**Introduction**

In this project, we will examine the one of the modern communication systems: optical wireless communication system. The aim is to transmit the audio input signal that is generated by the microphone and to receive this information wirelessly. Then, the received signal is fed to the speaker at the final step while the quality of the signal is indicated by a single RGB LED. In general, the project can be grouped under two main units: Transmitter Unit and Receiver Unit. Also, each main part consists of different sub-units, and they are explained in detail in the following sections of the report. The overall diagram of the project is given below for better understanding.

**Project Description**

1. **Transmitter Unit**

In the transmitter unit,

1. **Microphone Driver**

To transmit an audio signal using laser and photodiode, we need to detect this audio signal first. Therefore, to detect the audio signal we should use a electret microphone. However, since the output voltage of the microphone is quite low, we cannot directly connect it to the rest of the circuit. In order to use this output, first, we should amplify it with a microphone driving circuit shown in Figure 2.

1. **Automatic Gain Control (AGC)**

After the pre-amplification process, we should adjust the output signal because the output of the microphones is distance and frequency dependent, so the output amplitude of the microphone change with time as well as distance of the speaker (person) to it. Therefore, as it is stated in project definition, we need an automatic gain controller that controls gain and adjusts the amplitude of the microphone signal, so we will get a relatively constant amplitude audio signal. To achieve this, we use the circuit given in Figure 3.

1. **Low-Pass Filter**
2. **Summing Amplifier**

Before transmitting the audio signal, we are going to add another signal namely reference signal so that at the receiver side, the amplitude of this signal will be treated as the measure of signal strength since it is constant. To sum up these two signals, we use basic summing amplifier circuit which can be seen in Figure 4.



1. **Optical Transmitter**
2. **Receiver Unit**
3. **Optical Receiver**
4. **Low-Pass Filter**
5. **High-Pass Filter**
6. **Signal Level Indicator**
7. **Audio Amplifier**

1. **Clipped Indicator**

lpf (ismail)

hpf (ismail)

rgb (ismail)

speaker (caner)

clipped (ismail)

**Conclusion**

**References**