SIMATS SCHOOL OF ENGINEERING
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SAVEETHA
INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES
(Declared as Deemed to be University under Section 3 of UGC Act 1956)

CAPSTONE PROJECT

UBA1220-COMPUTER ARCHITECTURE FOR FUTURE ENGINEERS

DESIGN AND IMPLEMENTATION OF NUMBER SYSTEM SIMULATOR

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INTRODUCTION:

Computers operate using binary logic, while humans commonly use decimal, creating a gap in understanding. Additional systems like Octal and Hexadecimal are widely used in computer science and digital electronics. Learning number system conversions manually is often time-consuming and error-prone for students.Traditional teaching methods rely on textbooks and theory, with limited hands-on practice. There is a growing need for interactive tools to simplify learning of digital number systems. The Number System Simulator provides a practical, web-based solution to enhance conceptual clarity.

ARCHITECTURE DAIGRAM

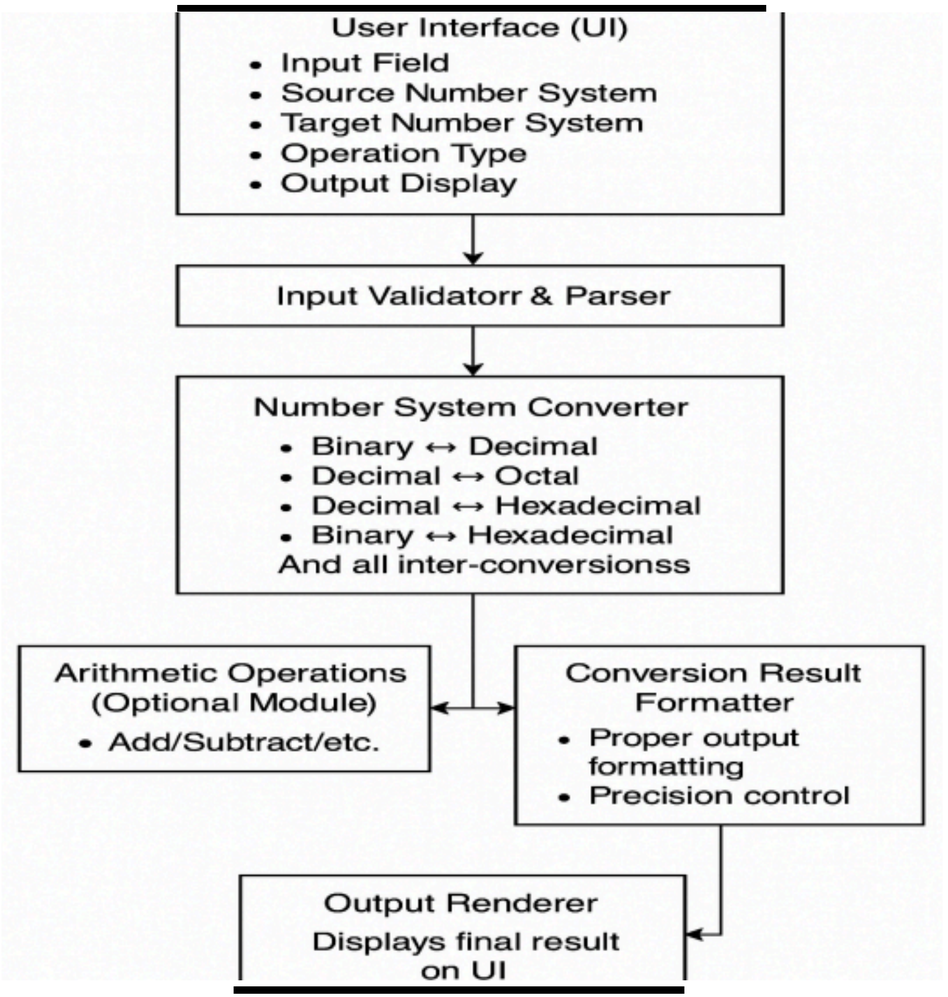

Fig : 1

NUMBER SYSTEM OVERVIEW:

SYSTEM	BASE	SYMBOLS
BINARY	2	0,1
OCTAL	8	0-7
DECIMAL	10	O-9
HEXADECIMAL	16	0-9,A-F

IMPLEMENTATION:

1.Input taken → Converted to Binary, Decimal, Octal, Hex.

2.Real-time display of results.

3. Implemented conversion logic for Binary, Decimal, Octal, and Hex.

4. Added arithmetic and logical operations across number systems.

5. Tested with sample inputs to ensure real-time and accurate outputs.

RESULTS:

1. Successfully implemented the number system simulator with accurate conversion across Binary, Decimal, Octal, and Hexadecimal.

2. Achieved real-time conversion with minimal delay, ensuring fast response.

3. Improved user understanding of number systems through interactive simulation.

4. Enhanced accuracy and reduced manual errors compared to traditional calculations.

CONCLUSION:

1. The project successfully demonstrated the working of a number system simulator.

2. It simplified the process of learning and converting between number systems.

3. The tool proved to be accurate, reliable, and user-friendly.

4. It enhanced conceptual understanding for students and beginners in computer architecture.

5. The simulator minimized manual effort and reduced calculation errors.

6. The project can serve as a foundation for future advancements in digital system education.

CODE:

```
#include <stdio.h>
#include <stdlib.h>

// Function to convert decimal to binary
void decimalToBinary(int n) {
int binary[32], i = 0;
if (n == 0) {
printf("Binary: 0\n");
return;
}
while (n > 0) {
binary[i++] = n % 2;
n /= 2;
}
printf("Binary: ");
for (int j = i - 1; j >= 0; j--)
printf("%d", binary[j]);
printf("\n");
}
```

```
// Function to convert decimal to octal
void decimalToOctal(int n) {
int octal[32], i = 0;
if (n == 0) {
printf("Octal: 0\n");
return;
}
while (n > 0) {
octal[i++] = n % 8;
n /= 8;
}
printf("Octal: ");
for (int j = i - 1; j >= 0; j--)
printf("%d", octal[j]);
printf("\n");
}
// Function to convert decimal to hexadecimal
void decimalToHex(int n) {
char hex[32];
int i = 0;
if (n == 0) {
printf("Hexadecimal: 0\n");
return;
}
```

```
while (n > 0) {
int temp = n % 16;
hex[i++] = (temp < 10) ? (temp + '0') : (temp - 10 + 'A');
n /= 16;
}
printf("Hexadecimal: ");
for (int j = i - 1; j >= 0; j--)
printf("%c", hex[j]);
printf("\n");
}
int main() {
int choice, num;
while (1) {
printf("\n--- Number Conversion Menu ---\n");
printf("1. Decimal to Binary\n");
printf("2. Decimal to Octal\n");
printf("3. Decimal to Hexadecimal\n");
printf("4. Exit\n");
printf("Enter your choice: ");
scanf("%d", &choice);
if (choice == 4) {
```

```
printf("Exiting program.\n");
break;
}
printf("Enter a decimal number: ");
scanf("%d", &num);
switch (choice) {
case 1:
decimalToBinary(num);
break;
case 2:
decimalToOctal(num);
break;
case 3:
decimalToHex(num);
break;
default:
printf("Invalid choice! Try again.\n");
}
}
return 0;
}
```