Impact of T-Consciousness Fields on Three-Dimensional Monte Carlo Calculations (Volume)

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Abstract

In the previous computational studies of this issue, the impact of T-Consciousness Fields (TCFs) on the generation of random numbers and Monte Carlo calculations in one- and two-dimensions have been investigated. Based on the results obtained, it was expected that generating three sets of random numbers for calculating the volume of a rectangular prism (three-dimensional calculation) in this third phase of the studies would lead to a clearer response. In other words, the impact of the TCFs on the three sets of random numbers created a more significant effect on the output of the designed experiment. The results confirmed the initial hypothesis test, as the TCF2 exposure led to a meaningful reduction (p-value < 0.05) in the calculated distance from the analytical value (computational uncertainty) and increased the expected hits by 4% near the analytical value. The TCF2 exposure also reduced the entropy value of the distribution by 10%, with respect to the control. These responses to TCF2 are more significant in three-dimensional calculations than in two- or one-dimensional calculations.

Keywords: T-Consciousness Fields, Random Numbers, Monte Carlo, Volume Calculation, Uncertainty

Introduction

The Monte Carlo method is a statistical technique that employs randomly generated numbers as the input for generating a wide range of solutions and hence, understanding complex physical or mathematical systems. By increasing the number of experiments in this method, the probability of the solutions derived can be determined with a higher degree of accuracy. The Monte Carlo method has applications in a wide range of areas, including mathematics, physics, biology, engineering, and finance, where finding an analytical solution would be very time-consuming. The Monte Carlo method can be compared with deterministic methods, which are based on solving transport equations and/or molecular dynamics[1]. Common Monte Carlo computational programs such as SRIM, PENELOPE, MCNP, FLUKA, and GEANT4 are used to simulate complex processes, namely, particle penetration into matter[2]. In this study, we investigate the effects of TCFs on the higher level of Monte Carlo computations.

Method

Calculations in this study are related to a specific volume, and it is performed with three series of randomly generated data. The analytical value for the volume is 40. For more details, see section 2-2-2 of the common considerations. Initially, a descriptive analysis was performed on all the values obtained from the volume in the control and the two samples. Then, with a binning width of 0.2, the distribution of the acquired data was obtained. Finally, the changes in the calculated volume, as well as the entropy values, were compared for the samples and the control.

Results and Conclusions

Table 1 provides an overview of the statistical parameters derived from calculating the volume in all the studied groups. As can be seen, the average tendency towards the expected analytical value is higher for sample 2 than for sample 1 and the control.

Furthermore, in the box plot provided in Figure 1 (bottom), a decrease is evident in the range of variations for the values derived from sample 2 compared to sample 1 and the control.

Table 1 - Descriptive analysis of calculated volume values in samples and control

	Control	TCF1	TCF2
Number of values	100	100	100
Minimum	38.874	38.832	38.802
25% Percentile	39.522	39.443	39.709
Median	39.935	39.907	39.931
75% Percentile	40.254	40.141	40.293
Maximum	41.199	41.281	40.993
Range	2.325	2.449	2.191
Actual confidence level	96.480%	96.480%	96.480%
Lower confidence limit	39.782	39.810	39.879
Upper confidence limit	40.065	40.031	40.098
Mean	39.940	39.873	39.977
Std. Deviation	0.497	0.508	0.409
Std. Error of Mean	0.050	0.051	0.0409
Lower 95% CI of mean	39.841	39.772	39.896
Upper 95% CI of mean	40.038	39.974	40.059
+1 Sigma (round 0.1) of Mean	40.4	40.4	40.4
-1 Sigma (round 0.1) of Mean	39.4	39.4	39.6

