Summary of Meetings

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The method used is the following, where ε is the time step:

$$e^{\frac{\varepsilon}{2}(\mathrm{A})} e^{\varepsilon \mathrm{B}} e^{\frac{\varepsilon}{2}(\mathrm{A})} = e^{\varepsilon(\mathrm{A}+\mathrm{B})} + \mathcal{O}\left(\varepsilon^3\right)$$

in the actual coding one useful thing to do is making the successive application of the exponential of A as one single operation. Like

$$\underbrace{e^{\frac{\varepsilon}{2}(\mathrm{A})}}\,\underbrace{e^{\varepsilon \mathrm{B}}}\,\underbrace{e^{\frac{\varepsilon}{2}(\mathrm{A})} e^{\frac{\varepsilon}{2}(\mathrm{A})}}_{e^{\varepsilon \mathrm{A}}}\,\underbrace{e^{\varepsilon \mathrm{B}}}\,\underbrace{e^{\frac{\varepsilon}{2}(\mathrm{A})} e^{\frac{\varepsilon}{2}(\mathrm{A})}}_{e^{\varepsilon \mathrm{A}}}\,\underbrace{e^{\varepsilon \mathrm{B}}}\,\underbrace{e^{\frac{\varepsilon}{2}(\mathrm{A})}}$$

While using the fft in two dimensions one should always remember to split space in every direction in 2^n parts to utilise the complexity advantage of the fft implementation.

The definition of the width is, in every direction:

$$\sigma_x = \sqrt{\left\langle (x - \langle x \rangle)^2 \right\rangle} \quad \text{with} \quad \langle f \rangle = \int_{\mathbb{R}^2} f |\psi| \mathrm{d}^2 x$$

The implementation, for the dimensions of the wave-function and the space matrix should be vectorial.

Then to check the code try the example 2.I .

Questions

- What is the error in the scheme for both the temporal and the spatial discretisation?
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