# NUMBER CONVERSION SYSTEM


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## COURSE – PROGRAMMING IN C

# PROBLEM DEFINATION

Number system conversion is a fundamental concept in computer science and programming. It involves changing the representation of a number from one base to another, such as converting a decimal number to binary or a hexadecimal number to binary.

# HOW THE PROBLEM WORKS

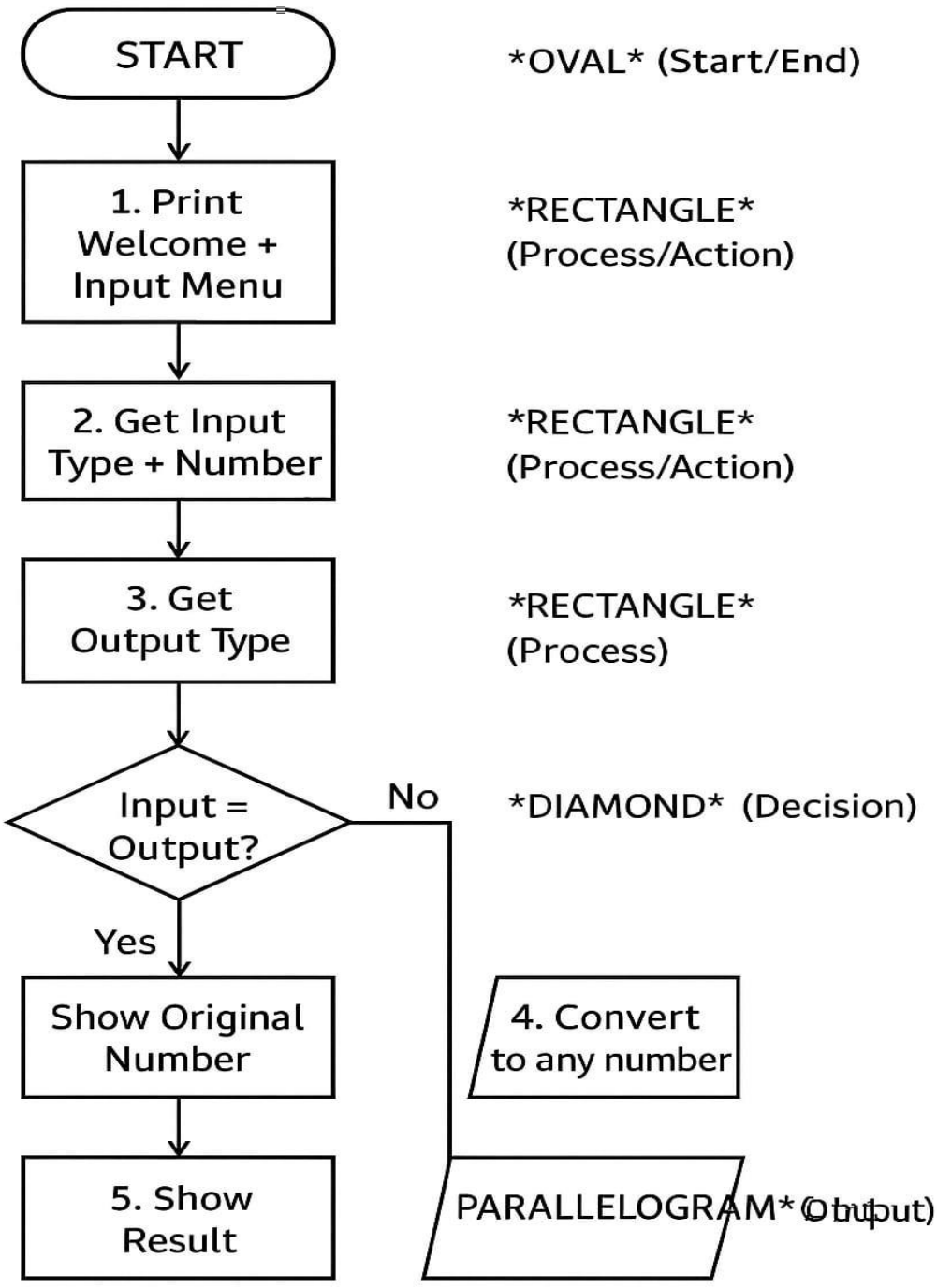
We define functions for decimal-to-binary, binary-to-decimal, and other mentioned conversions. These functions implement the standard method for the respective conversions.

In the main function, we display a menu of conversion options and ask the user to select one. Depending on the user's choice, we take input and call the corresponding conversion function. The conversion functions perform the conversion and display the result.

