Atoi implementation

The **atoi() function** in C takes a string (which represents an integer) as an argument and returns its value of type int. So basically the function is used to convert a string argument to an integer.

Syntax of atoi()

```
int atoi(const char strn);
```

Parameters

- The function accepts one parameter **strn** which refers to the string argument that is needed to be converted into its integer equivalent.

Return Value

- If strn is a valid input, then the function returns the equivalent integer number for the passed string number.
- If no valid conversion takes place, then the function returns zero.

```
#include <bits/stdc++.h>

using namespace std;


int main()

{

    int val;

    char strn1[] = "12546";


    val = atoi(strn1);

    cout << "String value = " << strn1 << endl;
```

```
    cout << "Integer value = " << val << endl;

    char strn2[] = "GeeksforGeeks";
    val = atoi(strn2);
    cout << "String value = " << strn2 << endl;
    cout << "Integer value = " << val << endl;

    return (0);
}
```

Output

```
String value = 12546
Integer value = 12546
String value = GeeksforGeeks
Integer value = 0
```

Complexity Analysis:

- **Time Complexity:** O(n), Only one traversal of the string is needed.
- **Space Complexity:** O(1), As no extra space is required.

Approach 1

The following is a simple implementation of conversion without considering any special case.

- Initialize the result as 0.
- Start from the first character and update the result for every character.
- For every character update the answer as *result = result * 10 + (s[i] – '0')*

```
// A simple C++ program for
// implementation of atoi
#include <bits/stdc++.h>
using namespace std;

// A simple atoi() function
int myAtoi(char* str)
{
	// Initialize result
	int res = 0;

	// Iterate through all characters
	// of input string and update result
	// take ASCII character of corresponding digit and
	// subtract the code from '0' to get numerical
	// value and multiply res by 10 to shuffle
	// digits left to update running total
	for (int i = 0; str[i] != '\0'; ++i)
		res = res * 10 + str[i] - '0';
```

```
    // return result.

    return res;

}


// Driver code

int main()

{

    char str[] = "89789";


    // Function call

    int val = myAtoi(str);

    cout << val;

    return 0;

}
```

Output
89789

Complexity Analysis:

- **Time Complexity:** O(n), Only one traversal of the string is needed.
- **Space Complexity:** O(1), As no extra space is required.

Approach 2
This implementation handles the negative numbers.

- If the first character is '-' then store the sign as negative and then convert the rest of the string to number using the previous approach while multiplying the sign with it.

```
// A C++ program for
// implementation of atoi
#include <bits/stdc++.h>
using namespace std;

// A simple atoi() function
int myAtoi(char* str)
{
    // Initialize result
    int res = 0;

    // Initialize sign as positive
    int sign = 1;

    // Initialize index of first digit
    int i = 0;

    // If number is negative,
    // then update sign
    if (str[0] == '-') {
        sign = -1;

        // Also update index of first digit
        i++;
```

```
    }

    // Iterate through all digits
    // and update the result
    for (; str[i] != '\0'; i++)
        res = res * 10 + str[i] - '0';

    // Return result with sign
    return sign * res;
}

// Driver code
int main()
{
    char str[] = "-123";

    // Function call
    int val = myAtoi(str);
    cout << val;
    return 0;
}

// This is code is contributed by rathbhupendra
```

Output

```
-123
```

Complexity Analysis:

- **Time Complexity:** O(n), Only one traversal of the string is needed.
- **Space Complexity:** O(1), As no extra space is required.

Approach 3

Four corner cases need to be handled:

