

ZENSE PROJECT

INTRODUCTION

A kaleidoscope is an optical instrument with two or more reflecting surfaces tilted to each other in an angle, so that one or more (parts of) objects on one end of the mirrors are seen as a regular symetrically pattern when viewed from the other end, due to repeated reflection. A kaleidoscope works by reflecting light taht bumps into a reflective surface such as a mirror. It has two or more mirrors placed at an angle to each other. The mirror assembly is surrounded by a case, with an eye hole at one end of the mirrors and a collection of objects at the other end.

IDEA

In this Project I have created a simple simulation of kaleidoscope. This is mainly used to create beautiful patterns.

TECHNOLOGY USED AND IMPLEMENTATION

I have used Mathplotlib and Python for this Project.

Initially I have created an object for this project. Around this object I have placed three mirrors in the form of a triangle. As all the 3 mirrors are of same size and are placed symmetrically the angle between them is 60 degrees. By using laws of reflection, I have calculated the positions of virtual objects for every mirror and have created images correspondingly.

Then I rotated the object with respect to the mirrors. Correspondingly the 3 images for each object started rotating.

If I move the position of any object, it's images also change their positions.

Also if I rotate one of the objects faster than the remaining objects, the corresponding images rotate faster.

I gave the cordinates of different objects initially. Then I have drawn the mirrors. I calculated the perpendicular distance of each and every object from the 3 mirrors using the methods 'dist1', 'dist2', 'dist3'. Then I calculated the distance of virtual images from each mirror for every

object. I have plotted them accordingly. Then I rotated my object keeping the mirrors stationary. As the coordinates of my image were related to the coordinates of my object my image also rotated in accordance with the laws of reflection.

As all my objects were circles it was just sufficient for me to find the images of the centre of the circles. The radius of the circles remain same even after reflection.

By making minor changes we can make them rotate in ellipses or whatever shape we like.

