# Mini project in Analog System Design

*High Fidelity Infrared Audio Transmitter and Receiver System*

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# INTRODUCTION

- An IR based audio transmitter and receiver system is a device that allows audio signals to be transmitted wirelessly over short distances using infrared (IR) light. The transmitter converts audio signals into IR light signals that are then transmitted to the receiver. The receiver converts the IR light signals back into audio signals, which can be played through a speaker or headphones.

- IR based audio transmitter and receiver systems are commonly used in situations where wired connections are impractical, such as in home theatre systems, gaming consoles, and portable audio devices. They offer a convenient and reliable way to transmit high-quality audio signals without the need for cables or wires.

# PROBLEM STATEMENT

- The problem addressed in this project is the need for a reliable and efficient IR based audio transmission and reception system. While IR based systems have been used for many years, the current technology available for audio transmission and reception still faces several challenges. These challenges include limited range, interference from other light sources, and poor sound quality.

- Therefore, this project aims to develop an IR based audio transmission and reception system that overcomes these challenges and provides a reliable, high-quality audio experience. The system will need to be designed to have a longer range, be resistant to interference, and provide excellent sound quality. By addressing these issues, this project will contribute to the development of an advanced IR based audio transmission and reception system that can be used in a wide range of applications.

# METHODOLOGY

The methodology for developing an advanced IR based audio transmission and reception system involved the following steps:

- Requirements Analysis: This step involved identifying the functional and non-functional requirements of the system. The requirements include the desired range, sound quality, supply voltages,bandwidth of transmission,sensitivity of receiver.

- Circuit  Design: Based on the requirements analysis, the hardware circuit design  was developed.

- Component Selection: The selection of the hardware components was done based on the circuit design and requirements analysis. This includes selecting the IR light source, the receiver ,comparators, operational amplifiers, voltage regulators, speaker, transistors,microphone,diodes, batteries,regulator IC, timer IC and passive components.

- Prototyping: A prototype circuits were developed to test the design and component selection. This involved building the hardware for the circuit on the breadboard.

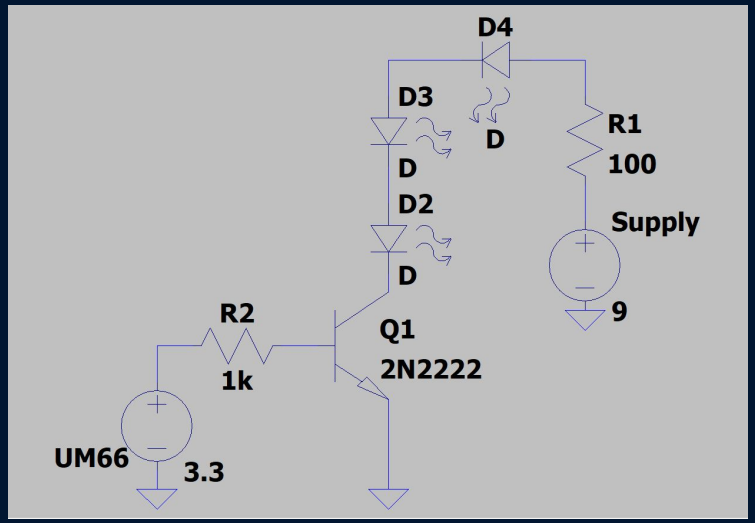
- Testing and Evaluation: The prototype circuits were tested to evaluate its performance, including its range, sound quality. The results of the tests was used to refine the system design and identify any areas for improvement.

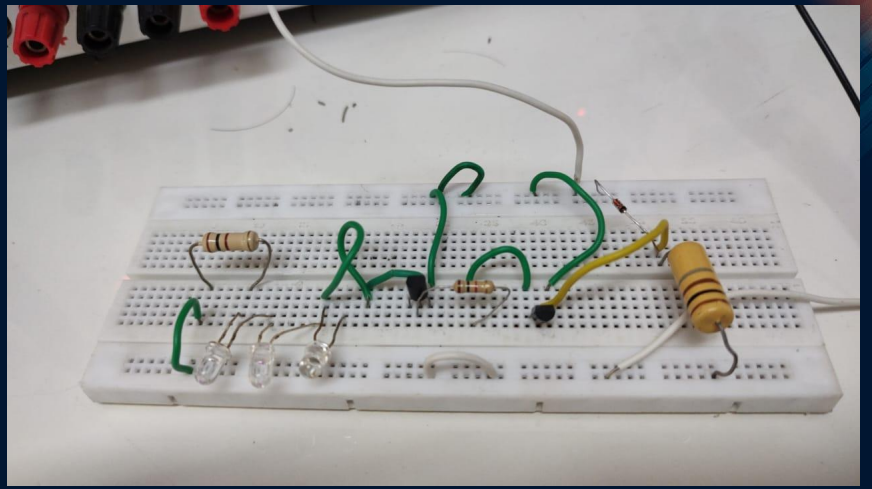
- Circuit Integration and Optimization: Based on the testing and evaluation, the circuit was optimised to improve its performance and ensure compatibility with existing circuit design and finally design freezing was done to manufacture the final prototype for the demo.

