UNIVERSITY OF ENGINEERING & TECHNOLOGY LAHORE

DIGITAL LOGIC DESIGN

SEMESTER FINAL PROJECT REPORT

SUBMITTED TO: PROF. RAJA MUZAMMIL

SESSION 2019

Title

Data Transmission System With Error Detection

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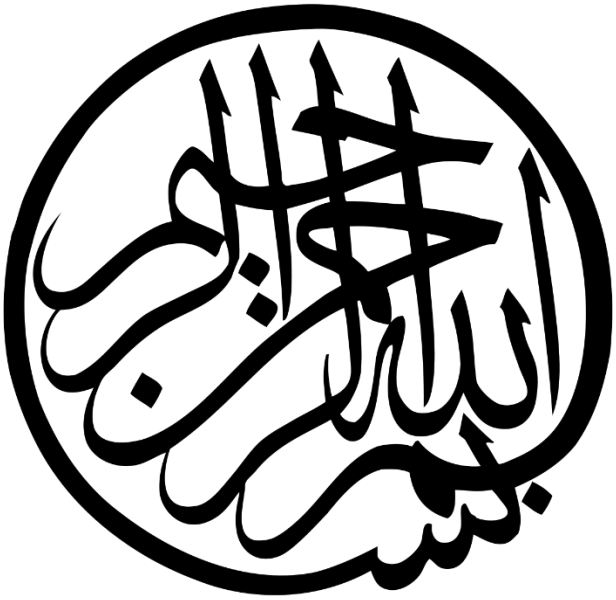

"IN THE NAME OF ALLAH

THE MOST BENEFICENT THE MOST MERCIFUL "

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Abstract:

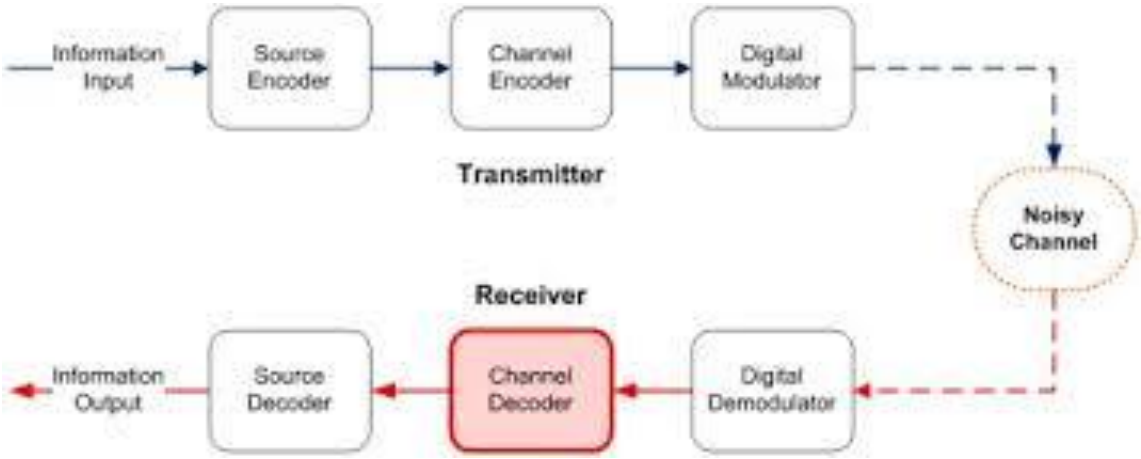
Our topic is **data transmission system through error detection**.

In our proposed project we will come to know that how data is transferred and how it detects the error as we know that data transmission means to transfer a data with the help of different combination logic units and error means to detect whether there is error in our data or not.

The logics we are going to use are:

→**De-multiplexer:**

With the help of this logical unit, our circuit will be able to detect the errors and transfer the data. It is a highly important concept in modern business networking, with high data transfer rates allowing networks to be used for complex tasks, such as online streaming. Understanding data transfer rate could help you improve the performance of your business's own network.



