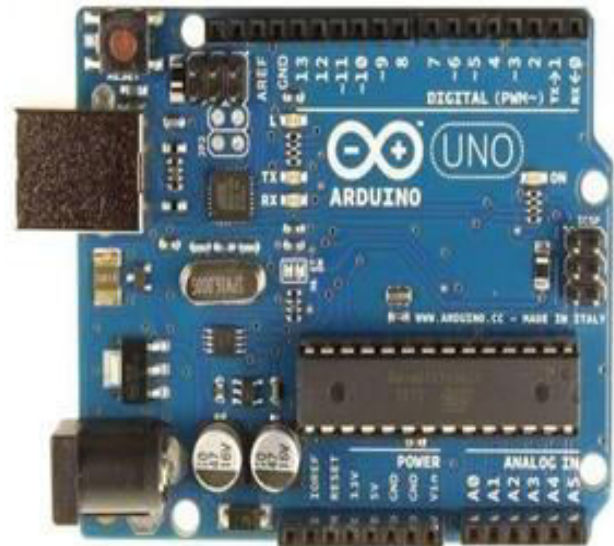


Figure.01. Arduino Uno

IC LM386

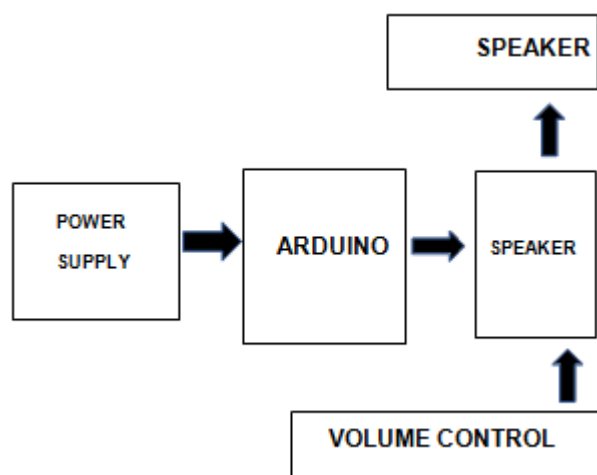
The IC LM386[2] is a low power audio amplifier, and it utilizes low power supply like batteries in electrical and electronic circuits. This IC is available in the package of mini 8-pin DIP. The voltage gain of this amplifier can be adjusted to 20, and the voltage gain will be enhanced to 200 by employing external components like resistors as well as capacitors among the pins 1 & 8.

When this amplifier uses a 6V power supply for the operation then the static power drain will be 24 milliwatts to make the amplifier for an ultimate operation of the battery. This amplifier consists of 8-pins where pin-1 and pin-8 are gain control pins of the amplifier, and this IC is most widely used IC that allows a customer to increase volume. The data sheet is provided in the references.[2]

Speaker

We are using an 8ohm speaker in this system to get the result in form of sound from the texts that are given at the input side.

3. BLOCK DIAGRAM



4. CIRCUIT DESIGN AND IMPLEMENTATION OF THE SYSTEM

Here the circuit diagram of the project using the components is given below. It has two parts input processing through Arduino Uno and then the amplifier circuit to produce the desired volume and clear output voice.

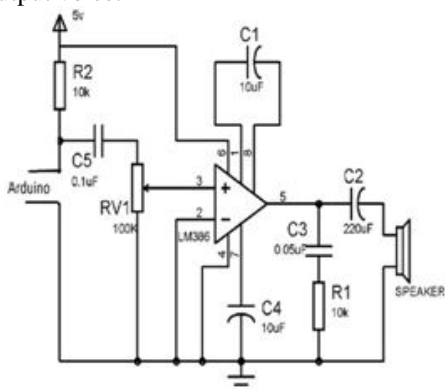


Figure.02. Circuit diagram

Arduino board designs have a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The Arduino boards have the feature of serial communications interfaces, including Universal Serial Bus (USB) on some of the models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. Along with this traditional compiler tool chains, like the Arduino related project provides an integrated development environment (IDE) based on the Processing language project. Now here are the steps through which we interface the Arduino board to the text provided and get its audio heard by the human.

Input to Arduino:- we are using cell phone to provide the input to the Arduino. The instruction giving makes it handy and easy to carry.

Role of Potentiometer:- It enables us to control the degree of amplification and hence it is used as volume control in the circuit.

Gain and filter:- The capacitor helps to maximize the gain and also it acts as filter.