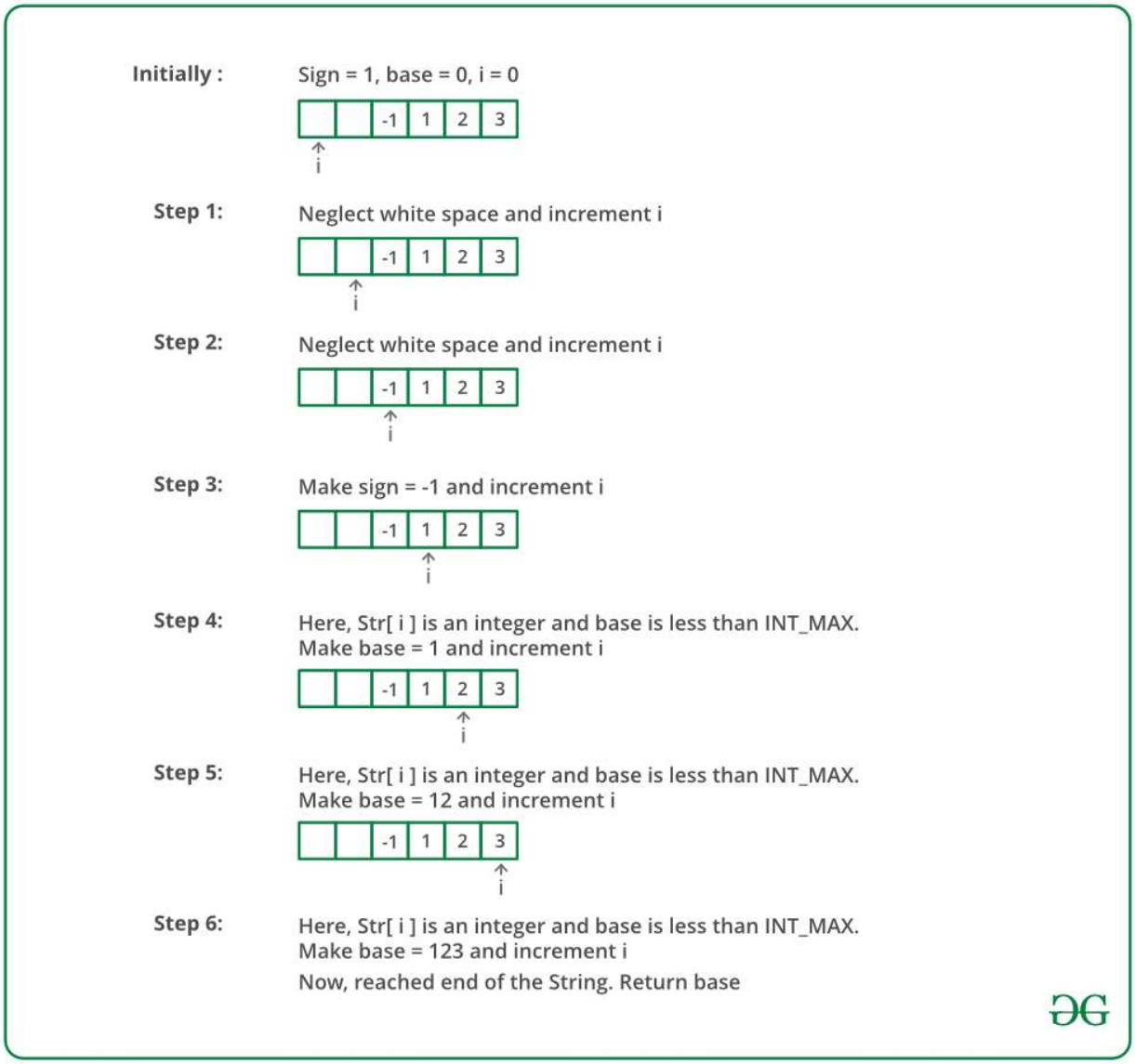
- Discard all leading whitespaces
- Sign of the number
- Overflow
- Invalid Input

Below are the steps for the above approach:

- To remove the leading whitespaces, run a loop and ignore the whitespaces until a character of the digit is reached.
- It keeps a sign variable to keep track of the sign of the number.
- It checks for valid input characters if all characters are from 0 to 9 and converts them into integers.
- If an overflow occurs and if the number is greater than or equal to INT_MAX/10, return INT_MAX if the sign is positive and return INT_MIN if the sign is negative.

The other cases are handled in previous approaches.

Dry Run:




```cpp
// A simple C++ program for
// implementation of atoi
#include <bits/stdc++.h>
using namespace std;

int myAtoi(const char* str)
{
```

```
    int sign = 1, base = 0, i = 0;

    // if whitespaces then ignore.
    while (str[i] == ' ') {
        i++;
    }

    // sign of number
    if (str[i] == '-' || str[i] == '+') {
        sign = 1 - 2 * (str[i++] == '-');
    }

    // checking for valid input
    while (str[i] >= '0' && str[i] <= '9') {
        // handling overflow test case
        if (base > INT_MAX / 10
            || (base == INT_MAX / 10 && str[i] - '0' > 7)) {
            if (sign == 1)
                return INT_MAX;
            else
                return INT_MIN;
        }
        base = 10 * base + (str[i++] - '0');
    }
    return base * sign;
}
```

```
// Driver Code
int main()
{
    char str[] = "  -123";

    // Functional Code
    int val = myAtoi(str);
    cout << " " << val;
    return 0;
}

// This code is contributed by shivanisinghss2110
```

Output

```
-123
```

Complexity Analysis:

- **Time Complexity:** O(n), Only one traversal of the string is needed.
- **Space Complexity:** O(1), As no extra space is required.