EE322: Embedded Systems Design - Project

Laser Communication System

Project Proposal

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Laser Communication System

Introduction

In Industrial applications, transmitting and receiving signals with higher precision and accuracy is the prime goal. For the embedded system project, we have designed a model to approach this using a laser beam. The system can transmit 4-bit simplex signals efficiently with a low-cost setup and display the received signal. To approach this, a transmitter and a receiver will be designed separately. For demonstration purposes, the transmitter is input with a 4-bit digital signal and the receiver displays the relevant signal. We aim to achieve this goal using two PIC16F84A microcontrollers for the hardware and Assembly language for scripting.

Problem Identification

In industry, most of the time RF communication and lengthy conductors are used for communication even in the places where the line of sight is available. In these methods, the initial cost is high due to the need for complex instruments which are used for noise filtering, amplification and so on. And also it is hard to set up a temporary reliable connection with lesser cost and time. These problems will be addressed through this project.

Proposed Solution

To overcome these constraints in mentioned methods, we propose a communication system that uses a laser as the medium. This will facilitate the idea of low cost, low power, noise-free transmission and enables a user to set up the system in a lesser time.

Market Analysis

Target market

Through the market analysis, there wasn't a product exactly matching our design. Industrial users are the target market and there will be a higher demand as this design matches the permanent and temporary needs of the user. And also the initial setup is less time consuming and user friendly.

Position of the product in the market

The Laser Communication System will have a remarkable demand in the market. The features of this system are simple, reliable and easy to implement. And also, this could be expanded beyond 4-bit signals. Therefore, this design can be utilized in a wide range of applications.

Implementation (Methodology)

Transmitter module

4-bit input is taken from 4 toggle switches and a push-button for the send switch is used. 16 different switching patterns stored in the microcontroller will be passed through the laser module to transmit the signal.

Receiver Module

An LDR Based sensing module is used to detect the incoming laser signal. Predefined patterns are stored inside the microcontroller. 4 LEDs connected to the microcontroller will display the received signal.

The laser pattern is created through an algorithm developed by us. Proteus along with an Assembly script will be used for the simulations, and the Prototype will be implemented on a project board. The final hardware design is planned to be implemented on a PCB.

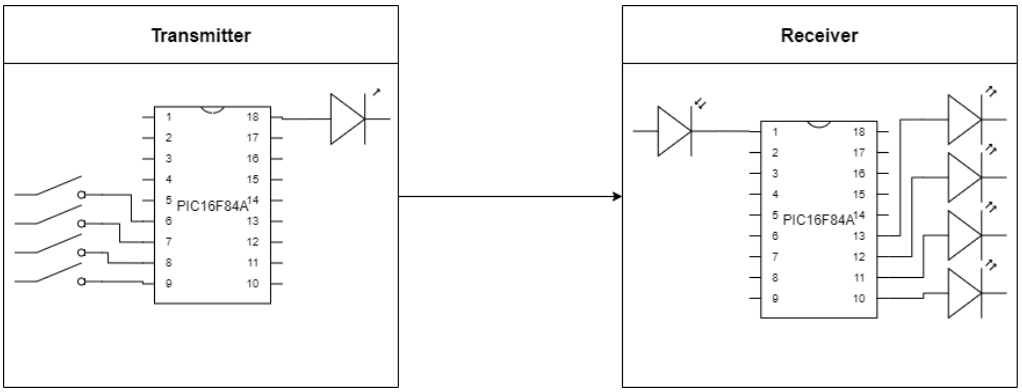

Figure 1: Block Diagram of the Design

Cost Analysis

Below mentioned are the estimated costs for this project. Prices may vary depending on the market.

Table 1 : Estimated BOQ

Component	Quantity	Price (LKR)
PIC16F84A MCU	2	600.00
Laser module	1	225.00
Receiver module	1	300.00
PCB Production	1	1000.00
LEDs, Jumper Wires, Breadboard, Resistor, Capacitor, Switches	-	1000.00
Total		3125.00

Sources :
https://www.duino.lk/
https://tronic.lk/shop/products

Timeline (Gantt chart)

Table 2 :Timeline

Task	JUNE		JULY				AUGUST			
	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week	1st Week	2nd Week	3rd Week	4th Week
Creating project groups										
Registering the project Title										
Preparing the project proposal										
Simulation and coding UML Diagram										
Hardware prototype (Progress Report 1)										
Prototype development and testing (Progress Report 2)										
Progress Report 3 and Final project submission										