

EE313 Project Final Report

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I. INTRODUCTION

II. TRANSMITTER

A. Microphone

B. Automatic Gain Control

III. RECEIVER

A. Photodiode

B. Low-Pass and High-Pass Filter

After the light signal is converted to voltage signal, we need to separate audio signal and reference signal. We need to implement a low-pass filter to obtain audio signal and a high-pass filter to obtain reference signal. We decided to use a fourth order Butterworth Filter [x] for low-pass filter and second order Butterworth Filter for high-pass filter. The schematics of the filters are shown below.

C. peak detector

At the proposal report, we decided to use a simple circuit with one diode and one capacitor to obtain the amplitude of the reference signal and it worked properly at the simulations. However, in practical case, it did not work as we expected since the frequency (20kHz) of the signal is too high. Therefore, we changed our design and used the circuit shown in [x] which is shown in the figure below.

The simulation results for the peak detector circuit is shown below.

D. Signal Level Indicator

We are expected to design a circuit to represent received signal level with a single RGB led. Chosen colors for each case are shown in the table below. The overall schematic of

to determine regions for each signal level case. Then four comparator is used to determine at which region the amplitude of the reference signal is. When the amplitude is at the first region, all comparators will have negative output and no color will be displayed. When the amplitude is at the second and third region, the first and the second comparator will have a positive output and red and yellow color will be displayed respectively. The output of the third comparator is subtracted from the output of the first comparator by the difference amplifier so that the red pin will be turned off when the signal is at the fourth region and green color will be displayed. Similarly, the output of the last comparator is subtracted from the output of the second comparator so that the green pin will be turned off and blue color will be displayed when the amplitude is at the last region.

We used common anode RGB led so that the led has a common ground pin. We used different resistors for each color pin of the led to adjust the tone of the colors.

The simulation results are shown below.

E. audio amplifier

IV. CONCLUSION

REFERENCES

TABLE I
LED COLORS FOR EACH CASE

Signal Level	Color	R Pin	G Pin	B Pin
No Signal	-	0	0	0
Weak Signal	Red	1	0	0
Moderate Signal	Yellow	1	1	0
Good Signal	Green	0	1	0
No Signal	Blue	0	0	1

the signal level indicator circuit is shown below.

At first, we used 5 resistors connected in serial between Vcc and ground to divide Vcc into four different voltages