Implementation of BigInt

Course : Design Principles of Programming Languages.
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About the assignment :

The assignment is to create a program which can simulate the basic operations like addition and subtraction on really long integers by best utilising the underlying architecture. It is similar to the functionality provided by the BigInt class in java.

Need of BigInt :

As the biggest data type in c/c++ is long long int and it can carry out operations in the range - 9223372036854775808 to 9223372036854775807 we need a way to carry out basic operations having inputs of length and value bigger than long long int for various purposes.

Range of values of some data types in c/c++

short int	-32,768 to 32,767
Unsigned short int	0 to 65,535
Unsigned int	0 to 4,294,967,295
int	-2,147,483,648 to 2,147,483,647
Unsigned long int	0 to 4,294,967,295
long int	-2,147,483,648 to 2,147,483,647
long long int	- 9223372036854775808 to 9223372036854775807

Objectives :

> The program should be able to take inputs of very big numbers, greater than 19 digits provided by long long int.
> The program should provide basic operation like addition and subtraction
> The output of the program should be precise and correct

Description about the assignment :

The program takes two numbers as input in the form of a string. Both numbers are compared and the smaller number is padded with zeros from the front. Then the numbers are each divided into parts each of long long int. The operations are performed part wise i.e first part of number1 with first part of number2 and so on until the final result is obtained.

In case of addition operation , it is checked whether the addition of part1 of number1 and part1 of number2 produces carry or not and the addition is carried out.Similarly in case of subtraction it is checked if the part wise subtraction produces borrow or not and subtraction is carried out. During this process the part wise result is continuously added to the final result. Finally we get the result of addition/subtraction of two numbers having digits more than normal limits.

Functionality provided by the program :

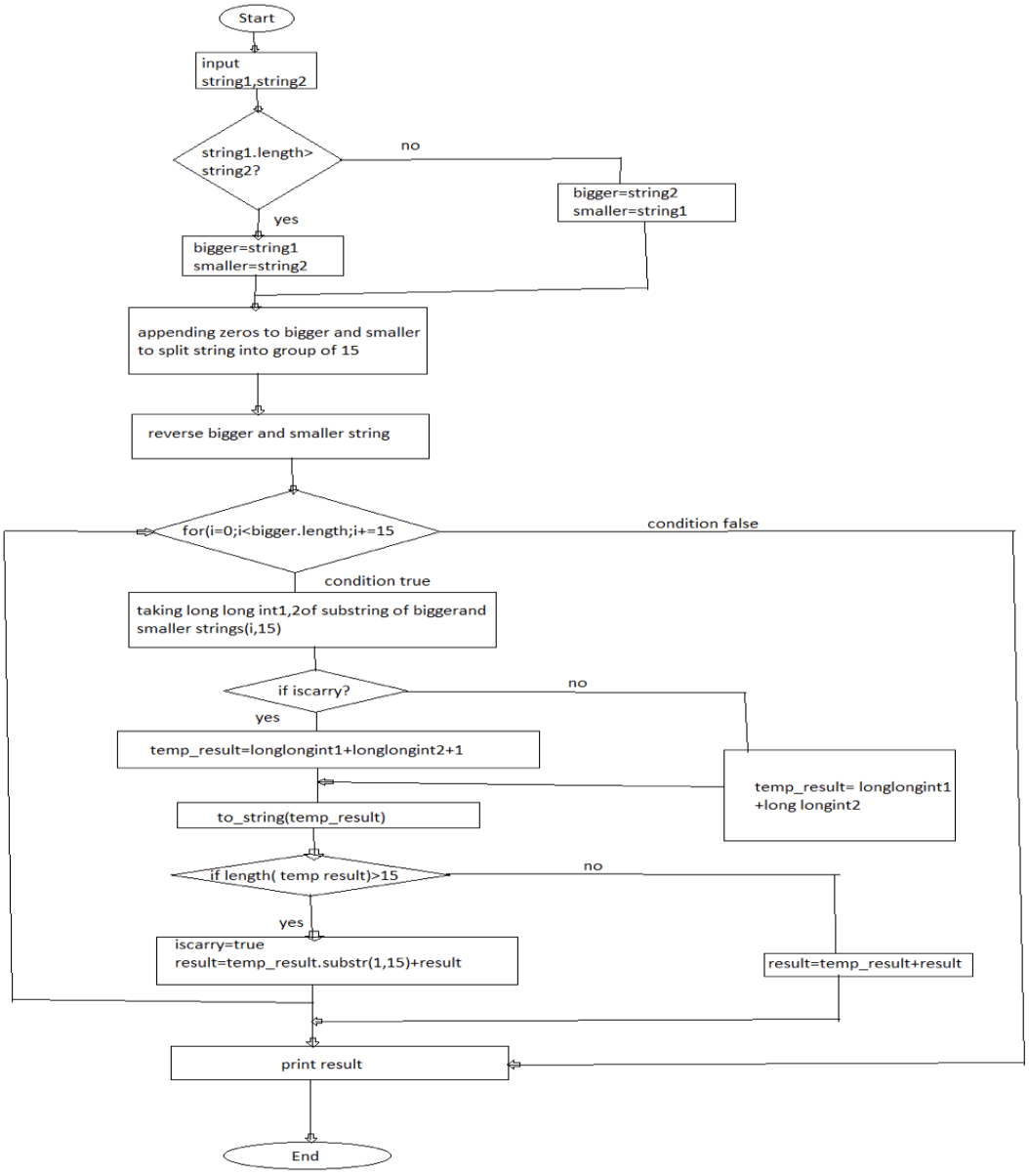
> Addition of two numbers of any possible length
> Subtraction of two numbers of any possible length

