

What are the advantages of non restoring division over restoring division?

The advantage of using non-restoring arithmetic over the standard restoring division is that a test subtraction is not required; the sign bit determines whether an addition or subtraction is used.

The non-restoring division algorithm is more complex as compared to the restoring division algorithm. But when we implement this algorithm in hardware, it has an advantage, i.e., it contains only one decision and addition/subtraction per quotient bit. After performing the subtraction operation, there will not be any restoring steps. Due to this, the numbers of operations basically cut down up to half. Because of the less operation, the execution of this algorithm will be fast.

Give the importance of IEEE-754 representation for floating point numbers?

IEEE developed the IEEE 754 floating-point standard. This standard defines set formats and operation modes. All computers conforming to this standard would always calculate the same result for the same computation. This standard does not specify arithmetic procedures and hardware to be used to perform computations. It is important because it is a standard way of representing numbers.

- The IEEE Standard for Floating-Point Arithmetic (IEEE 754) is a technical standard for floating-point computation which was established in 1985 by the **Institute of Electrical and Electronics Engineers (IEEE)**.
- The standard addressed many problems found in the diverse floating point implementations that made them difficult to use reliably and reduced their portability. IEEE Standard 754 floating point is the most common representation today for real numbers on computers, including Intel-based PC's, Macs, and most Unix platforms.
- There are several ways to represent floating point number but IEEE 754 is the most efficient in most cases.

1. **Explain advantages and disadvantages of Booth's algorithm.**

Advantages of booth's multiplication:

- Easy calculation of multiplication problem.
- Consecutive additions will be replaced.
- Less complex and ease scaling.

Disadvantages of booth's multiplication:

- This algorithm will not work for isolated 1's.
- It is time consuming.
- If digital gates are more, chip area would be large.

2. **Is Booth's recoding better than Booth's algorithm? Justify**

Advantage of Booth's recoding is that it reduces the number of 1's and increases the number of 0's in a binary number. Having more number of 0's is advantageous for easier calculation.

For Example: $(01111)_2$ is equivalent to $(+1\ 0\ 0\ 0\ -1)$ in Booth Recoding

1. **What are the advantages of restoring division over non restoring division?**

ANS:

1. **Simplicity of Quotient Correction:** In restoring division, the quotient correction step is simpler compared to non-restoring division. In restoring division, the quotient is corrected by simply adding the divisor to the remainder when a subtraction borrow occurs. This correction is straightforward and doesn't involve complex logic.
2. **Predictable Correction:** Restoring division has a more predictable correction process. When a borrow occurs during the subtraction step, it's guaranteed that the correction will involve adding the divisor to the remainder. This straightforward correction behavior makes the algorithm easier to implement and understand.
3. **Easier Hardware Implementation:** The hardware implementation of restoring division is generally simpler compared to non-restoring division. This is because the correction step involves adding the divisor to the remainder, which is a simpler operation than the complex adjustments required in non-restoring division.
4. **Single Cycle Throughput:** Restoring division can potentially achieve a single cycle throughput (one division result per clock cycle) in some hardware implementations, which is beneficial for high-performance applications.
5. **Regular Division Process:** Restoring division follows a more regular division process. The steps of subtraction, shifting, and correction are consistently repeated until the division is complete. This regularity can make it easier to analyze and optimize the algorithm.
6. **Less Complex Control Logic:** The control logic for restoring division is generally less complex compared to non-restoring division, which often involves additional logic for conditionally shifting and adjusting the remainder.