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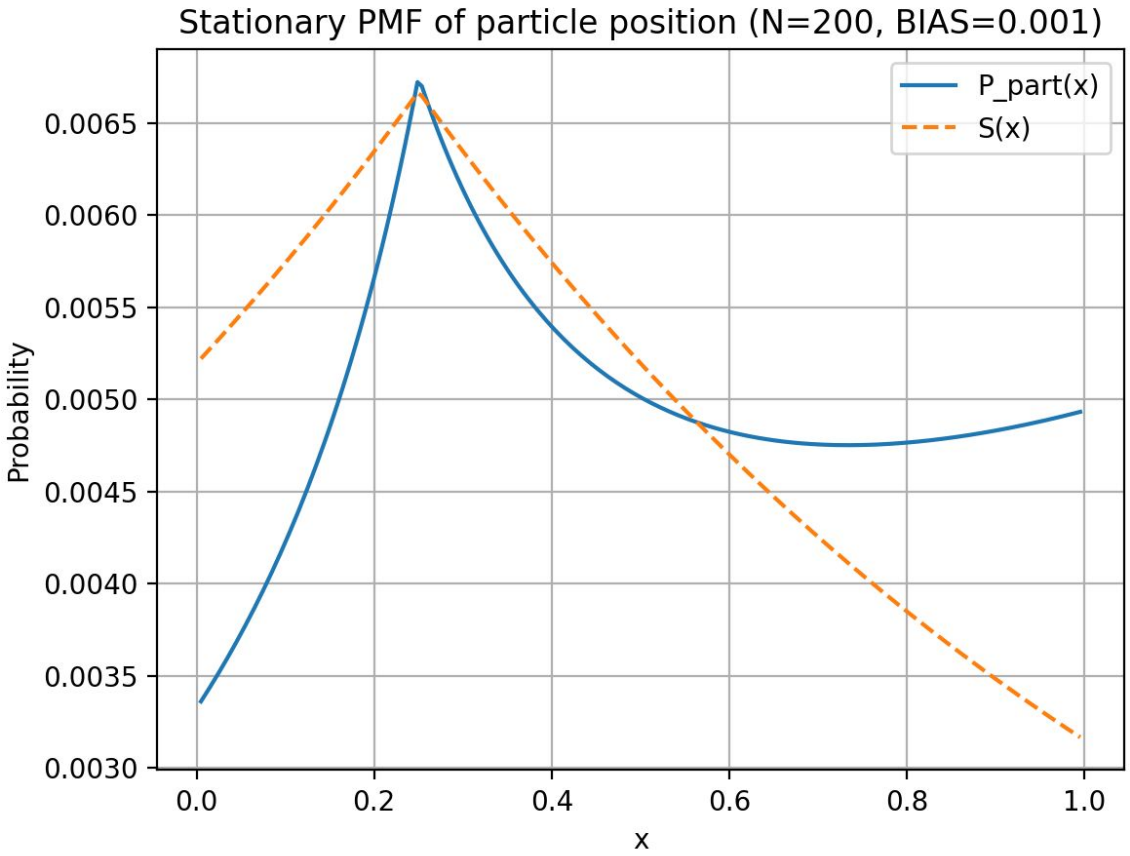
Homework 6 Report

The utility of the sparse matrix data structure is to condense the size of a matrix containing few nonzero entries. This significantly decreased the computation time. In fact, performing 15,550+ iterations took only milli-seconds. Increasing the grid size didn't add to the computation time by a noticeable amount. By storing only the essential parameters such as the number of nonzero entries in a given row as a list, as well as the values and associated column numbers for that row as a list of lists, we can greatly reduce the number of operations performed in a matrix multiplication. Using a normal matrix data structure (storing all zeros) would cause each matrix multiplication to take N^2 operations. By not storing the zeros, we have turned an NxN matrix into an $N \times \frac{1}{y}N$ matrix where $1 \leq y < N$. Therefore, the total number of operations is actually CxN where C is some constant. So the actual number of operations is closer to N than N^2.


Stationary PMF of particle position (N=200, BIAS=0.001)
P_part(x)
S(x)
Probability
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0
0.2
0.4
0.6
0.8
1.0
x