# ALGORITHM

1. Start program, show welcome message
2. Show menu: "Choose input type (1=Decimal, 2=Octal, 3=Binary, 4=Hex)"
3. Get user's *choice* (keep asking till valid 1-4)
4. Ask for number, check if valid for that base:
   - Binary: only 0,1 allowed
   - Octal: only 0-7 allowed
   - Decimal: only 0-9 allowed
   - Hex: 0-9,A-F allowed
5. Show output menu: "Convert to? (1=Decimal, 2=Octal, 3=Binary, 4=Hex)"
6. Get output *choice* (keep asking till valid 1-4)
7. Convert input number to decimal value
8. If input type = output type → show same number
   Else if output=Decimal → show decimal number
   Else → convert decimal to target base, show result
9. Show thank you message, end program

# FLOWCHART


START
1. Print Welcome + Input Menu
2. Get Input Type + Number
3. Get Output Type
Input = Output?
No
Yes
Show Original Number
4. Convert to any number
5. Show Result
PARALLELOGRAM* (Output)
*OVAL* (Start/End)
*RECTANGLE* (Process/Action)
*RECTANGLE* (Process/Action)
*RECTANGLE* (Process)
*DIAMOND* (Decision)

# Problems we faced while making this code

I. **INPUT CHECKING WAS SUPER TOUGH** - We kept getting wrong numbers like typing '8' in octal or 'G' in hex. Had to make loop that checks every single character one by one. Took 2 hours to fix!

II. **SCANF() WAS EATING WRONG INPUTS** - When user types letters instead of numbers for menu, program hangs. We used while (get char()!= '\n') to clear buffer - found this after googling 30 mins.

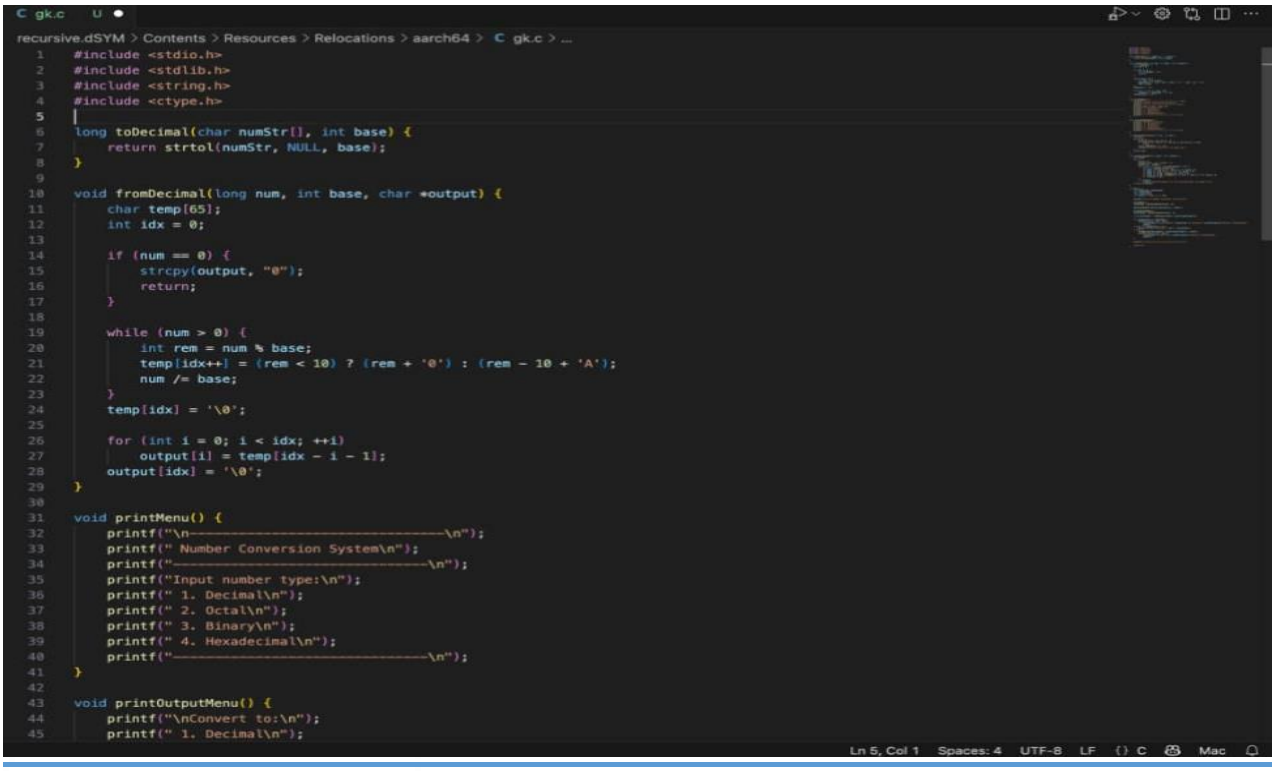
III. **HEX LETTERS CASE PROBLEM** - User types 'a' or 'A' both should work. Used to upper() but forgot to apply it first time, so hex validation failed half the time.

IV. **ZERO NUMBER CRASH** - When input is 0, our fromDecimal function made empty string. Added special case if(num==0) strcpy ("0") after testing.

