

Use of Mathematical Number Zero in Programming Language

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Abstract: Programming language involves set of instructions. It has special keywords and syntax for organizing the instructions. Number zero has many role in mathematics like Representing an empty set with no elements is only possible with the help of the zero number. It has made calculations a lot easier for the mathematician which was not possible in the past. Zero subtracted or added to the number will not bring about any change in the value. In addition, when the whole number is subtracted from itself the number would be zero this paper will discuss the Importance of number zero in programming language.

Keywords: Programming language, Mathematical Number Zero.

I. INTRODUCTION

The number zero that was invented by Brahmgupta has many benefits in mathematics like to perform calculation easily and The division property of zero is quite interesting as any number dividing zero will give the result as zero while anything divided by zero is an indeterminate quantity. It is quite useful in the calculation in algebra and arithmetic.

Zero is also importance in rounding off the numbers. If the digits beyond decimal are greater or equal to 5, it is replaced by zero and many more uses.

This paper describe main uses of number zero in programming.

✓ In c or c++ when we use “INT MAIN()” it indicates main function return an integer value that is passed to operating system .0 indicates that program is successful.when we don’t write “Return 0” explicitly. It will happen automatically when MAIN terminate.

```
Int main()
{
-----
-----
Return 0;
}
```

✓ To Check whether number is even or not we make condition like this

```
If(number%2==0) //number is a given number to check even or not
```

Explanation: Any number would be even if number is divided by 2 and after division Remainder comes 0(zero) .

✓ To Check whether number is positive or negative through programming we make condition like this if(number>0) //number is a given number to check positive or negative.

Explanation: Any Number would be positive if that number is greater than zero.

✓ To find Sum of 1 to N number then we have to take a variable that would be initialized with 0(zero) and then that same variable will be added to 1 to N number like this

Program to find sum of 1 to 100 numbers

```
Sum=0
Number=1
While(number<=100)
{
Sum=sum+number
Number=number+1
}
```

✓ To find roots of quadratic equation we first find discriminate and compare discriminate with zero like this for example we have an equation $ax^2 + bx + c = 0$ and we want to find the roots of this equation first we will find discriminate like this $D=b^2-4*a*c$ and if $D=0$ then roots will be equal

if $D<0$ then roots are imaginary else there will be two roots of this equation .In Programming Language problem is express like this

```
d=b*b-4*a*c
if(d==0)
Roots are equal
If (d<0)
Roots are Imaginary
Else
X1=(-b+sqrt(d))/2*a
X2=(-b-sqrt(d))/2*a
```

✓ To determine whether given year is leap year or not we will compare year with zero like this

```
If((year%400==0)||((year%4==0)&&(year%100!=0)))
IT WILL BE A LEAP YEAR.
```

✓ For String comparison there is more role of zero like this

```
If(strcmp(string1,string2)==0) then
String will be equal
Otherwise
String are not equal
```

✓ To find H.C.F Of two positive integer numbers we will do like this in programming

```
Remainder=1
While(Remainder!=0)
{
Remainder=number1%number2
Number1=number2
Number2=remainder
}
```

✓ To write a program that takes user input in the form of an integer and returns the amount of odd, even, and zero numbers in the int. For example

Input: 2100

Output: 1 Odd, 1 Even, 2 Zeros /

To solve this problem in programming there is also need of number zero like this

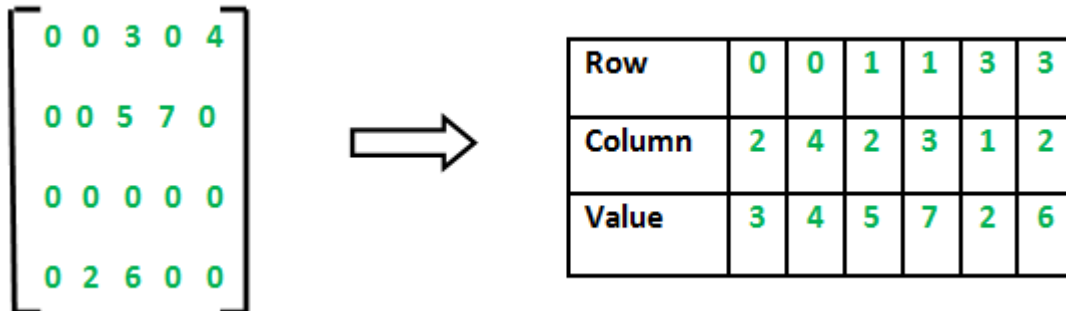
```
int even_count=0,odd_cout=0,zero_count=0
while(input_number>0)
{
Int remainder=input_number%10;
If(remainder==0)
{
Zero_count++;
}
Else if(input_number%2==0)
{
Even_count++;
}
Else
{
Odd_count++;
}
Input_number=input_number/10
}
```

✓ To perform string comparison using strcmp function through programs let us see

```
Char str1[100], str2[100]
cout<<"Enter first string : ";
gets(str1);
cout<<"Enter second string : ";
gets(str2);
if(strcmp(str1, str2)==0)
{
cout<<"Both the strings are equal";
}
Else
{
cout<<"Both the strings are not equal";
}
```

✓ Implementation of Sparse Matrix most of the elements of the matrix have **0 value**, then it is called a sparse matrix.. There are lesser non-zero elements than zeros and thus lesser memory can be used to store only those elements. Computing time can be saved by logically designing a data structure traversing only non-zero elements.

instead of storing zeroes with non-zero elements, we only store non-zero elements. This means storing non-zero elements with **triples- (Row, Column, value)**.



Implementation in c++

```
int sparseMatrix[4][5] =
{
  {0 , 0 , 3 , 0 , 4 },
  {0 , 0 , 5 , 7 , 0 },
  {0 , 0 , 0 , 8 , 0 },
  {0 , 2 , 6 , 0 , 0 }
};

int size = 0;
for (int i = 0; i < 4; i++)
for (int j = 0; j < 5; j++)
if (sparseMatrix[i][j] != 0)
  size++;

int compactMatrix[3][size];
// Making of new matrix
int k
for (i = 0; i < 4; i++)
for (j = 0; j < 5; j++)
if (sparseMatrix[i][j] != 0)
{
  compactMatrix[0][k] = i;
  compactMatrix[1][k] = j;
  compactMatrix[2][k] = sparseMatrix[i][j];
  k++;
}
for (i=0; i<3; i++)
```

```

    {
    for (j=0; j<size; j++)
    cout<< compactMatrix[i][j];
    cout<<("\n");
    }
    return 0;
}

```

✓ Implementation of stack data structure

Stack is one data structure in which insert and delete operation are performed at top of the stack.

To check Stack underflow condition

If TOP == 0 then

Write ('Stack Underflow')

Return

2. PREVIOUS RESEARCH

- In 22 April 2012 researcher karl said if you ask programmer to write a program for processing the race the result would begin with the winner assigned position 0 instead runner up in position 1 .for a programmer hero is a zero .
- In 19 march 2015 Anders Kaseorg, MIT PhD student in CS; Cofounder of Ksplice, Inc. said array index should starts from zero **Zero-based indexing actually simplifies array-related math for the programmer**, and simpler math leads to fewer bugs.

3. CONCLUSION

In this paper I have described the importance of zero in various programs .we have developed many program like program to calculate HCF,LCM, Implementation of array ,sparse matrix string comparison, sorting etc many more but these all program are impossible to implement without the help of ZERO number.i have just highlight the importance of zero .

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