# IMPLEMENTATION AND RESULTS (BEFORE MIDSEM)

# TRANSMITTER

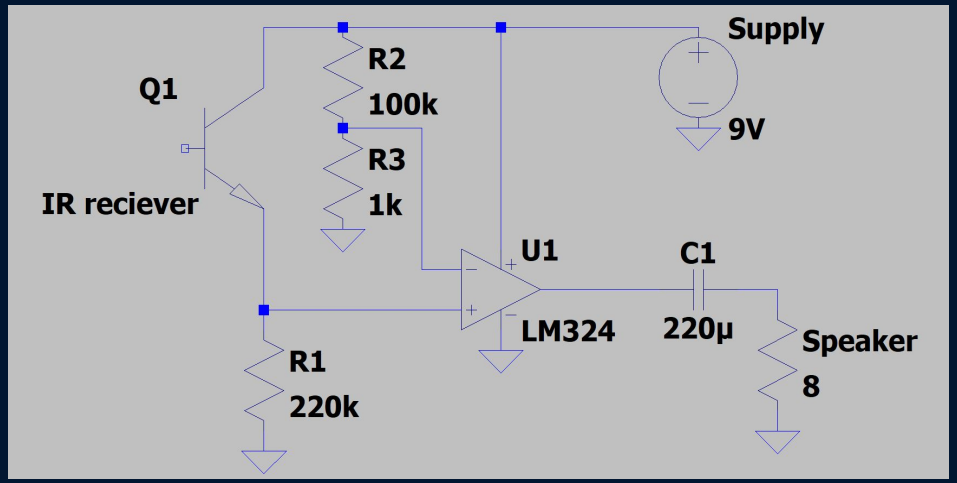
The audio input is taken from a tone generator UM66.This IC generates audio PWM signals of 3.3vpp which is then used as control signal to switch IR LEDs arranged in series connected fashion using low sided driving from NPN transistor 2N2222 which can drive upto 800mA current.

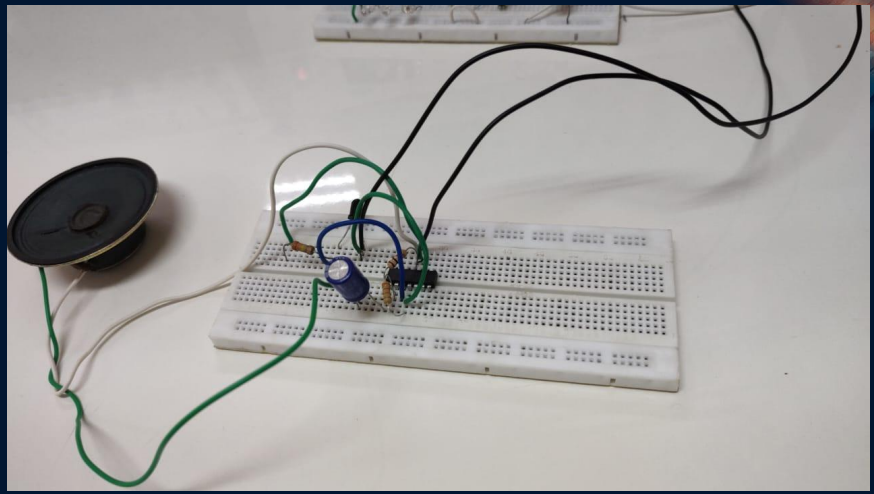


# RECEIVER

The receiver circuit consists of a phototransistor  which is connected to a comparator(LM324) circuit to retrieve PWM signal from the transmitter.This PWM signal is applied to the speaker through a capacitor to get the audio/tone transmitted.



