Function - 8: Beta Function

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Introduction

Beta function is also known as Euler's integral of first kind and is very important in calculus and is basically an association between input and output values. The beta function is used to determine average time to complete some tasks in the time related problems. Beta function has a very close connection to the gamma function which also the generalisation of the factorial function. The beta function is defined as follows:

$$\beta(x,y) = \int_0^1 t^{x-1}(1-t)^{y-1}dt$$

- Domain: Re (x) > 0 and Re (y) > 0

- Co-domain: All real numbers

$$(-\infty, \infty)$$

Algorithm used

Algorithm 1 Calculate the Beta function

```
1:  procedure BETA(x, y)
2:      System Initialization
3:      Read input values
4:      if (x and y > 0) then
5:          betaNum ← GAMMA(x) * GAMMA(y);
6:          betaDen ← GAMMA(x + y);
7:          result ← betaNum ÷ betaDen
8:          return result;
9:      else
10:         return ;
11:
12: procedure GAMMA(num)
13:     pi ← 3.1416;                              ▷ Pi value is used in gamma function
14:     eBase ← 2.7183;                           ▷ This is the base of natural logarithm
15:     varA ← (2 × pi) ÷ num;
16:     varB ← num ÷ eBase;
17:     squareRoot ← √varA;
18:     powerUp ← varB^num;
19:     result ← squareRoot × powerUp;
20:     return result;
```

Repository

Throughout the brainstorming and development of the project all the files were updated and committed to the central repository. There were two repos maintained, one for the whole team (Team - A), and the other for the each individual of the team.

Following is the address of the GitHub,
https://github.com/charan121317/soen-6011-project

Critical Decisions

There were a few decisions made during the project that were very critical:

- Using Gamma function to calculate beta function.

$$\beta(x,y) = \frac{\gamma(x)\gamma(y)}{\gamma(x+y)}$$

- Choosing the Stirling's Approximation, to calculate the gamma function, it is an approximation for *factorials*. It is very useful in calculation of gamma function, even for very small numbers.

- Use of MVC design pattern to make it easier to develop and maintain different modules of code.

Lessons Learnt

There were many useful lessons that were learned during development, testing and brainstorming.

- Always plan the deliverable according to time in hand.

- Setting up meetings with the teammates and coming up with decisions that are followed by the whole team take a lot of time and input from the whole team.

- Follow certain coding standards, which makes it easier to understand the code and also maintain it for further integration.

References

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