Computational Physics HW9

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December 9, 2023

(a)When doing $v = B\phi$ calculation, notice that we have v as a complex vector, so when assigning v as zeros, remember to set dtype as csingle.

I tried solving $Av = x$ using given banded.py; however, it warns that there are invalid divisions which I guess have to do with the complex values. I decided to use built-in function np.linalg.solve instead.

Follow the steps to get the wavefunction of the next moment. Now, define the function with this whole process but replace ϕ_0 with any previous step wavefunction, we get the general function to generate wavefunction of the next step, naming it next_phi. We can run this function repeatively to generate $\phi(t)$. We define a function to calculate $\phi(t)$ with t as number of steps, so real time as $t * h$.

(b)I first made a matrix to record the wavefunction at each time step. Notice that when setting np.zeros of 1D and multi0dimentions, we need to give different dtype to have each elements to be of the same type. I don't really know why it is, but I get this conclusion after experimenting and checking the type of elements of the matrix.

(c)Make the animation of the wavefunction for 3000 time steps, I find that the wave is bouncing between the walls while the waveform becomes flatter and flatter.