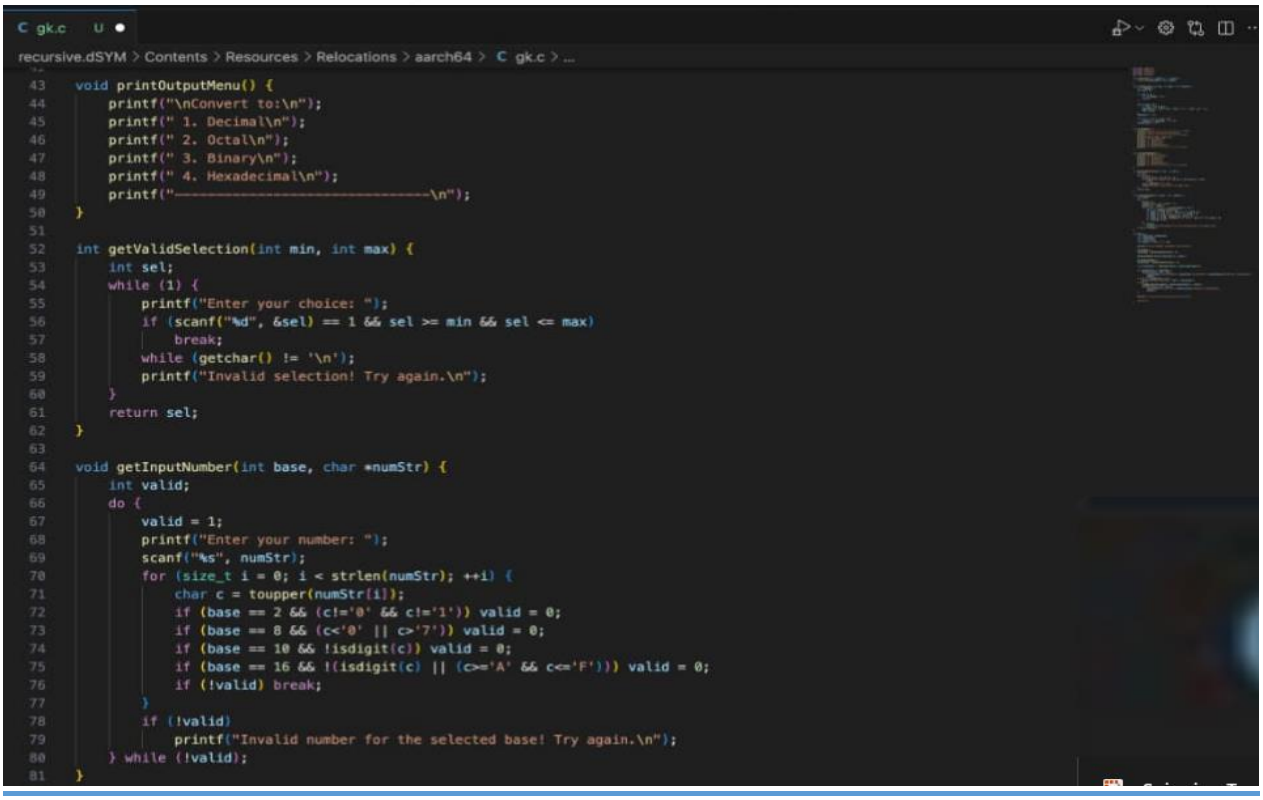
V. **ARRAY INDEXING MISTAKE** - bases [] = {10,8,2,16} but we wrote bases[inputType] instead of bases[inputType-1]. Kept giving wrong base!

VI. **OUTPUT SAME AS INPUT** - If user chooses same input/output, we didn't want to reconvert. Added IF (output Type == input Type) check after 3 wrong tries.

