IEEE-754 Decimal-32 Floating-Point Converter

Introduction

This document provides a simple guide for the IEEE-754 Decimal-32 floating-point converter. This application is designed to convert decimal and base-10 inputs into IEEE-754 Decimal-32 format, handling special cases such as NaN or infinity, and rounding options. The output includes the binary representation with spaces between sections, its hexadecimal equivalent, and an option to output in the text file.

Overview of IEEE-754 Decimal-32 Format

The IEEE-754 Decimal-32 format is a 32-bit representation used for floating-point numbers. It consists of three main components:

- Sign bit (1 bit): Indicates whether the number is positive or negative.
- Combination field (5 bits): Composed of the two most significant bits of the exponent representation and 1 or 3 bits of the most significant digit of the significand.
- Exponent continuation field (6 bits): Composed of the remaining 6 digits of the exponent representation.
- Coefficient continuation field (20 bits): Composed of the remaining 6 digits of the significand, which are represented as densely-packed BCD.

Input Specifications

- 1. Decimal and Base-10 Input: User input must be in this format (127.0x10^5) in order for it to be accepted, otherwise it will assume it as NaN.
- 2. NaN: Users can input either 'NaN', or any other input that does not follow the decimal and base-10 format.
- 3. Infinity (positive & negative): Any value higher than 9999999x10^90 or -9999999x10^90.
- 4. Zero: Any value ranging from 0x10^-96 to 0x10^95.

Rounding Options

The application provides multiple rounding methods:

Round to nearest

- Round towards zero
- Round up (towards +∞)
- Round down (towards -∞)

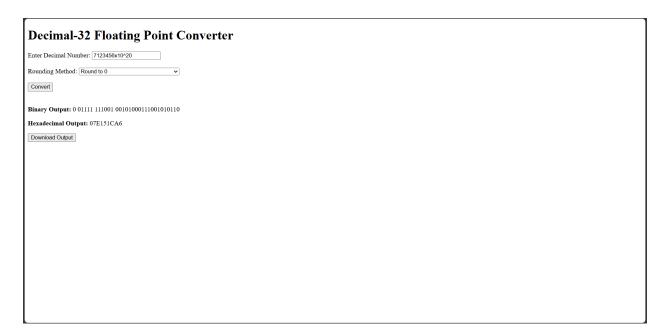
Output Specifications

The converter outputs the following formats:

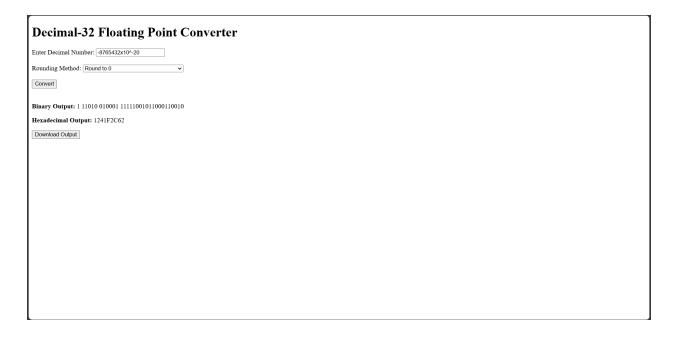
- 1. Binary Output
- 2. Hexadecimal Output
- 3. Text File Output containing the Binary and Hexadecimal Output

