B(x,y): Implementation of Beta Function.

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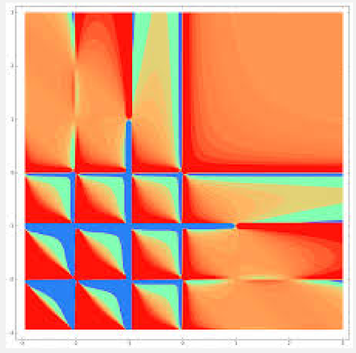
Introduction:

$B(x, y)$ denotes the beta function also known as the Euler'âĂŹs beta function. Beta function is a function which is defined for the values defined in a certain specific limits of a function. The formula of $B(x, y)$ is:

- $B(x, y) = \frac{(x-1)!(y-1)!}{(x+y-1)!}$ **For positive integers**
- $B(x, y) = \int_0^1 \frac{t^{x-1}}{(1-t)^{y-1}} dt$ **For positive real numbers**



Critical Decisions

- One of the most critical decision made by me was to deal with the functionality of the integration. It was very difficult to ignore the integration function because it is an integral part of the Beta function. Finding an alternate method for the same was a difficult part. Here, I used the method of Gamma function and tried to ignore the integration. Here, in the gamma method, I used the sterling's approximation for the gamma function which can be used for both integer as well as the real numbers.
- Another critical decision was to ignore the values for which the function would not be able to process the data i.e. the Beta function does not accept negative real numbers. Moreover, there are cases wherein the program couldn't give the solution because of the byte size of the inbuilt data types.
- The most critical decision was to go further with the mathematical formula which was derived from the process I performed, and implementing the mathematical derivation which was a complex integration formula broken down into gamma function using power and natural log functions.

Implications of Critical Decisions

Advantages:

1. One of the major positives of the decision was that the formula of the Beta function simplified to a certain extent.
2. I could get the answers for the beta functions I wanted.
3. I was able to accommodate various functionalities (i.e. gamma, power, logarithm) in my project, which can make the functionality (i.e. Beta function) easily understandable to a layman.

Disadvantages:

1. Running time for the program increased because of the increase in the calculations to be performed.
2. For some of the input values, the answers are not accurate.
3. Each functionality implemented had their own variations in the answers (i.e. not accurate).

Lessons Learned

1. It is very important to know the programming standards and code accordingly to be fit in the industrial environment.
2. It is very important to understand the problem and know the consequences before starting to code for it or building a logic for it.
3. Testing should be performed as much as possible and most importantly, the development should be a TDD (Test Driven Development).
4. Test cases should be formed on different grounds to make sure that your code runs properly and doesn't behave in an abnormal way in any condition.
5. It is necessary to use a Version Control System (VCS) to keep a track of the progress made along the project and to traceback to the most recent working condition in case of an anomaly.
6. Pair programming plays an important role in individual personality and confidence development of team members.

Challenges

- One of the major challenges was to learn about the beta function, because there is no direct implementation of beta function in real world problems.
- Furthermore, the challenge was to accommodate all the aforementioned problems into one program and ensure proper functioning of the code with harmony.
- Lastly, I had to deal with the variations that was depicted in the solution from each of the functionalities mentioned above. i.e., each function had their own deviations from the original answers.

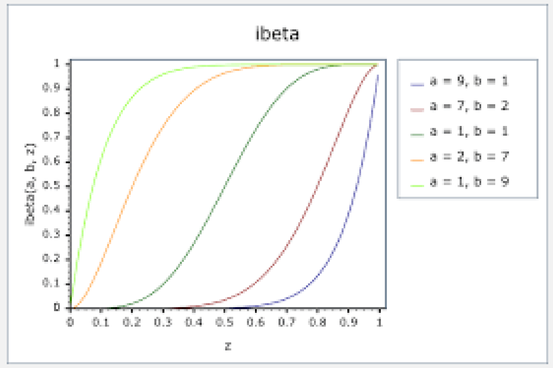


Figure: Beta Function 1

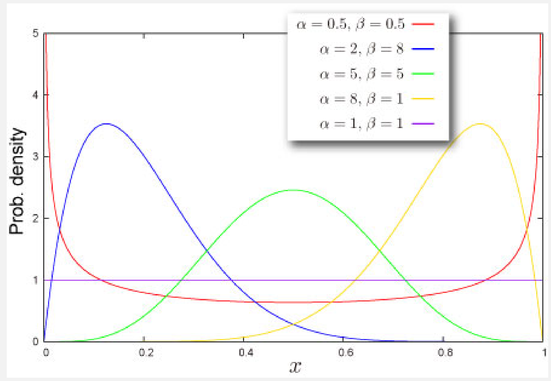


Figure: Beta Function 2

GitHub Information

- https://github.com/rohanpaspallu/SOEN-6011-Beta-x-y-