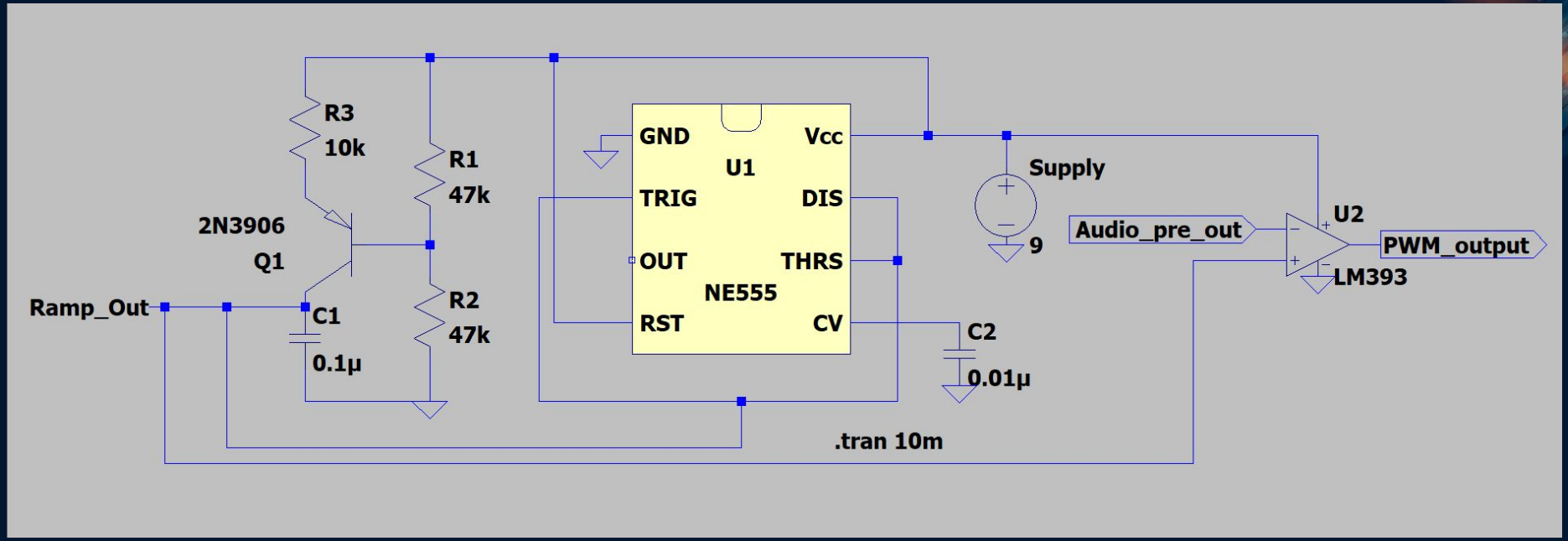



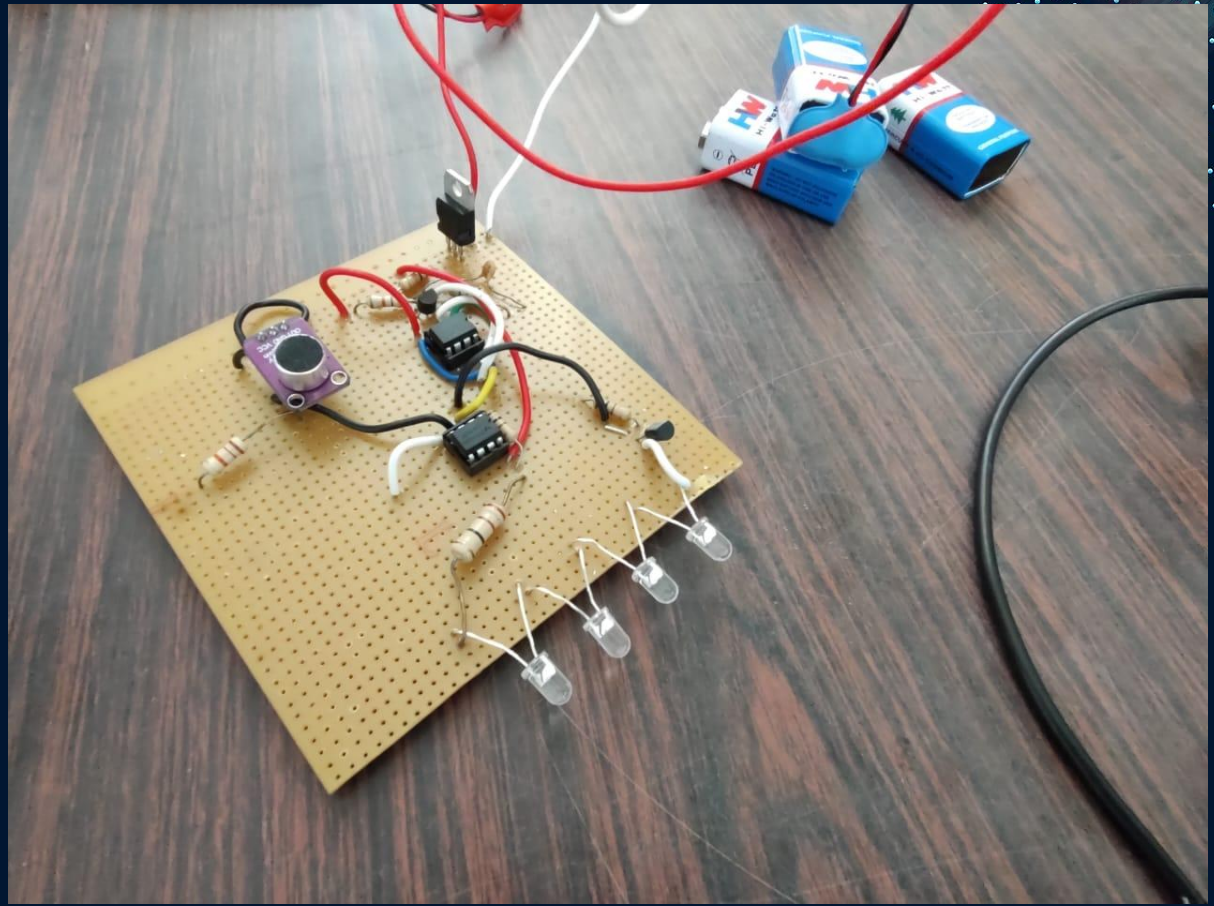
# IR TRANS-RECEIVER WORKING CIRCUIT USING UM66