Test Cases

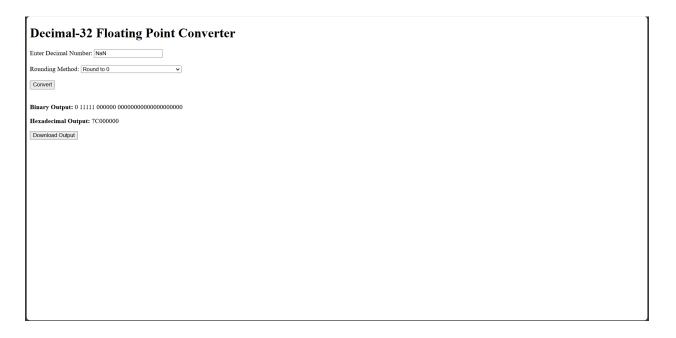
1. Normal positive input



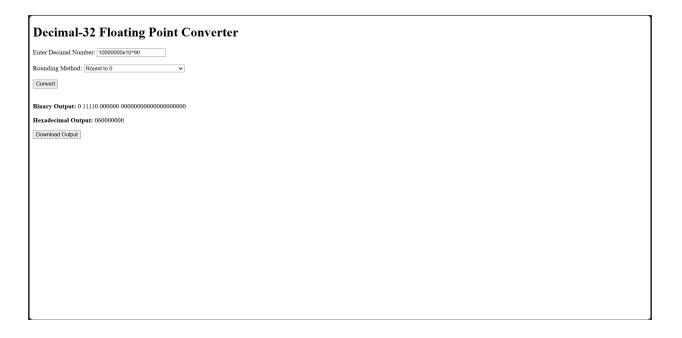
2. Normal negative input



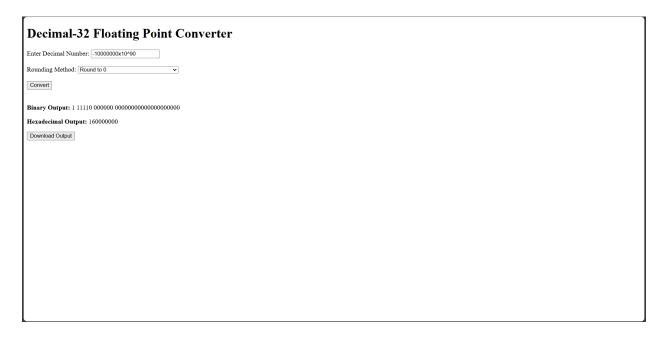
3. NaN



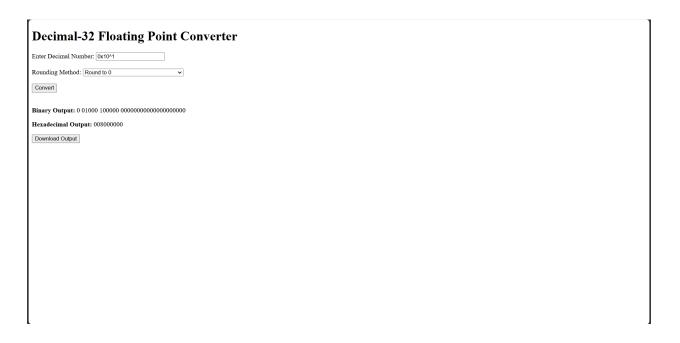
4. Positive infinity



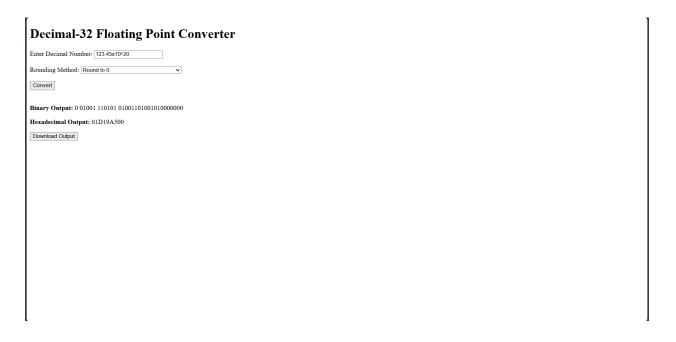
5. Negative infinity



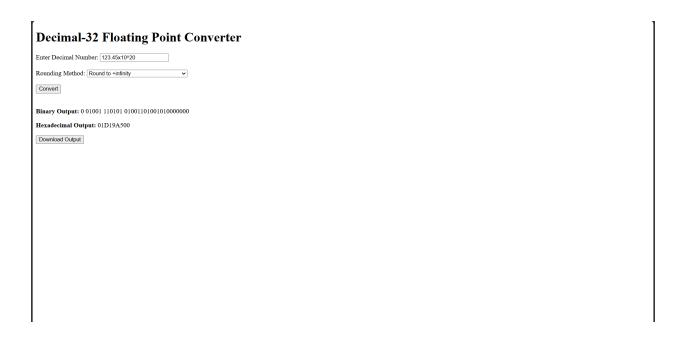
6. Zero



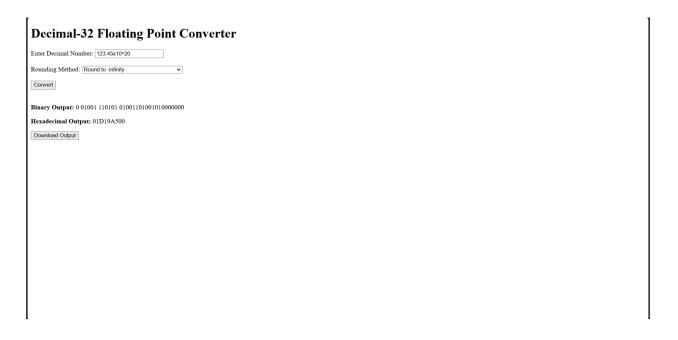
7. Normal with rounding to 0



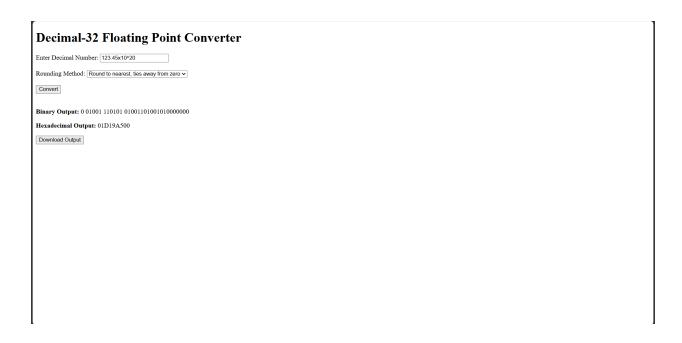
8. Normal with rounding to + infinity



9. Normal with rounding to - infinity



10. Normal with rounding to nearest, ties away from 0



11. Normal with rounding to nearest, ties to even

