A Simple Laser Communicator

A Project Presentation Summary

Presented to

the Instructor of Electrical Engineering 164:

Fiber Optic Communication

In Partial Fulfillment

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Electrical Engineering 164

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1 INTRODUCTION

1.1 Objective

The objective of this project is to build a simple fiber optic communication system that transmits an audio signal through air from a transmitter to a receiver via a laser beam. Once constructed, the system is to be modified in some manner in attempts to improve on one of the following:

- Sound quality
- Range (limited)
- One-to-one

1.2 Parts List

The following is a parts list for this project:

- Laser pointer/2-AAA batteries/battery holder
- CD player (powered by 2-AA batteries)
- Earphone jack
- Audio output transformer (8 ohm/1000 ohm)
- Clip leads
- Cadmium sulphide photoresistor
- AA battery
- Microphone jack
- Mini amplifier/speaker (powered by 9-volt battery)

2 IMPROVEMENTS

2.1 Observations

The system works considerably well, producing a coherent audio signal at the speaker. The signal produced by the laser transmitter, however, becomes dimmer when connected to the transformer as opposed to when it is not connected to the transformer. The signal does get brighter and dimmer with the volume of the music in the signal, but even when there is no audio signal input the signal is dimmer when connected to the transformer. We are unsure as to why this occurs.

The system performs better in a dark room than it does in a room with the lights on. In a dark room there is little or no environmental noise (light) to interfere with the signal produced by the laser transmitter.

2.2 Attempted Improvements

One improvement was to use a cadmium sulphide photoresistor instead of a solar cell. This improvement was made due to difficulty in soldering the solar cell to the system. Photoresistors of various sizes were tested to determine the size yielding the best system performance. The photoresistor with the largest area was finally chosen. Using a photoresistor instead of a solar cell greatly improved the project as the system would not work at all when using the solar cell. The photoresistor worked better than the solar cell because soldering the photoresistor was easier and because the photoresistor is more responsive than the solar cell.

Another attempted modification was connecting multiple batteries (size AA) to the photoresistor instead of just one battery. This modification did not improve the system. This modification did not improve the system because the photoresistor was already being driven by a sufficient amount of power. Not only will additional voltage not improve the system, it may actually worsen the system's performance.

2.3 Possible Improvements

Due to time and equipment constraints, we were not able to employ any of the following modifications which could possibly have led to an improvement in one or more areas of the system:

By using a signal amplifier, the signal intensity reaching the receiver would have increased, thus increasing the range producing a louder, if not clearer, audio signal.

If the bandwidth of the laser transmitter signal were known, the use of a notch or matched filter would help in removing much of the unwanted noise.

The use of a specially-designed setup to hold both the laser transmitter and photoresistor receiver steady while sending the signal would produce a more steady output, thus improving the sound quality.

3 PICTURES

Fig. 3.1 Photoresistor receiver (powered by AA battery) and speaker/amplifier

Fig. 3.2 CD player, laser transmitter, 2-AAA batteries, battery holder, transformer, clips, and receiver circuit

Fig. 3.3 CD player, 2-AAA batteries, battery holder, transformer, and clips