GeeksforGeeks

A computer science portal for geeks

Login	L	0	ອ	in
-------	---	---	---	----

Home	Algorithms	DS	GATE	Interv	iew Corner	Q&A	С	C++	Java	Books	Contribute	Ask a Q	About
Array	Bit Magic	C/C+	+ Arti	cles	GFacts	Linked L	ist	MCQ	Misc	Outpu	t String	Tree	Graph

Count set bits in an integer

Write an efficient program to count number of 1s in binary representation of an integer.

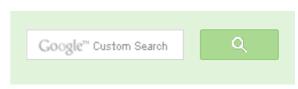
1. Simple Method Loop through all bits in an integer, check if a bit is set and if it is then increment the set bit count. See below program.

```
/* Function to get no of set bits in binary
   representation of passed binary no. */
int countSetBits(unsigned int n)
 unsigned int count = 0;
  while(n)
    count += n & 1;
    n >>= 1;
  return count;
/* Program to test function countSetBits */
int main()
    int i = 9;
    printf("%d", countSetBits(i));
    getchar();
    return 0;
```

Time Complexity: (-)(logn) (Theta of logn)

2. Brian Kernighan's Algorithm:

Subtraction of 1 from a number toggles all the bits (from right to left) till the rightmost set





53,526 people like GeeksforGeeks.











nterview E	Experiences
------------	-------------

Advanced Data Structures

Dynamic Programming

Greedy Algorithms

Backtracking

Pattern Searching

Divide & Conquer

Mathematical Algorithms

Recursion

bit(including the righmost set bit). So if we subtract a number by 1 and do bitwise & with itself (n & (n-1)), we unset the righmost set bit. If we do n & (n-1) in a loop and count the no of times loop executes we get the set bit count.

Beauty of the this solution is number of times it loops is equal to the number of set bits in a given integer.

```
1 Initialize count: = 0
2 If integer n is not zero
   (a) Do bitwise & with (n-1) and assign the value back to n
      n: = n&(n-1)
   (b) Increment count by 1
  (c) go to step 2
3 Else return count
```

Implementation of Brian Kernighan's Algorithm:

```
#include<stdio.h>
/* Function to get no of set bits in binary
   representation of passed binary no. */
int countSetBits(int n)
    unsigned int count = 0;
    while (n)
      n \&= (n-1);
      count++;
    return count;
/* Program to test function countSetBits */
int main()
    int i = 9;
    printf("%d", countSetBits(i));
    getchar();
    return 0;
```

Geometric Algorithms



Popular Posts

All permutations of a given string

Memory Layout of C Programs

Understanding "extern" keyword in C

Median of two sorted arrays

Tree traversal without recursion and without stack!

Structure Member Alignment, Padding and

Data Packing

Intersection point of two Linked Lists

Lowest Common Ancestor in a BST.

Check if a binary tree is BST or not

Sorted Linked List to Balanced BST

Example for Brian Kernighan's Algorithm:

```
n = 9 (1001)
count = 0
Since 9 > 0, subtract by 1 and do bitwise & with (9-1)
n = 9\&8 \quad (1001 \& 1000)
n = 8
count = 1
Since 8 > 0, subtract by 1 and do bitwise & with (8-1)
n = 8&7 (1000 & 0111)
n = 0
count = 2
Since n = 0, return count which is 2 now.
```

Time Complexity: O(logn)

3. Using Lookup table: We can count bits in O(1) time using lookup table. Please see http://graphics.stanford.edu/~seander/bithacks.html#CountBitsSetTable for details.

You can find one use of counting set bits at http://geeksforgeeks.org/?p=1465 References:

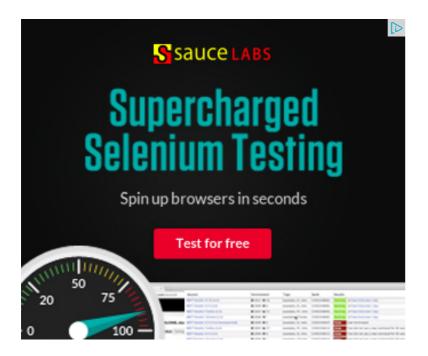
http://graphics.stanford.edu/~seander/bithacks.html#CountBitsSetNaive

HP Chromebook 11

8 google.com/chromebook

Everything you need in one laptop. Made with Google. Learn more.





Related Tpoics:

- Check if a number is multiple of 9 using bitwise operators
- How to swap two numbers without using a temporary variable?
- Divide and Conquer | Set 4 (Karatsuba algorithm for fast multiplication)
- Find position of the only set bit
- Swap all odd and even bits
- Add two bit strings
- Write your own strcmp that ignores cases
- Binary representation of a given number









Writing code in comment? Please use ideone.com and share the link here.





Recent Comments

Abhi You live US or India?

Google (Mountain View) interview · 20 minutes ago

Aman Hi, Why arent we checking for conditions...

Write a C program to Delete a Tree. · 59 minutes ago

kzs please provide solution for the problem...

Backtracking | Set 2 (Rat in a Maze) · 1 hour ago

Sanjay Agarwal bool

tree::Root_to_leaf_path_given_sum(tree...

Root to leaf path sum equal to a given number \cdot 1

hour ago

GOPI GOPINATH @admin Highlight this sentence "We can easily...

Count trailing zeroes in factorial of a number \cdot 1

hour ago

newCoder3006 If the array contains negative

numbers also. We...

Find subarray with given sum · 1 hour ago

AdChoices ▷

- ▶ Bits Byte
- ► Java 64 Bits
- ► Hex Bits

AdChoices ▷

- ► Long Integer
- ► Int Bits
- ► Log Me Int

AdChoices [▷

- ► Convert Int
- ► From Int
- ► To Int

@geeksforgeeks, Some rights reserved

Contact Us!

Powered by WordPress & MooTools, customized by geeksforgeeks team