

Hamming Receiver

Assignment:

You need to write a program which, given a seven digit binary input (which I will provide), it will check to see if there is a single bit error using the Hamming Code method discussed in class. For a sample of Hamming Code, the input: 1011001 will reveal that '001' is the location of the error (meaning the first slot in the number), so the corrected number would be 0011001, and the actual message transmitted (minus the check bits), would be 1001, which is 9 in decimal. You can use this example to test your program to ensure it's working correctly.

FOR YOUR ASSIGNMENT: Create a program which can, given a 7-bit long input, written in Hamming Code style, do the three following tasks, displaying the results as output.

- (1) Determine if there's an incorrect bit, and if so, where it is.
- (2) Display what the CORRECT code should look like (if it needs to be corrected.)
- (3) Display the decimal form of the message that was sent, after any needed correction. Remember, when using Hamming code, only the 3, 5, 6, and 7 slots comprise the actual message!

For your input, use the following five inputs, and show the results of each:

1101010

0010111

1010101

1001001

0110011

Please don't forget that you can use the sample of Hamming Code provided to test your code for correctness. *(50pts for Code, 10pts for Each Result)*

Code:

```
// Name: Dawlat Hamad
```

```
// ID: GV5450
```

```
// Lab 9 - Hamming Code
```

```
// Source 1: https://www.youtube.com/watch?v=AGo8MP1xgVk
```

```
// Source 2: https://www.geeksforgeeks.org/how-to-concatenate-two-integer-values-into-one/amp/
```

```
#include <iostream>
```

```
#include <string>
```

```
using namespace std;
```

```
//Creates a binary number form the bits - four int to one
```

```
//Concatenate function
```

```
int concat(int a, int b, int c, int d)
```

```
{
```

```
    //int to string
```

```
    string s1 = to_string(a);
```

```

    string s2 = to_string(b);
    string s3 = to_string(c);
    string s4 = to_string(d);

    //Concatenate strings
    string s = s1 + s2 + s3 + s4;

    //Convert string to int
    int m = stoi(s);

    return m;
}

//Binary to Decimal Function
int Bin2Dec(int num)
{
    //Declare Variables
    int dec = 0;
    int base = 1;
    int rem;
    int temp = num;

    //Convert loop
    while (temp)
    {
        rem = temp % 10;
        temp = temp / 10;
        dec += rem * base;
        base = base * 2;
    }

    return dec;
}

int main ()
{
    //Declare Variables
    int c[10];
    int p1;
    int p2;
    int p4;
    int totalp;

    //Prompt user for input
    cout << endl;

```

```

    cout << "This program will take a 7-bit code and check for errors using Hamming
code. " << endl;
    cout << "Enter the 7-bit code: ";
    for (int i = 1; i < 8; i++)
    {
        cin >> c[i];
    }

    //Parity Check
    p1 = c[1] ^ c[3] ^ c[5] ^ c[7];
    p2 = c[2] ^ c[3] ^ c[6] ^ c[7];
    p4 = c[4] ^ c[5] ^ c[6] ^ c[7];
    totalp = p1*1 + p2*2 + p4*4;
    if (totalp == 0)
    {
        cout << "No errors found." << endl;
    }
    else
    {
        cout << "Error found in bit: " << totalp << endl;
        cout << "Correct code is:";

        //Correct Error bit
        if (c[totalp] == 0)
        {
            c[totalp] = 1;
        }
        else
        {
            c[totalp] = 0;
        }
        for (int i = 1; i < 8; i++)
        {
            cout << " " << c[i];
        }
        cout << endl;
    }

    //Print Output
    cout << "The Binary Number recieved is: ";
    cout << c[3] << c[5] << c[6] << c[7] << endl;
    cout << "The Decimal Number is: ";
    cout << Bin2Dec(concat(c[3], c[5], c[6], c[7])) << endl;
    cout << endl;
    return 0;
}

```

Output:

```
This program will take a 7-bit code and check for errors using Hamming code.
Enter the 7-bit code: 1 1 0 1 0 1 0
Error found in bit: 1
Correct code is: 0 1 0 1 0 1 0
The Binary Number recieved is: 0010
The Decimal Number is: 2
This program will take a 7-bit code and check for errors using Hamming code.
Enter the 7-bit code: 0 0 1 0 1 1 1
Error found in bit: 7
Correct code is: 0 0 1 0 1 1 0
The Binary Number recieved is: 1110
The Decimal Number is: 14
This program will take a 7-bit code and check for errors using Hamming code.
Enter the 7-bit code: 1 0 1 0 1 0 1
No errors found.
The Binary Number recieved is: 1101
The Decimal Number is: 13
This program will take a 7-bit code and check for errors using Hamming code.
Enter the 7-bit code: 1 0 0 1 0 0 1
Error found in bit: 2
Correct code is: 1 1 0 1 0 0 1
The Binary Number recieved is: 0001
The Decimal Number is: 1
This program will take a 7-bit code and check for errors using Hamming code.
Enter the 7-bit code: 0 1 1 0 0 1 1
No errors found.
The Binary Number recieved is: 1011
The Decimal Number is: 11
```