Block diagram of data transmission

Contents:

Introduction:

Overview Data transmission system with error detection in this topic we have three parts:

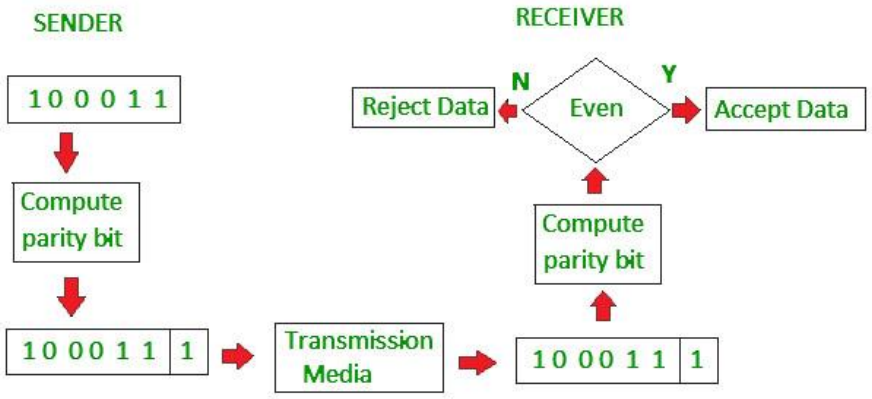
- Data transmission
- Error detection
- Error correction

Data transmission:

Data transmission, Sending and receiving data via cables (e.g., telephone lines or fiber optics) or wireless relay systems. Because ordinary telephone circuits pass signals that fall within the frequency range of voice communication **(about 300–3,500 hertz),** the high frequencies associated with data transmission suffer a loss of amplitude and transmission speed. Data signals therefore must be translated into a format compatible with the signals used in telephone lines. Digital computers use a modem to transform outgoing digital electronic data; a similar system at the receiving end translates the incoming signal back to the original electronic data. Specialized data-transmission links carry signals at frequencies higher than those used by the public telephone network.

Error detection:

Error detection is the process of detecting the errors that are present in the data transmitted from transmitter to receiver, in a communication system. We use some redundancy codes to detect these errors, by adding to the data while it is transmitted from source (transmitter).



Error Detection

Error correction:

Error correction are the codes, which are used for both detecting errors and correcting them. We have different ways to detect the errors but during error correction, we have following methods:

- Hamming code
- Alphanumeric code

Alphanumeric code have further more branches to correct the error like Unicode,

ASCII code,

MORSE code.

Problem Statement:

As our topic is data transmission system with error detection Yesterday I discussed with my team mates related to the data transmission system with error detection because we faced a

problem during our data conversion process so personally decided to choose this topic to make ourselves aware related to the data transmission system and the error detection in it.

Objectives

The purpose to choose this topic is:

- We will be able to deal with Proteus
- Come to know about the data transmission system
- Able to deal with the different combinational logic units
- Learn that how the error will be detected and corrected
- Able to discuss on this topic

Description

Background of data transmission system:

Data (mainly but not exclusively informational) has been sent via non-electronic (e.g. optical, acoustic, mechanical) means since the advent of communication. Analog signal data has been sent electronically since the advent of the telephone. However, the first data electromagnetic transmission applications in modern time were telegraphy (1809) and teletypewriters (1906), which are both digital signals. The fundamental theoretical work in data transmission and information theory by Harry Nyquist, Ralph Hartley, Claude Shannon and others during the early 20th century, was done with these applications in mind. Data transmission is utilized in computers in computer buses and for communication with peripheral equipment via parallel ports and serial ports such as RS-232 (1969), FireWire (1995) and USB (1996). The principles of data transmission are also utilized in storage media for Error detection and correction since 1951. Data transmission is utilized in computer networking equipment such as modems (1940), local area networks (LAN) adapters (1964), repeaters, repeater hubs, microwave links, wireless network access points (1997), etc.

The digital revolution has also resulted in many digital telecommunication applications where the principles of data transmission are applied. Examples are second-generation (1991) and later cellular telephony, video conferencing, digital TV (1998), digital radio (1999), telemetry, etc. Data transmission, digital transmission or digital communications is the physical transfer of data (a digital bit stream or a digitized analog signal) over a point-to-point or point-to-

multipoint communication channel. Examples of such channels are copper wires, optical fibers, wireless communication channels, storage media and computer buses. The data are represented as an electromagnetic signal, such as an electrical voltage, radio wave, microwave, or infrared signal.

