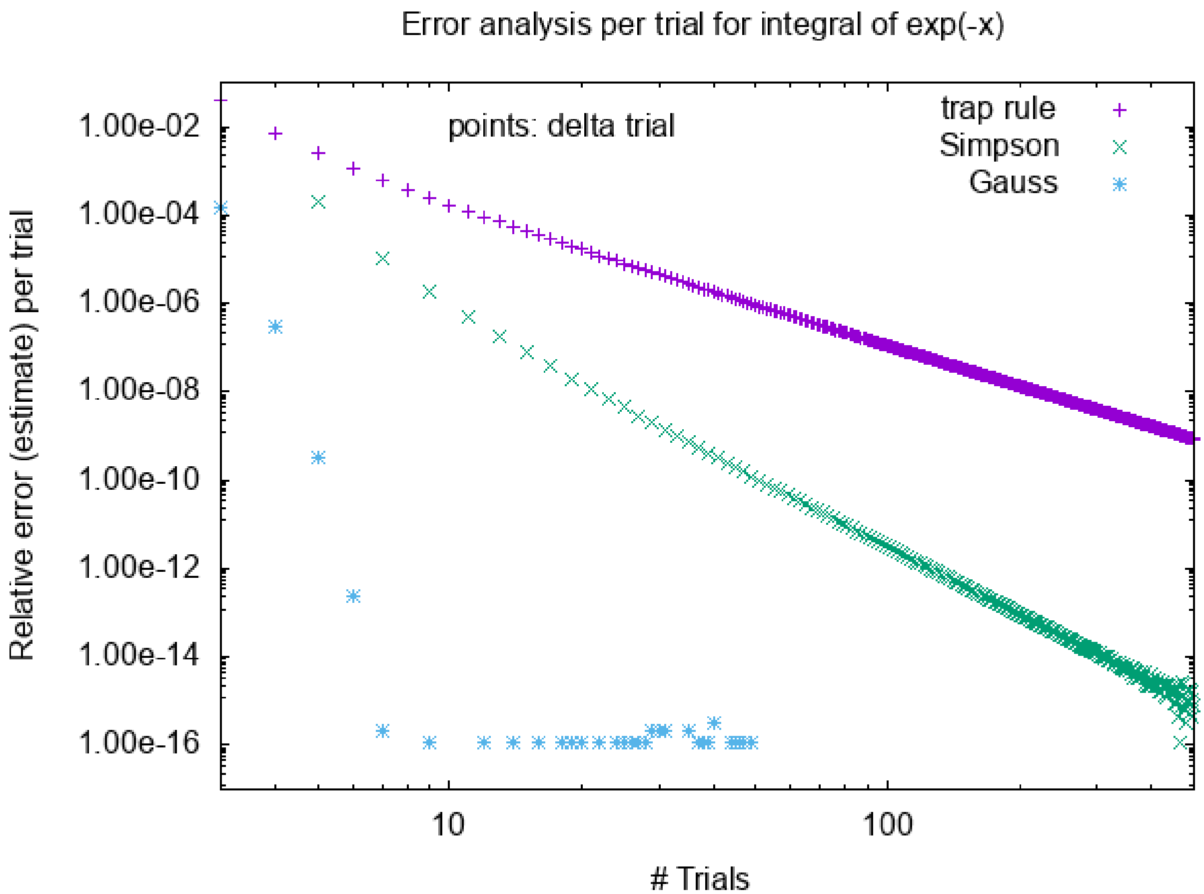


The plot "compareinteg.pdf" shows errors vs intervals of integration of various methods of integration of exp(-x).
These are trapazoidal, Simpsom's ,and Gauss rule.

