Beta Function

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Introduction

Beta Function is a function which is also known as Eular function is defined by:

- $\mathrm{B}(x,y) = \int_0^1 t^{x-1}(1-$
  $t)^{y-1}dt\mathrm{B}(x,y) = \int_0^1 t^{x-1}(1-t)^{y-1}dtforRex > 0, Rey >$
  $0.Thekeypropertyofbetafunctionisitssymmetry$:
- $\mathrm{B}(x,y) = \mathrm{B}(y,x).\mathrm{B}(x,y) = \mathrm{B}(y,x)$.
- Another property of the beta function is its relation to gamma function which is given by: $\mathrm{B}(x,y) = \frac{\Gamma(x)\,\Gamma(y)}{\Gamma(x+y)}.\mathrm{B}(x,y) = \frac{\Gamma(x)\,\Gamma(y)}{\Gamma(x+y)}$.

Domain and Range

Domain is positive real numbers. and domain is $-\infty$ *to* $+\infty$

Advantages and Disadvantages

Advantages

- As program is divided into sub-functions its easy to program it into real problem.
- As user defined values are used,so its easy to implement the program.

Disadvantages

- the inputs are specified by the user,wide range of inputs can be missed.
- It uses Bruteforce technique.

Critical Decisions

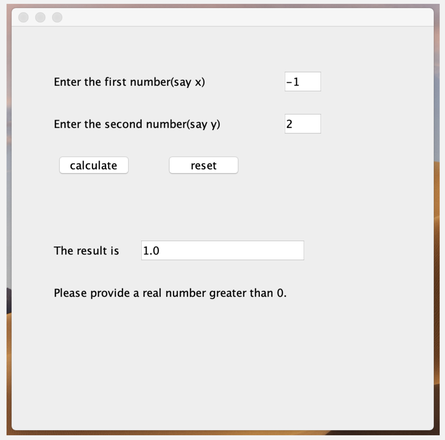
- **Selection of algorithm** Selecting an algorithm for Beta function was a kind of challenge.Beta Integral function was selected from variety of algorithms.The reason behind choosing this algorithm was that the algorithm was divided into sub functions which increases its usability.
- **Implementation against approximation** It was critical to provide the implementation for Stirling's approximation which gives the asymptotic formula:

  $$\mathrm{B}(x,y) \sim \sqrt{2\pi}\frac{x^{x-1/2}y^{y-1/2}}{(x+y)^{x+y-1/2}}$$

  for large x and large y. If on the other hand x is large and y is fixed, then

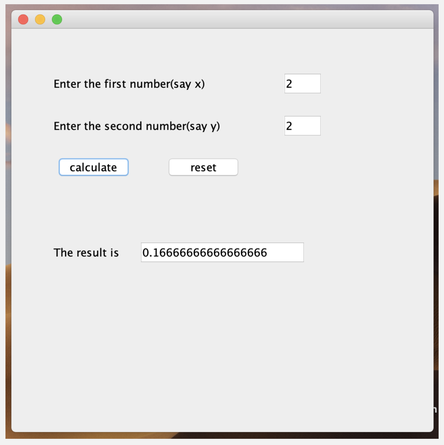
  $$\mathrm{B}(x,y) \sim \Gamma(y)\,x^{-y}.$$

- **User Interface** Selecting the user interface for implementing the Beta function was also a critical decision which finally continued with SWING framework as this framework provides user-friendly interface and is easy to understand and implement based on J2SE.



Lesson learnt

- **Latex**: I learnt how to use latex framework for report which was completely new for me.
- **User Interface**: SWING implementations was something i had never done before,it was quite interesting part of learning.
- **Deadlines meet**: Delivering builds within the limited time frame.
- **Code Review and Test Case Review**:Learnt to do code review and test case review in effective way by using tools such as Geritt, FreeMind(Mind mapping Tool).
- **Peer Learning**: After peer code and report review,i analyzed that it is very important to have a solid documentation for future traceability.



Conclusion

To Conclude,

- Beta Integral Function algorithm is simple and efficient as compared to other algorithms for Beta Function.
- Use of tools such as Checkstyle,jacoco,junit framework make code highly reliable and efficient.
- Proper Documentation is key to Software Engineering.
- Importance of code reviews in Software Engineering cannot be ignored.

References

- https://en.wikipedia.org/wiki/Beta_function
- http://functions.wolfram.com/
- https://www.overleaf.com/gallery/tagged/poster
- https://en.wikipedia.org/wiki/Euler_integral

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