Simple Sample

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1 Overview

The goal of this project is to numerically simulate the classical and quantum mechanical case of the CHSH correlator, and analyze the physical significance of each result. We do this by examining two different scenarios denoted as Problem 3.1 and Problem 3.2 in the following sections. The solution to both of these problems point to the same conclusion: quantum mechanics contains no hidden local variables that can account for the measurment correlation between two entangled particles measured at a distance, in different lab setups. Consequently, we are forced to conclude that quantum mechanics is a fundementally non-local theory.

2 Problem 3.1

Problem 3.1 presents our beloved scientists, Alice and Bob, measuring the angular momentum of classical particles. They set up a micro explosion that sends two particles to opposite sides of the lab, Alice recieves a fragment with angular momentum J, while Bob recieves another fragment with angular momentum $-J$.

For each fragment, Alice will chose a direction α_i along which to measure her fragment. Bob will do the same, choosing an direction β_j. The final measurents for each measurement will be $\text{sign}[\alpha_i \cdot J]$ and $-\text{sign}[\beta_j \cdot J]$ respectively. For the first part of this problem, we calculate the CHSH correlator for the classical case of Alice and Bob's micro-exposion experiment.

For the second part of this problem, we assume that Alice and Bob are measuring a singlet state of spin-1/2 particles. We