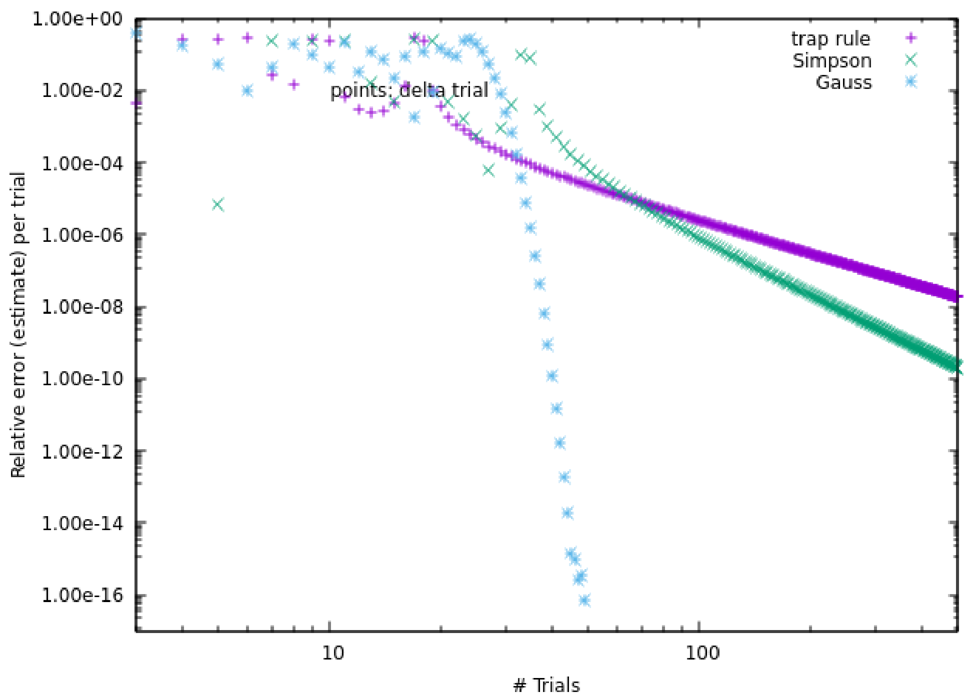
The purple plot show the slowest algorithm which is the trapazoidal rule.
The fastest algorithm is Gauss rule.

From my opinion, I think these methods are suitable for each function with different original ideas. The trap integral is inspired by the linear section with a constant slope. So, I think this approximation will make a difference when the used function is upper than 2nd order polynomials.

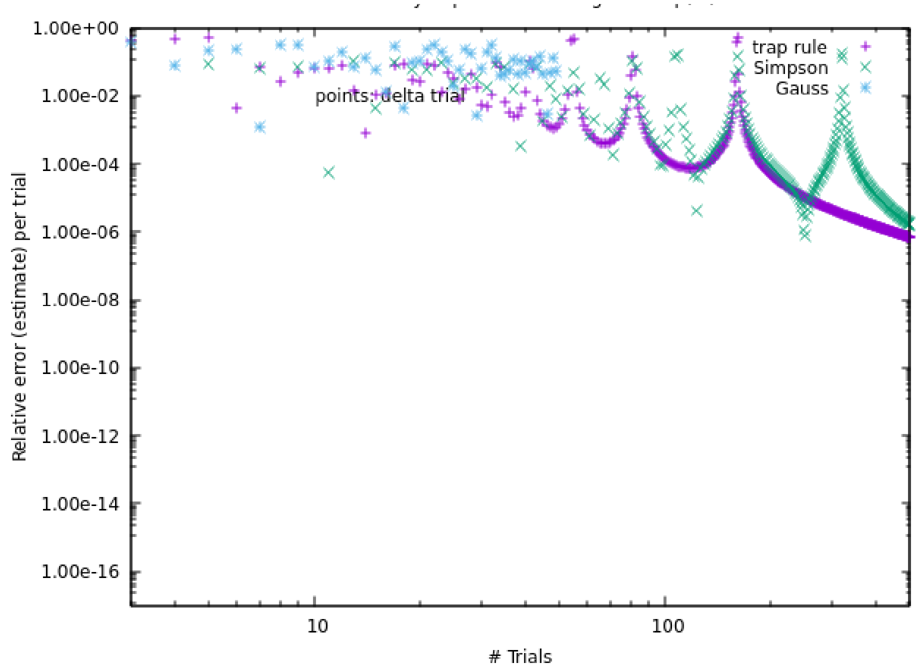
Secondly, the Simpson's rule bases on 2nd order polynomials fitting. For more curvy function, this method is better than the trap rule.

Finally, the Gauss rule is the best method to get the least error, because of 3rd order polynomial approximation.

This image used sine(100*x)



This image used sine(1000*x)



These 2 image of sin(100*x) and sin(1000*x) shows the periodic function shows strange results that the Gauss rule looks worse with the high frequency periodic function.

As the origination of these integrations, they are based on polynomial approximation and their order of differentiation. See the periodic function, the first order differentiation is disappeared at the extremum points.

I think this is the major reason that make a big difference at very high frequency periodic function.