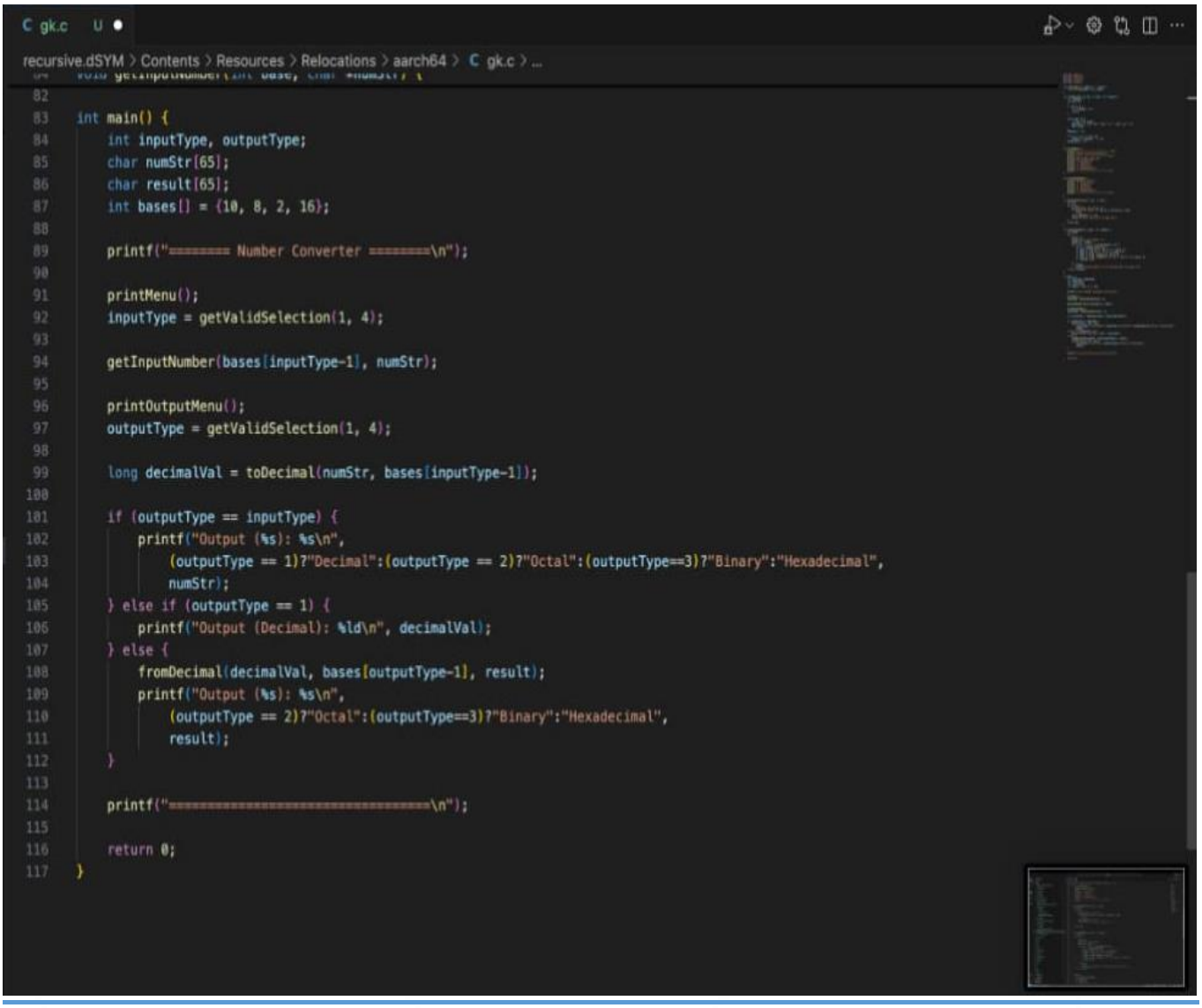
# IMPLEMENTATION DETAILS



```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <ctype.h>

long toDecimal(char numStr[], int base) {
    return strtol(numStr, NULL, base);
}

void fromDecimal(long num, int base, char *output) {
    char temp[65];
    int idx = 0;

    if (num == 0) {
        strcpy(output, "0");
        return;
    }

    while (num > 0) {
        int rem = num % base;
        temp[idx++] = (rem < 10) ? (rem + '0') : (rem - 10 + 'A');
        num /= base;
    }
    temp[idx] = '\0';

    for (int i = 0; i < idx; ++i)
        output[i] = temp[idx - i - 1];
    output[idx] = '\0';
}

void printMenu() {
    printf("\n-----------------------------------\n");
    printf(" Number Conversion System\n");
    printf("-----------------------------------\n");
    printf("Input number type:\n");
    printf(" 1. Decimal\n");
    printf(" 2. Octal\n");
    printf(" 3. Binary\n");
    printf(" 4. Hexadecimal\n");
    printf("-----------------------------------\n");
}

void printOutputMenu() {
    printf("\nConvert to:\n");
    printf(" 1. Decimal\n");
```