# IMPLEMENTATION AND RESULTS (AFTER MIDSEM)

# TRANSMITTER

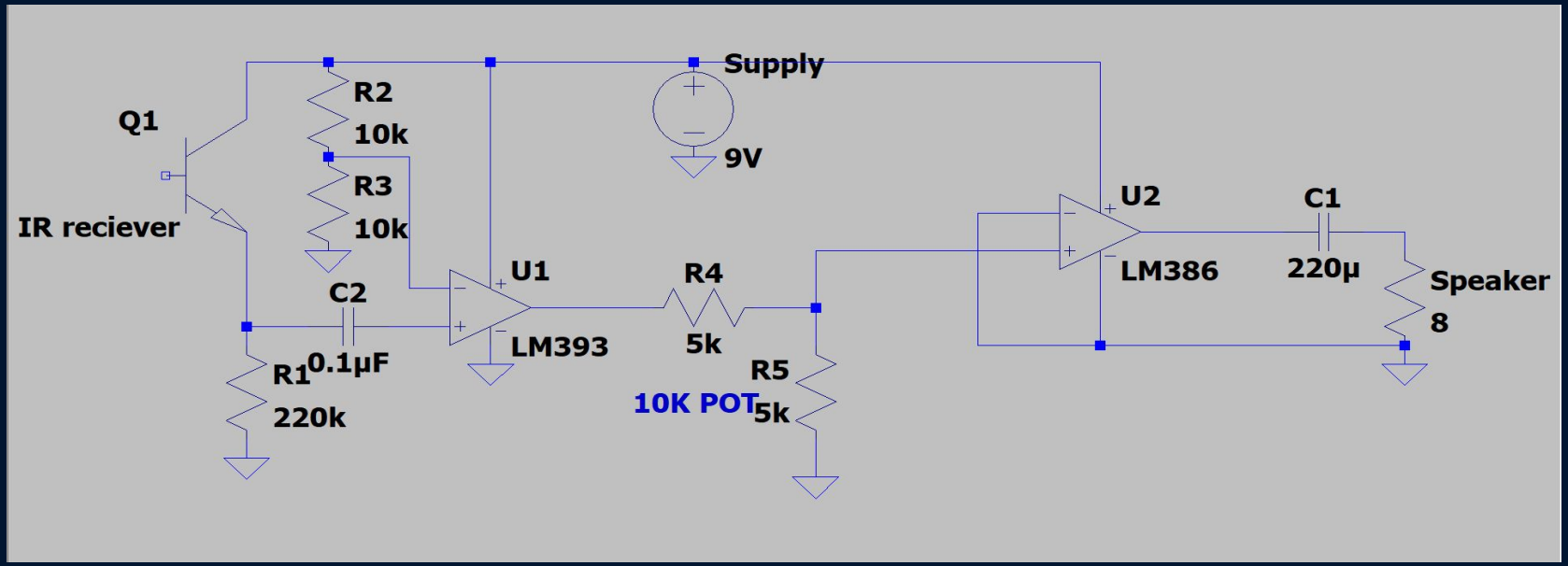
Audio Modulation for microphone :
We are using pulse width modulation to convert analog audio signal to digital to transmit IR signals which has high signal to noise ratio and controlled volume.We are generating 20Khz ramp signal using BJT constant current source capacitor charging and NE555 timer IC as discharging rate of 20 Khz.Then the LM393 is used as comparator between microphone and ramp signal to generate PWM audio signal which is fed to transmitter circuit.