Error detection and correction:

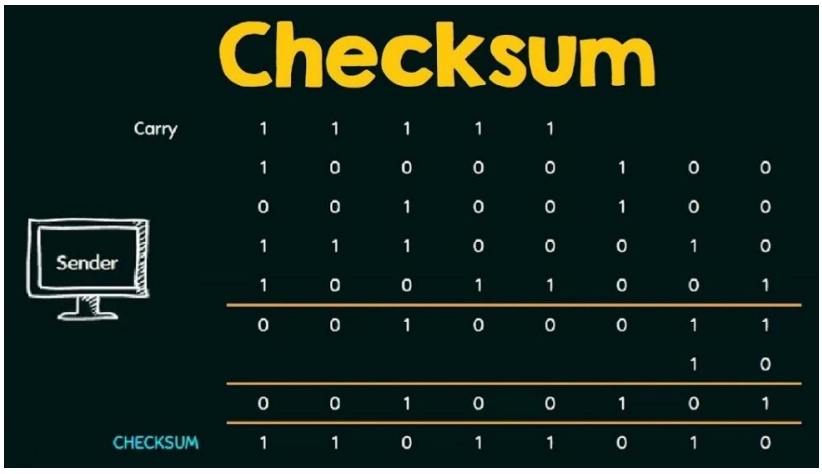
The modern development of error correction codes is credited to Richard Hamming in 1947.A description of Hamming's code appeared in Claude Shannon's A Mathematical Theory of Communication and was quickly generalized by Marcel J. E. Golay.

Hamming code:

Hamming code is a set of error-correction codes that can be used to detect and correct the errors that can occur when the data is moved or stored from the sender to the receiver. It is technique developed by R.W. Hamming for error correction.

Checksum:

In order to understand what a checksum error is, it is important to first learn what a checksum is. A **checksum** is a **redundancy check** during a computer's start up process, which makes sure that the computer's data is intact and unhampered. The data is scanned and tested for accuracy, either based on how well it relates to data elsewhere or based on previous data that was stored on the same computer. Essentially, all of the bits of data in a particular document or file are added up and a number or hash is created. This number or hash can then be compared to the number or hash generated from the same file on another person's computer or at a previous time on the same computer.



Checksum

Cyclic Redundancy Check:

Cyclic Redundancy Checks **(CRC)** are computed on both ends to ensure the validity of the sent data, which also remains on the Information Store until confirmation is received from the far end that the data has been received correctly.

A Longitudinal Redundancy Check:

LRC is an error-detection method for determining the correctness of transmitted and stored data. LRC verifies the accuracy of stored and transmitted data using parity bits. It is a redundancy check applied to a parallel group of bit streams. The data to be transmitted is divided into transmission blocks into which additional check data is inserted. This term is also known as a **horizontal redundancy check**.

Project Scope

Methodology and Implementation:

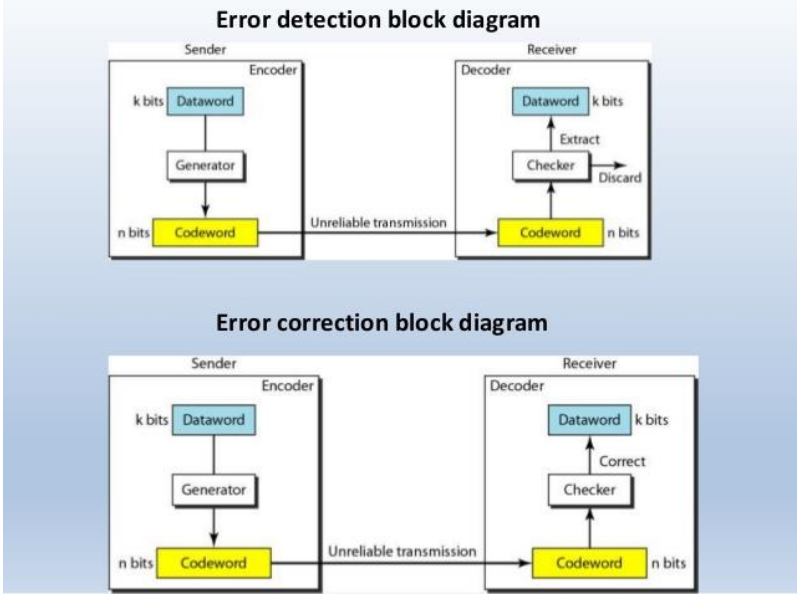
It helps to provide the information about proposed technique and methods to design the desire module. In order to understand the complete architecture of the proposed work, there is need to divide the complete model into different parts, which are mentioned below:

- Hardware (Components, IC, circuits Details) & Software Requirements
- Basic Techniques
- Block Diagram
- Basic working principle of the proposed research work (With Illustration)

METHODOLOGY:

The methodology of our project is based on the combinations of combinational logic unit. We prefer to explain our methodology through **diagram** so it is easy to understand.

BLOCK DIAGRAM:



Tools/ Technology:

Hardware Components:

1. Decoder (De-Mux)

2. XOR Gate

ICS:

¬ 74ls138 IC of de-mux

Simulation Software:

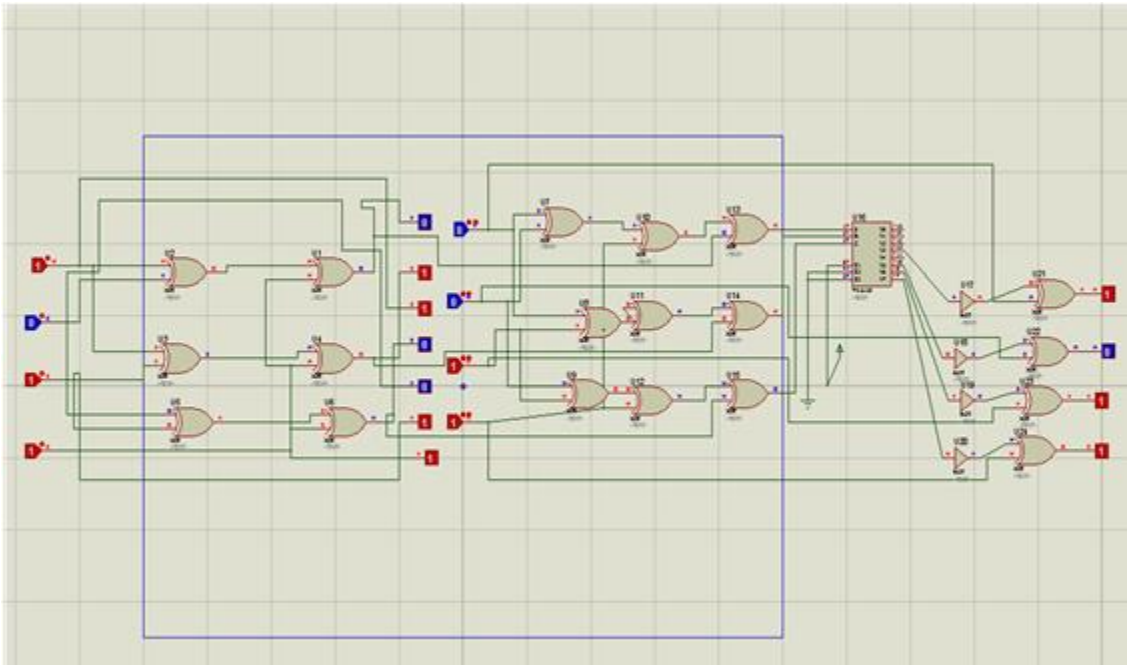
ISIS PROFESSIONAL PROTEUS

CONCLUSION

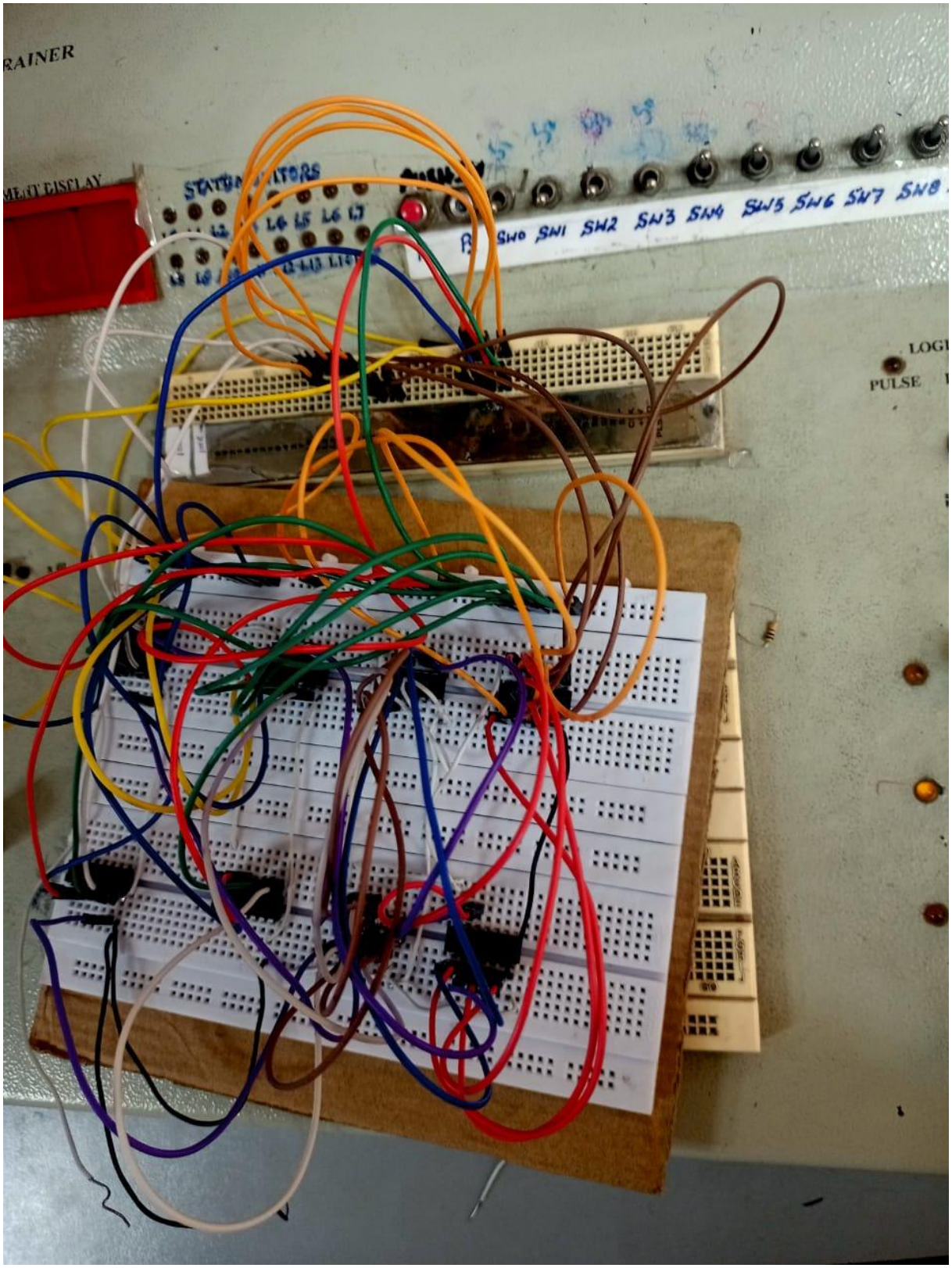
Data transmission refers to the process of transferring data between two or more digital devices. Data is transmitted from one device to another in analog or digital format. Basically, data transmission enables devices or components within devices to speak to each other. Data is transferred in the form of bits between two or more digital devices. There are two methods used to transmit data between digital devices: serial transmission and parallel transmission. Serial data transmission sends data bits one after another over a single channel. Parallel data transmission sends multiple data bits at the same time over multiple channels.