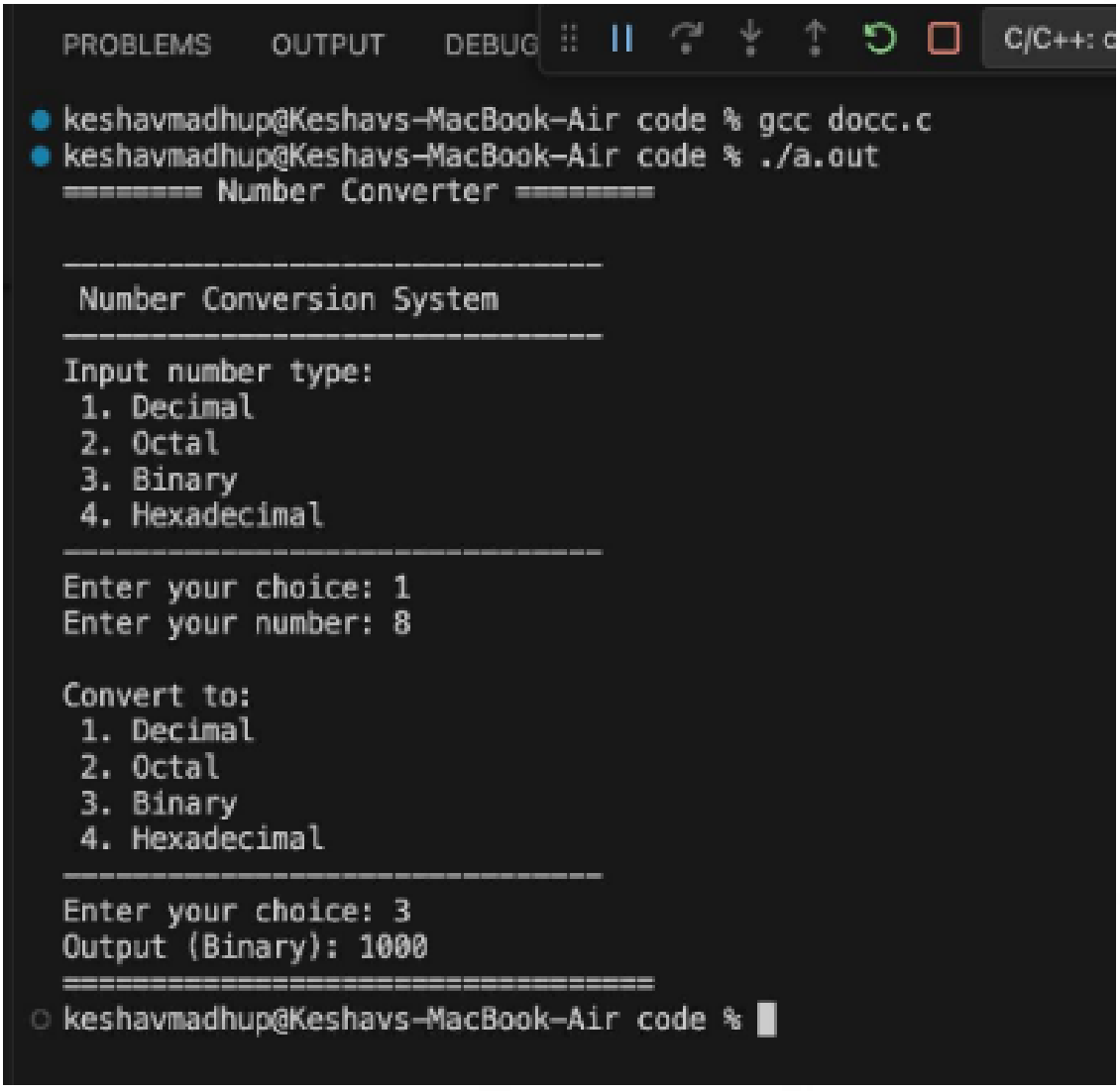


```c
void printOutputMenu() {
    printf("\nConvert to:\n");
    printf(" 1. Decimal\n");
    printf(" 2. Octal\n");
    printf(" 3. Binary\n");
    printf(" 4. Hexadecimal\n");
    printf("-----------------------------------\n");
}

int getValidSelection(int min, int max) {
    int sel;
    while (1) {
        printf("Enter your choice: ");
        if (scanf("%d", &sel) == 1 && sel >= min && sel <= max)
            break;
        while (getchar() != '\n');
        printf("Invalid selection! Try again.\n");
    }
    return sel;
}

void getInputNumber(int base, char *numStr) {
    int valid;
    do {
        valid = 1;
        printf("Enter your number: ");
        scanf("%s", numStr);
        for (size_t i = 0; i < strlen(numStr); ++i) {
            char c = toupper(numStr[i]);
            if (base == 2 && (c!='0' && c!='1')) valid = 0;
            if (base == 8 && (c<'0' || c>'7')) valid = 0;
            if (base == 10 && !isdigit(c)) valid = 0;
            if (base == 16 && !(isdigit(c) || (c>='A' && c<='F'))) valid = 0;
            if (!valid) break;
        }
        if (!valid)
            printf("Invalid number for the selected base! Try again.\n");
    } while (!valid);
}
```