In Built Functions Used :

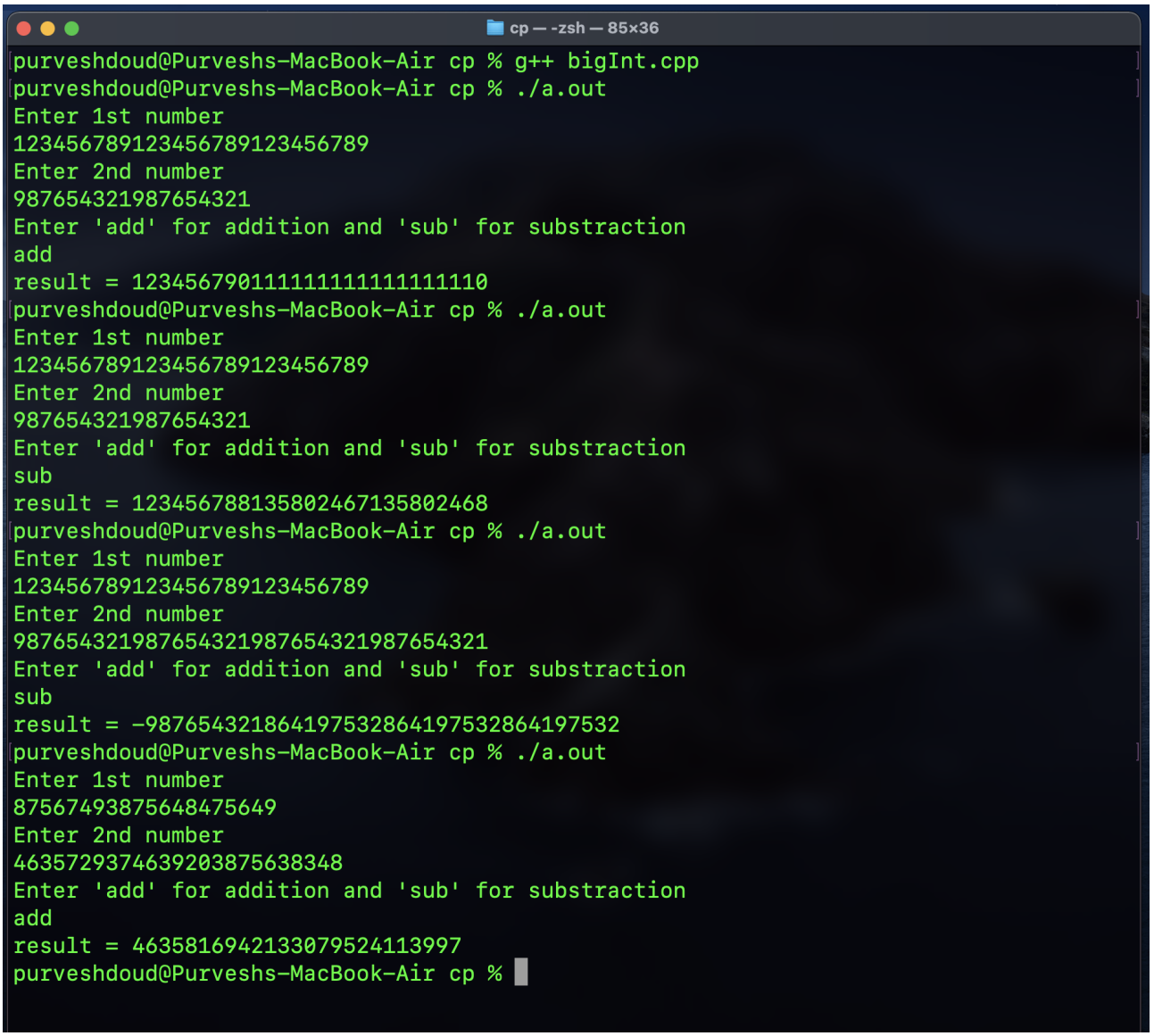
- reverse () function reverses the string
- substr () used to create a substring of specified length in our case 15
- stoll () used to convert string to long long
- to_string() used to convert to string

WorkFlow :

- Taking string as a input
- Comparing the 2 strings to find the bigger number
- Dividing string into substring of length 15 using substr()
- Then converting them to long long using stoll()
- Performing add/sub operations on this long long
- Converting this long long back to string using to_string()
- Appending this substring back to the main string now repeating process for next substring of length15
- Now finally outputting the resulting string.



Result / Working Program :



Conclusion :

Finally we were able to perform operations like addition and subtraction on really long numbers using this program. Our objective of simulating functionality like bigInt in our program is completed.