Green University of Bangladesh

Department of Computer Science and Engineering (CSE)
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Binary Conversion with Parity Check and Bit-Stuffing

Course Title: Data Communication Lab
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Chapter 1

Introduction

1.1 Overview

Data communication is a key aspect of digital systems since data must be transferred between two points in a cost-effective and reliable manner. In this project, we are interested in the binary-to-decimal and decimal-to-binary conversion process and parity checking for ensuring data integrity. Furthermore, in order to manage the long series of repetitive bits that may cause synchronization problems, bit stuffing and de-stuffing are adopted. This answer incorporates encoding, error detection, and data framing into an easy but effective communication simulation.

1.2 Motivation

Transmission errors may result in erroneous or degraded information, particularly in binary systems. Error detection and management are one of the primary functions of communication protocols. In coming up with a system that employs the practice of parity checking and bit stuffing, this project will illustrate how such mechanisms can help achieve reliability of data transmission. The concept is fundamental to data communication students as it offers a practical appreciation of theoretical principles.

1.3 Problem Definition

1.3.1 Problem Statement

In any data communication system, it is essential that data during transit does not get corrupted. If error-detection mechanisms are not present, binary data can become corrupted during transmission and produce unpredictable results. Besides, extended sequences of '1's would result in synchronization issues, requiring bit-level framing. In this regard, this project considers two fundamental issues: ensuring data integrity by employing parity checks and synchronization issues by employing bit stuffing.

1.3.2 Complex Engineering Problem

The issue is to simulate a communication system that is capable of decimal to binary and binary to decimal conversion, add parity bits for error detection, and bit stuffing for error-free transmission. In addition, it must check and decode the received message appropriately. Merging all these features in a single C++ program not only demands logical reasoning but also knowledge of how actual communication protocols function—a complex, multidisciplinary issue.

1.4 Design Goals/Objectives

The main goals and objectives of this project are as follows:

- To convert user input from decimal to binary.
- To calculate and insert parity bits (even or odd) to detect errors.
- To apply bit stuffing after five consecutive '1's in the binary stream.
- To simulate data transmission and check it via bit de-stuffing.
- To conduct parity checking on the receiver side to identify errors.
- To convert the given binary into its original decimal format.

1.5 Application

The operations used in this project are concepts that are low-level used in real-world data communication systems, including network protocols, serial communication, and embedded systems. Knowledge of these operations prepares students to manage more complex systems, such as CRC error checking, framing methods, and communication design, on a hardware level.