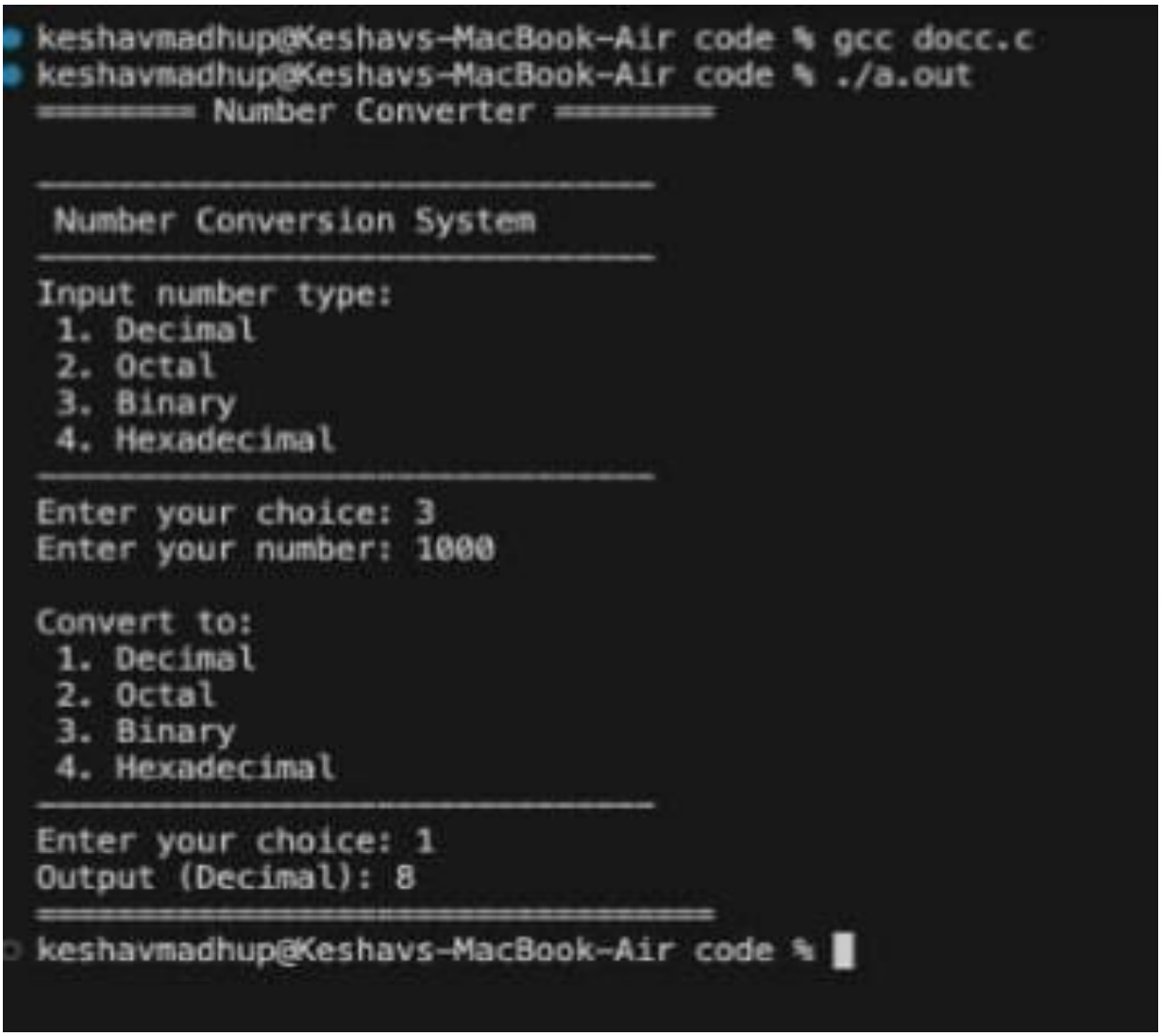

gk.c U
recursive.dSYM > Contents > Resources > Relocations > aarch64 > gk.c > ...
82
83 int main() {
84 int inputType, outputType;
85 char numStr[65];
86 char result[65];
87 int bases[] = {10, 8, 2, 16};
88
89 printf("======== Number Converter ========\n");
90
91 printMenu();
92 inputType = getValidSelection(1, 4);
93
94 getInputNumber(bases[inputType-1], numStr);
95
96 printOutputMenu();
97 outputType = getValidSelection(1, 4);
98
99 long decimalVal = toDecimal(numStr, bases[inputType-1]);
100
101 if (outputType == inputType) {
102 printf("Output (%s): %s\n",
103 (outputType == 1)?"Decimal":(outputType == 2)?"Octal":(outputType==3)?"Binary":"Hexadecimal",
104 numStr);
105 } else if (outputType == 1) {
106 printf("Output (Decimal): %ld\n", decimalVal);
107 } else {
108 fromDecimal(decimalVal, bases[outputType-1], result);
109 printf("Output (%s): %s\n",
110 (outputType == 2)?"Octal":(outputType==3)?"Binary":"Hexadecimal",
111 result);
112 }
113
114 printf("================================\n");
115
116 return 0;
117 }