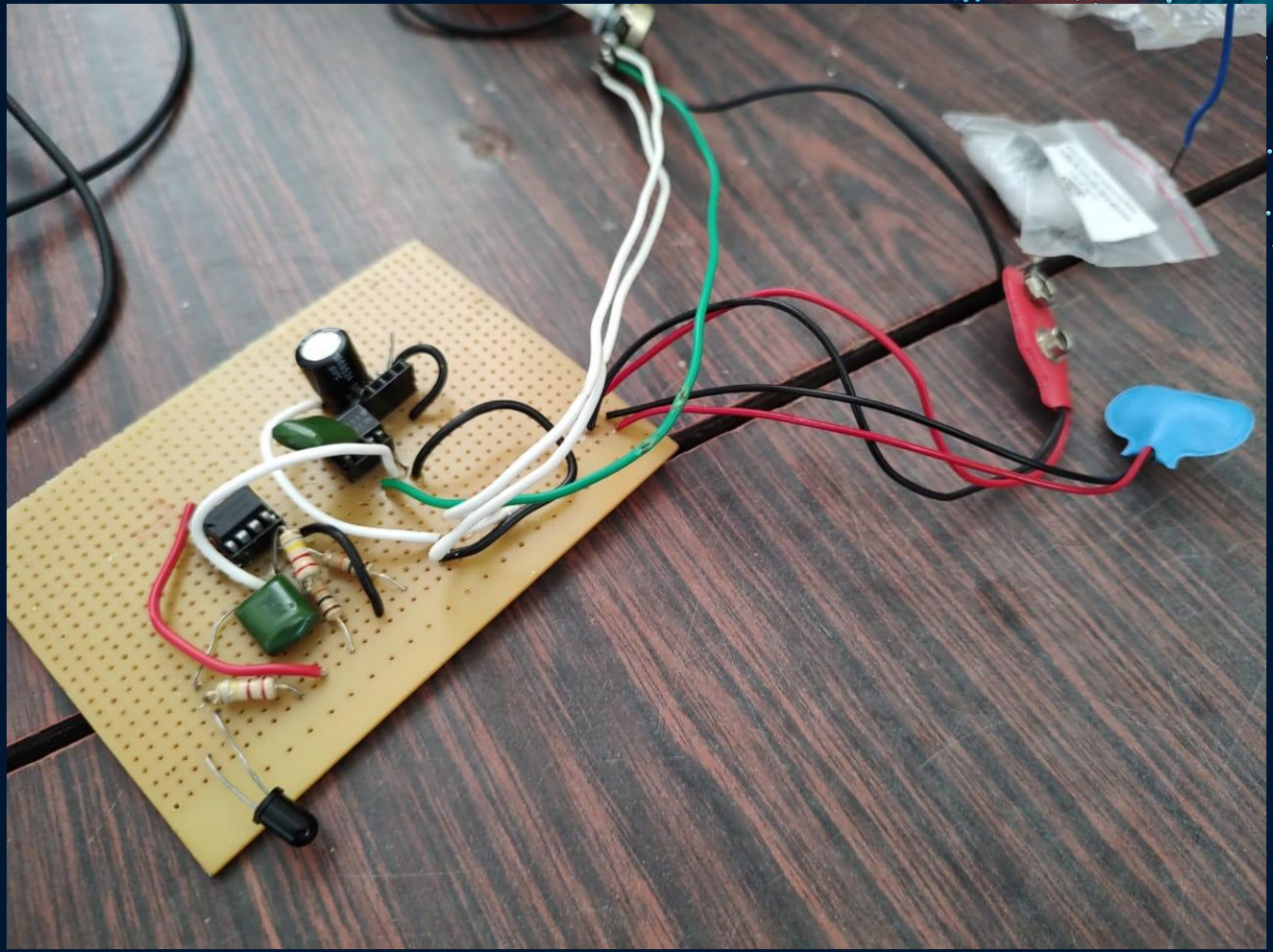




# RECEIVER

The receiver circuit consists of a phototransistor which is connected to a comparator through capacitor to remove dc.Output of comparator is connected to audio power amplifier LM386 through potentiometer which is acting as volume control.The output of the LM386 is used to drive the 8 ohm speaker through capacitor of 220uF.






THANK YOU