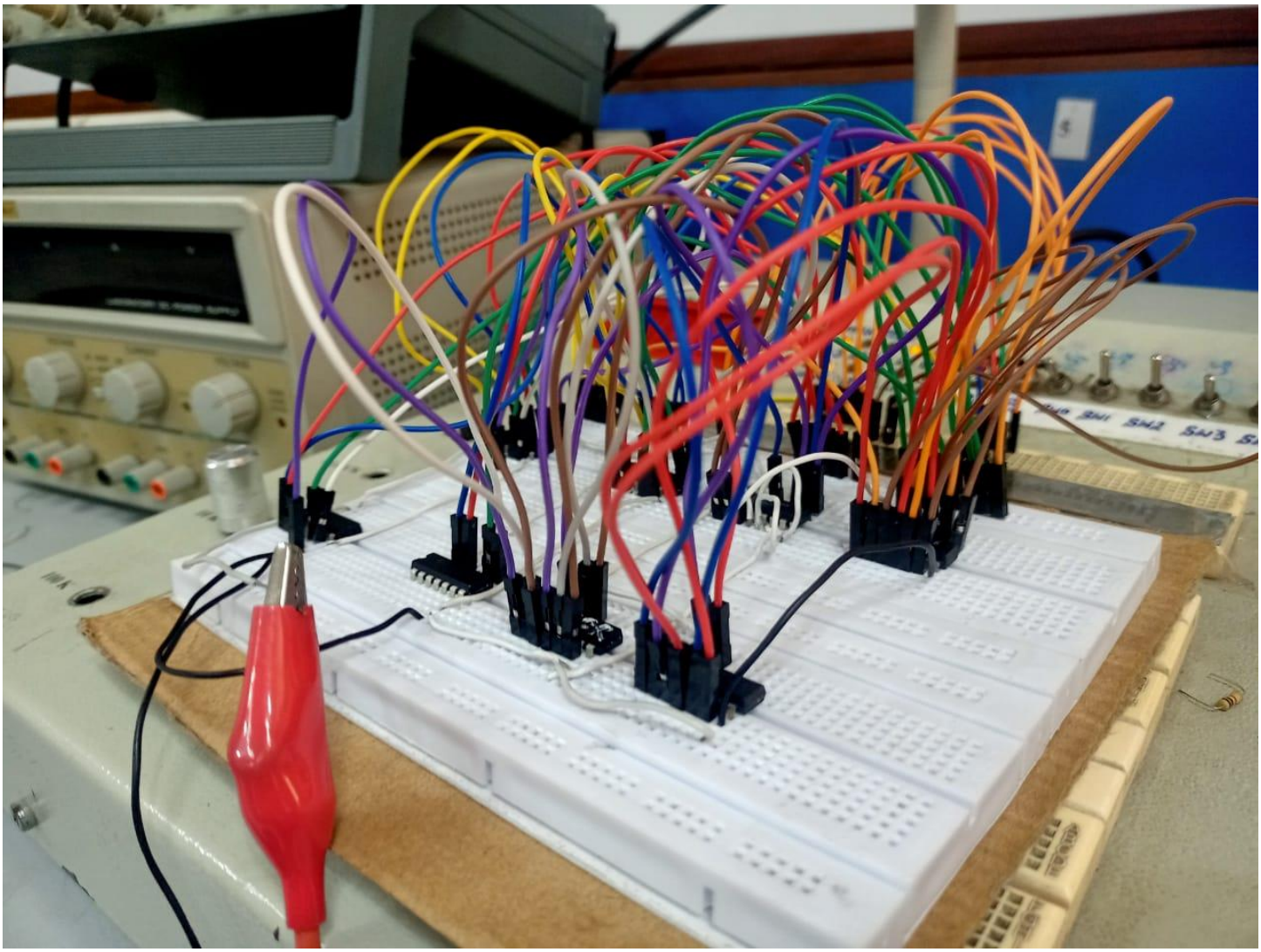
Now, It's time to conclude the topic as we told in the start of this report that data transmission system is very important and we must know that how a data transfer and how we can detect an error and correct it so data transmission means to transfer the information from one device to another and error detection means the device which helps to detect the error and have ability to correct to so we can transfer data safely.

Simulation Circuit Diagram:



Hardware Implementation





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