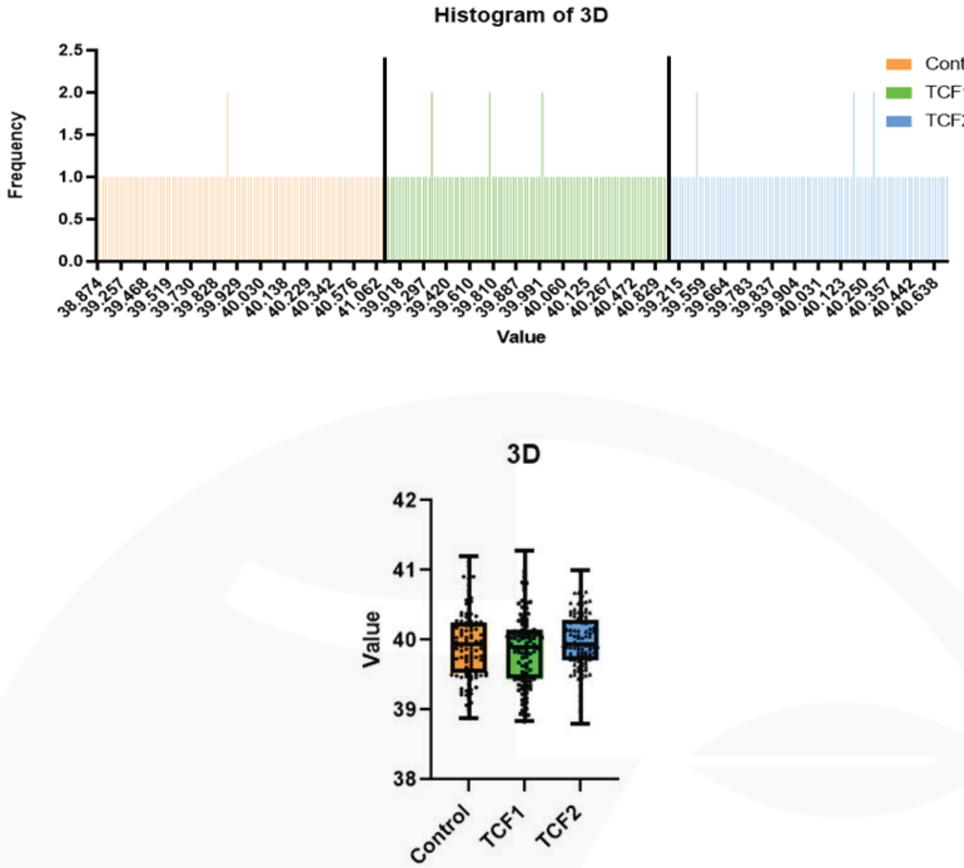

Figure 1 - Histogram of all generated values (top) along with box plot analysis of the generated values (bottom)

Based on the histogram provided in Figure 1 (top), there is an evident change in the frequency of the generated values in some intervals for the samples, as compared with the control group.

The drifts of the calculated values from the analytical value are compared between the samples and the control in Figure 2 (left).

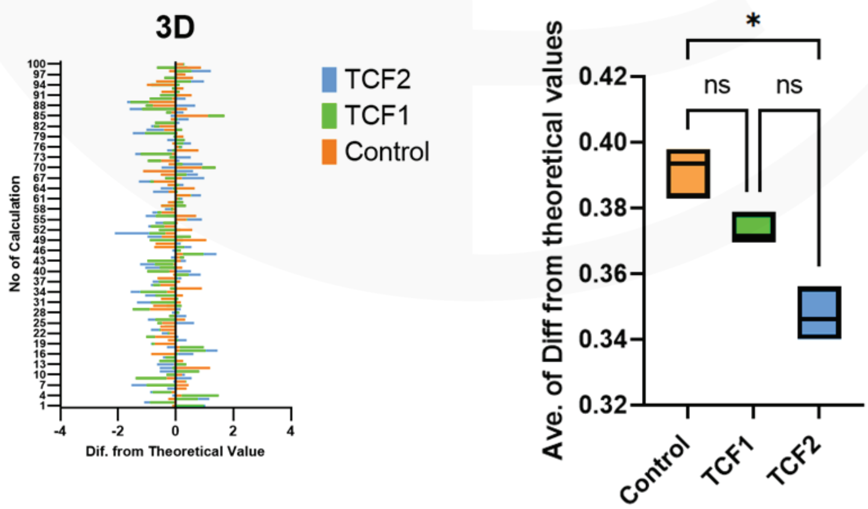

Figure 2 - (Left): Displaying comparisons of the difference between the calculated and analytical values in the control and samples for 100 calculation iterations. The zero line represents the calculation equivalent to the analytical value and the zero difference. (Right): Box plot analysis of the average uncertainty in the calculation for the control and samples in three repetitions for each.

Based on Figure 2 (left), the average calculation uncertainty between sample 2 and the control shows a significant decrease of approximately 12%. On the other hand, the uncertainty between sample 1 and control is not statistically significant. This is also true for the uncertainty between sample 1 and sample 2.

Table 2 represents the frequency of the calculated values in different intervals (bins) for the control and TCF-treated samples. The analytical value of the volume is highlighted in blue and in the first column. Additionally, because the frequencies are calculated from the intervals that are the nearest to the analytical value, one smaller interval and one larger interval on both sides of the analytical value are also highlighted. The overall frequency of the calculated values in this range is calculated and provided at the bottom of Table 2. In the entropy row, the Shannon entropy value for the entire range of the values is calculated according to the equation mentioned in the common considerations section.

Table 2 - Data categorized in the three-dimensional calculation test along with the calculation of the overall Shannon entropy; the value specified in column 1 is the expected analytical value.

Bin Center	Control	TCF1	TCF2
38.80	1	1	1
39.00	3	6	2
39.20	7	7	2
39.40	11	13	5
39.60	9	8	13
39.80	16	14	21
40.00	16	23	17
40.20	17	11	15
40.40	7	6	13
40.60	5	4	10
40.80	3	4	0
41.00	3	2	1
41.20	2	1	0
Entropy	2.31	2.27	2.07
The percentage of calculation output in the closest intervals to the analytical	49%	48%	53%

In Table 2, by classifying the calculated numbers into different bins and calculating their frequencies in each bin, the approximate frequency of the numbers estimated in the control and TCF-treated samples has been obtained. Since the expected analytical value in this study is 40, the bin with the central value of 40, together with the closest bins on both sides (highlighted rows in the table), are considered the nearest range to the expected answer. Furthermore, the frequency of the estimated numbers within this range and relative to the total calculations is reported as the occurrence or hits in the closest range. This is shown in the last row of Table 2. As evident, the minimum distance from the calculated values belongs to sample 2, with a difference of at least 4% from sample 1 and the control. The entropy of the distribution of sample 2 is also approximately 10% lower than that of the control.

References

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