Op-amp IC LM386:- This IC can be used as comparator, adder and for other operations but it's best use is as audio amplifier which is the essential requirement of our system.

Speaker:- The result of the amplifier circuit is passed to the speaker connected which produces the final audio output.

We connect the power supply to the amplifier circuit and also attach the digital pin 3 of the Arduino to the 10K resistor and then connect the ground of Arduino to the ground of given circuit. And after that we also connect the speaker by connecting its negative terminal to the ground and positive terminal to the 220Mf capacitor and at last we connect the power supply to run the system.

Text-input processing

The first part of the circuit to analyze the text given to it through the source code and create a corresponding analog output signal to the world. The processing is done by using a microprocessor Arduino Uno.

Amplification

The second part of the circuit is to take the output of the Arduino as input signal and provide the amplified version of the same signal using the amplifier circuit. It also enables us to change the volume of plot.

5. OVERALL FLOWCHART OF THE ARDUINO

Now it's here comes our entire project with the flowchart which includes the essential steps.

Also the code of the program to run the processor is given below.

```
Code:
#include "Talkie.h"
#include "Vocab_US_Large.h"

#include "Vocab_Special.h"

Talkie voice;

void setup()
{
}

void loop()
{
  voice.say(spPAUSE2);

  voice.say(sp2_DANGER);

  voice.say(sp2_IS);

  voice.say(sp2_A);

  voice.say(sp2_BOY);
}
```

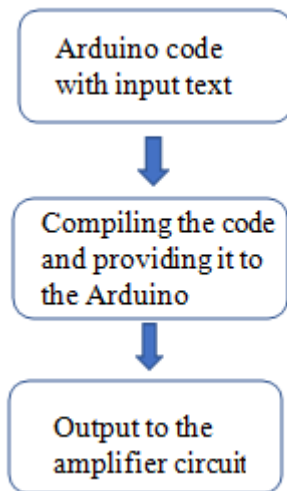


Figure.03. Flowchart of Arduino process

6. EXPERIMENTATION & RESULTS

Simulation:

The simulation of the circuit to be implemented using Proteus and the ideal output is obtained in the simulation. The coding is done in the Arduino ide for simulation and the path of the “.Hex” file is provided to the Arduino module in the proteus rather than input through cell- phone. The result of the simulation is as expected but since the output speaker is not as the hardware so the output is not clearly audible hence it gives output in the form of sound that is depicted in the meter of the speaker in the simulation. Hence the result we get as the output is shown by that volume rate of the speaker shown in the figures. The output of the hardware when implemented will be as we desired to be. Hence the simulation is successfully completed.

The output of the speaker is as follows:-

- The speaker has no output: The space between the words to be pronounced and the starting time of the circuit the output of the speaker is as shown below in the figure.

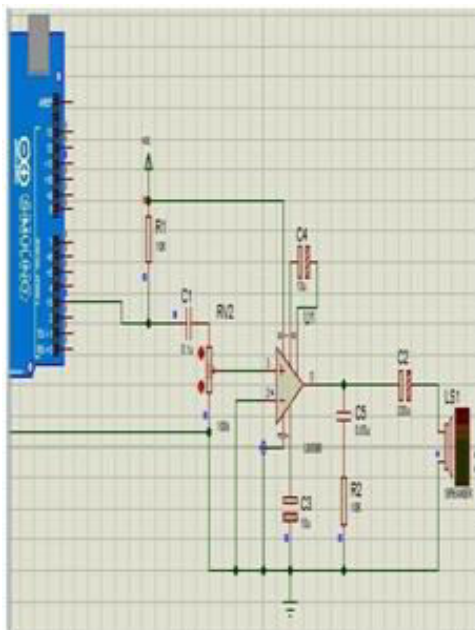


Figure.04. No output

- **The speaker has medium amplitude:** The amplitude adjusted using the potentiometer for a clear sound at medium. It is shown in the given figure.

