Developer :   Ashutosh Rana , Undergraduate, Indian Institute of Technology (BHU), Varanasi (ashutosh.rana.mst16@itbhu.ac.in)

Folder Name: ASHUTOSH_RANA_SIMULATOR (Large folder with everything that I worked on in this project)

Sub Folder : Programming   (All the files are here)

Development Environment : Python 3.7

User Guide (If the Program is running):

In any case animation is not working or paused or not responding please click on the [Freeze Image / Start Animation] Button.

- Edit user data (Geometrical Parameters and Materials Property) and click on [Show/Change] Button to visualize live dynamics of all the Hamiltonians.

- If materials property is not showing any effect then ask the developer to change animation type to mode 2 (Instructions below). Also user can do it easily too!

- In the central window animation is running with options to switch between different parts of hamiltonian.

- If user wants to get the crossection image at a particular point in animation.

    1. Click on the [Freeze Button] at that point of time and in the left panel user will see the plot at that instant.
    2. Now by sliding the plane in the cube find the positions where user wants to get image.
    3. On those positions click on the Z-axis button in menu button of that small window and then click on [Screenshot Button].

    4. After taking screenshots click on the [Superimpose] Button.

    5. Now user should be able to see the image in the bottom of the right panel.

- In the right panel, All the parts of the hamiltonians will be plotted to understand the

role of each part in the overall dynamics.

- Finally to process the experimanetal data, Click on the [Browse] button in the right panel. And then click on the [Process] Button

- To export video of the animation click on the [export video] button in the bottom of the central panel. Feel free to mention the duration of video.

- To change color of any part either ask developer or do it manually by going into the settings option of each plot.

All other buttons, edit fields, Labels are making sense by itself.

Thank you.

Developer Guide:

(To run this program in the same PC used by developer (Ashutosh Rana).

- Go to the programming folder and find the file named GUI_from_scratch.py

- Open this file in Spyder. (By right click or browse through spyder)

- Run this file in syder and a simulator window should appear.

If anything is wrong / export software to other machine / further development / change hamiltonians / bug_fixes / or others

- This program contains 7 modules. (1 main and 7 sub-modules)

    Main : GUI_from_scratch.py

    Imported user modules : GuiFromScratch_mayavi, Gui_animation,
                                        Gui_mayavi_leftPanel, Gui_image_leftPanel,
                                        Gui_img_processing_PyQt5, image_to_video

- Functioning of all:

    GuiFromScratch : Gui of whole simulator

    GuiFromScratch_mayavi : Gui for mayavi widget in the right panel

    Gui_animation : For animation in the central panel

Gui_mayavi_leftPanel : Mayavi widget in the left panel to visualize crossection

Gui_image_leftPanel : Take screenshot of crossection and superimpose algorithm

Gui_img_processing_PyQt5 : Image processing module to detect circles.

image_to_video : to export video in .mp4 format

- To change hamiltonian dig into the particular file and in the top of the file you will find the expression for hamiltonian, make changes there.

> **in the Gui_animation: comment the mode 1 and uncomment mode 2 to switch between expressions.**
> **mode1 does not have materials property while mode 2 have.**

- **Libraries to incule with their versions (be strict about versions)**

    Python 3.7

Library	Version	
PyQt5	5.9.2	
Mayavi	4.6.2	(os.environ['ETS_TOOLKIT'] = 'qt4' very important to run PyQt4 inside PyQt5)
pyface	6.0.0	
traits	5.1.1	
traitsui	6.1.1	
opencv (cv2)	4.1.0	
PIL	5.4.1	
skimage	0.14.2	
matplotlib	3.0.3	
scipy	1.2.1	