# TESTING AND DETAILS

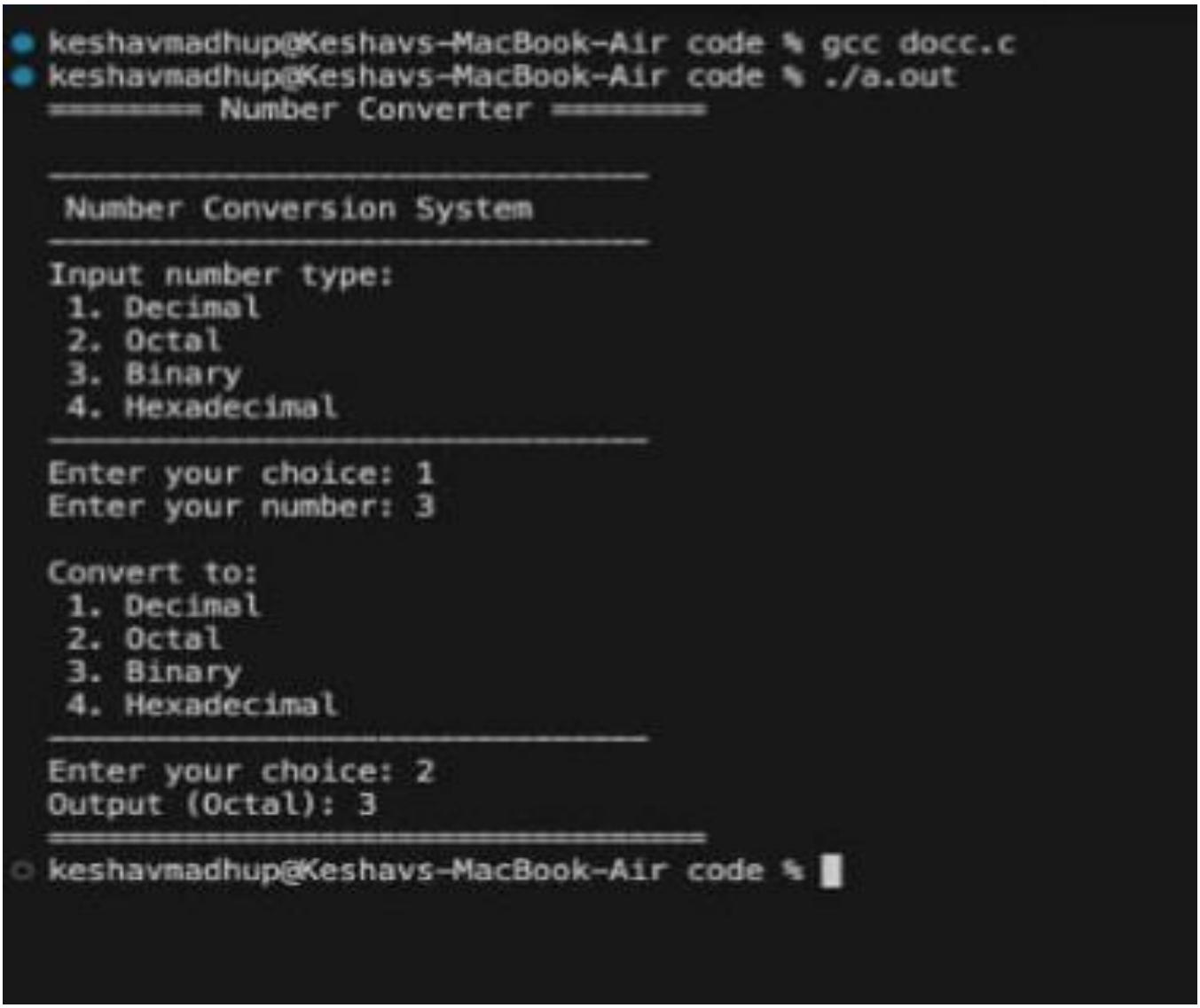
## 1. Decimal to binary



# 2. Binary to Decimal

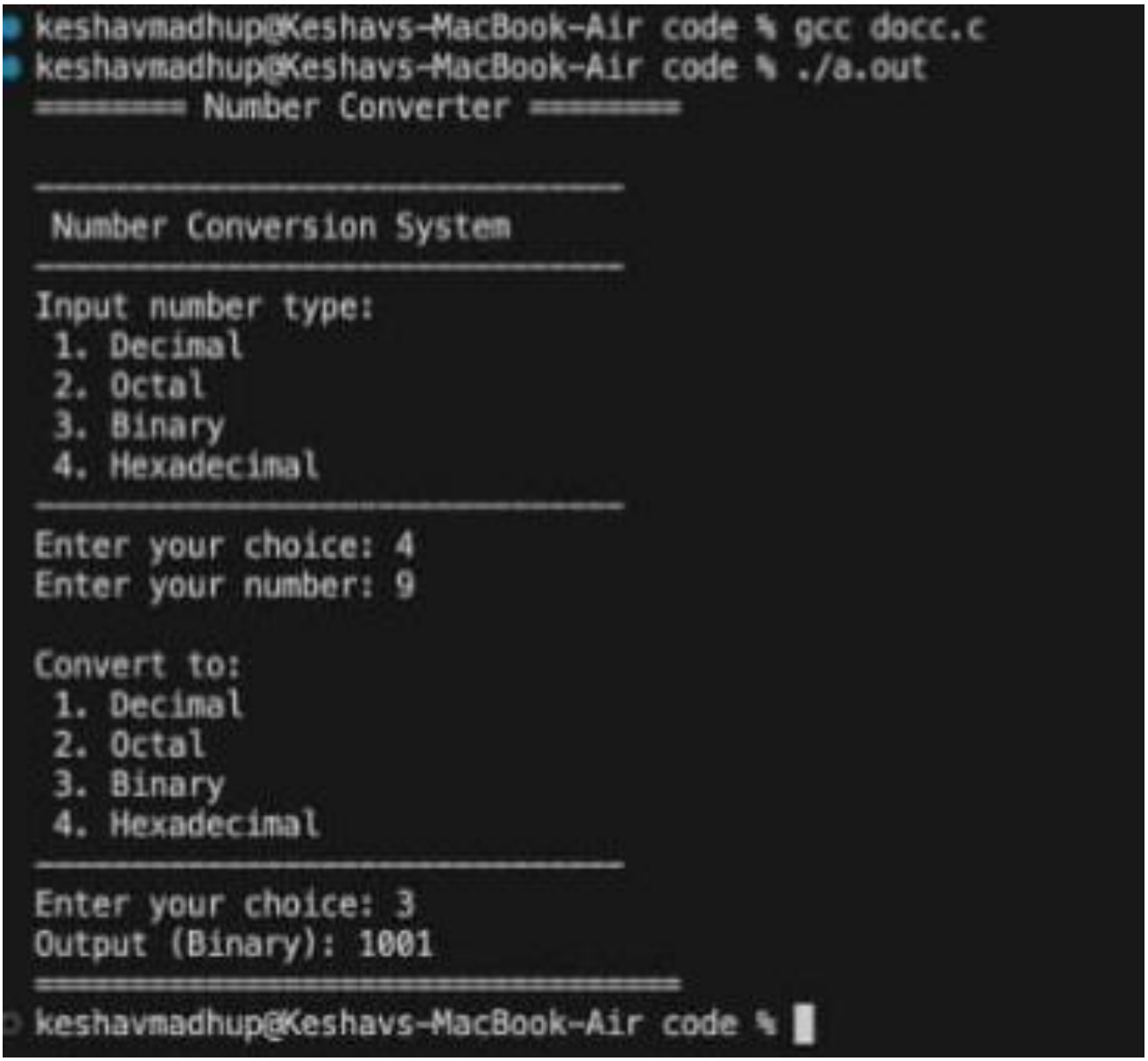


# 3. Decimal to Octal

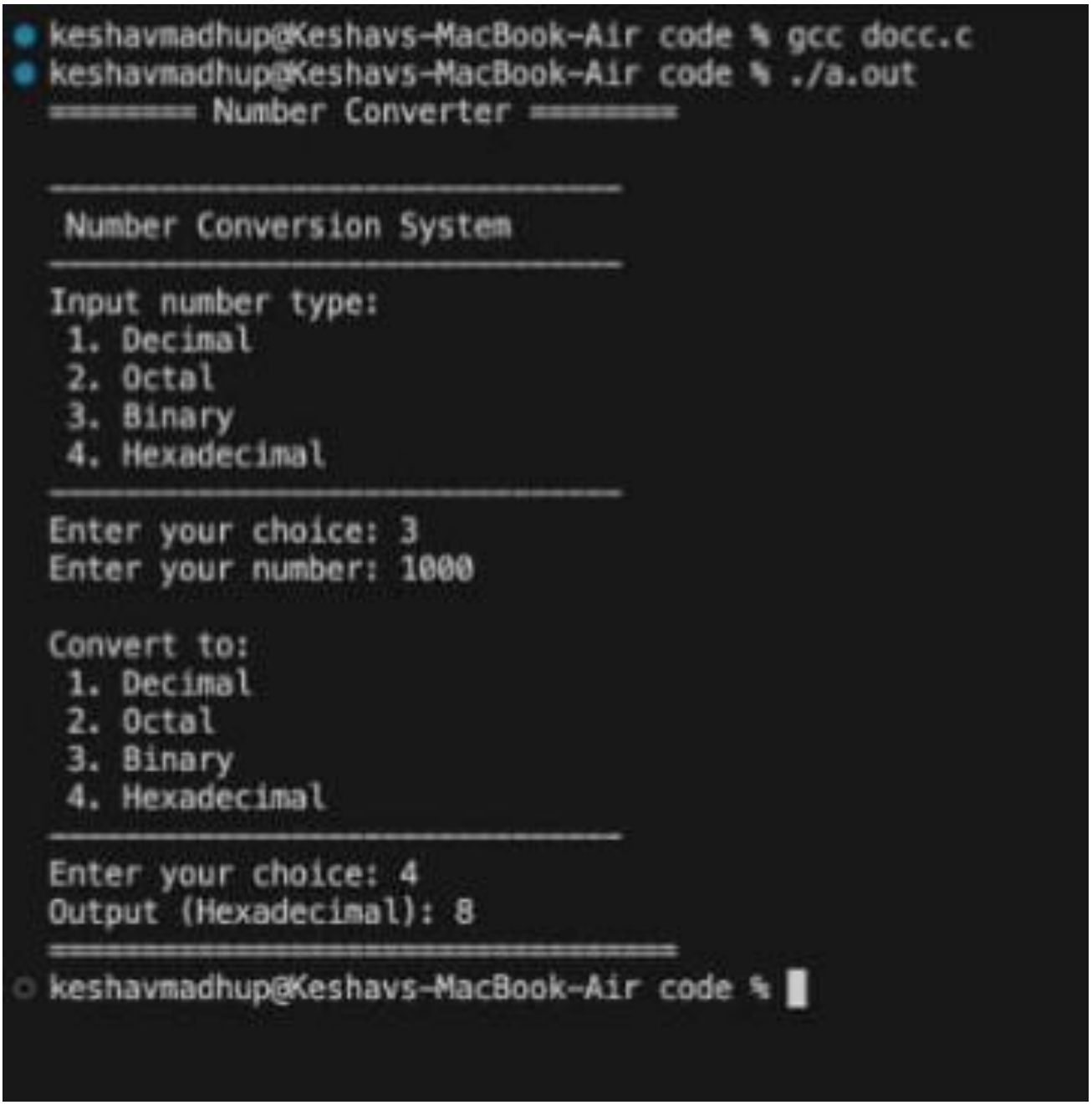


# 4. Octal to Decimal

# 5. Hexadecimal to Binary



# 6.Binary to Hexadecimal



# Thank You

- TOPIC – NUMBER CONVERSION SYSTEM
- COURSE – PROGRAMMING IN C
- SUBMISSION DATE – 30-Nov-2025
- SUBMITTED BY – KESHAV MADHUP
  PAVITRA SINGH
- SUBMITTED TO - DR. VINOD KUMAR