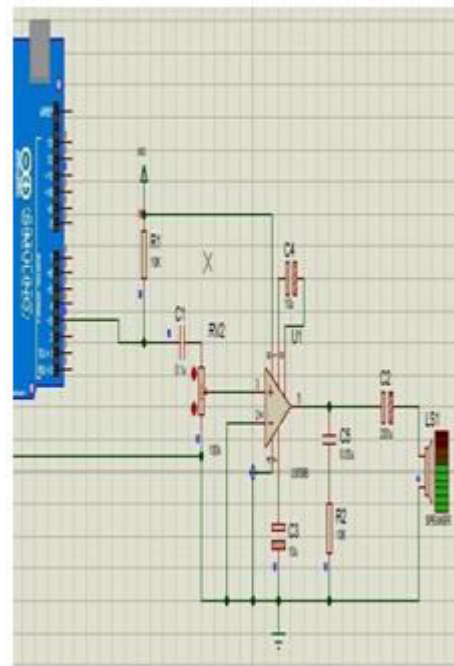


Figure.05. Medium amplitude

- **Maximum amplitude:** The output is adjusted using potentiometer as to the maximum. It is shown below.

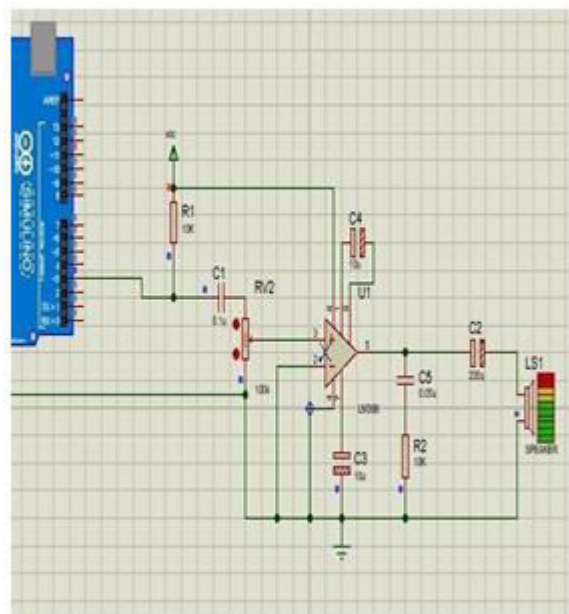


Figure.06. Maximum amplitude

7. CONCLUSIONS AND FUTURE SCOPE

As a result of this system, there may be many improvements to our society, specially for those who can't see or speak i.e. for the visually impaired people. Some children and adults were deprived of the pleasures that we have every day, and they want to change that. The circuit was successfully able to convert text into speech. The circuit is ready to be used as an automatic instructions provider in places. The system is handy and a small

size makes it easy to carry and the benefit of the system is it can be used without internet access and in places with no connectivity.

Future scope

- The library consisting the maximum compiled words will make sure the total use of the circuitry.
- Library will allow us to use the variety of words which will make it easy to use.
- It can be used for different languages in different areas.
- It can be used as translators with little modifications.
- If we want to brief about a subject which is very vast then it can be used.

9. REFERENCES

[1].Arduino Uno from Wikipedia, the free encyclopedia.
<https://store.arduino.cc/usa/>

[2].elprocus<https://www.elprocus.com/ic-lm386-audio-amplifier-pin-configuration-and-its-working/>For datasheet:-all data sheet.
https://www.alldatasheet.com/view.jsp?Searchword=Lm386%20datasheet&gclid=CjwKCAjw8J32BRBCEiwApQEKgcUvqI_XDgEi_UkzH2_jlEwwxraAm-vSX2Y_wEkRP_0nLFZbbYShQQDFLcBoChO_0QAvD_BwE

[3].Itunuolwa Isewon ,Jelilli Oyelade and Olufunkle Oladipupo. Design and Implementation of Text To Speech Conversion for Visually Impaired People in International Journal of Applied Systems(IJ AIS)-Foundation of Computer Science (FCS), New York, USA, Volume 7-No.2, April 2014-www. ijais. org

[4].Swathi, G., Mai, c.k, and Babu, B.R., 2013.Speech Synthesis System for Telugu Language . International journal of computer application(0975 – 8887),Volume 81- No5.

[5]. www.youtube.com

[6]. <https://circuitdigest.com/microcontroller-projects/arduino-based-text-to-speech-converter>

[7]. Mohanan, S., Salkar, S., Naik, G., Dessai, N.B., and Naik, S., 2012.Text To Speech Synthesizer for Konkani Language. International Conference on Computing and Control Engineering (ICCCE 2012),12 & 13 April,ISBN 978-1-4675-2248-9

[8]. [circuits4you.com https://blog.circuits4you.com/2016/04/text-to-speech-on-arduino.html](https://blog.circuits4you.com/2016/04/text-to-speech-on-arduino.html)