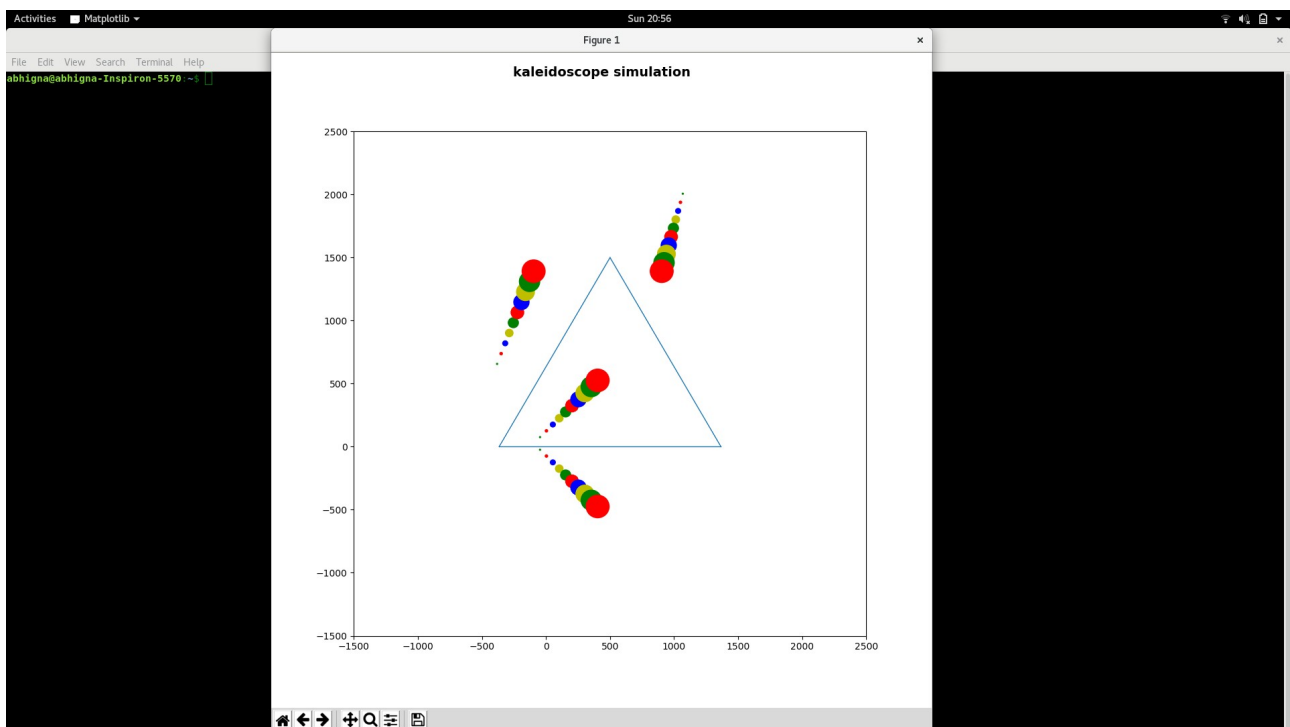
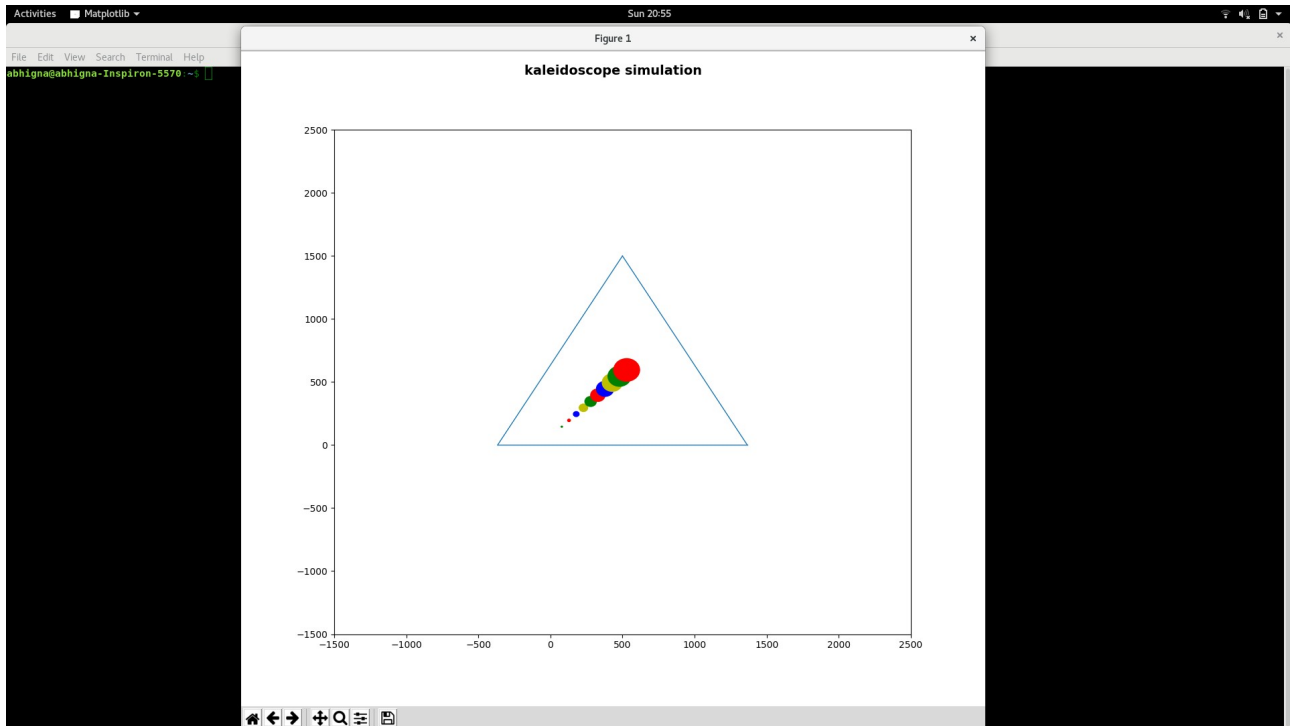
We can also controll the speed of each and every object.

The speed of the objects can be controlled by changing the variables in 'animate' method.

We can also change the orientation of rotation of object or objects just by interchanging the 'sine' and 'cosine; in the 'animate' method.

We can magnify or diminish the image size just my multiplying the radius with a multiplication factor for the object or objects that we want to.

IMAGES AND SCREENSHOTS



Watch the video in youtube: [Abhigna Banda kaleidoscope simulation](#)

FUTURE SCOPE OF MY PROJECT

The Project I have made can be improved a lot. I have used 3 mirrors and created 3 images. But these 3 images can be again reflected in these mirrors and we can get 3 more images. If we continue this process we can get many images. After getting sufficient number of images we can superimpose them in one plane to get a beautiful pattern.

Moreover we can use all kinds of geometric figures like squares, rectangles, ellipses, etc in this project to make it look better.

I have rotated my object to get moving images but instead we can rotate the mirror also.

By just making few changes we can control the rotation of object by which in turn we can control the rotation of image.

Instead of using 3 mirrors in form of a triangle we can use more than 3 mirrors to form regular polygons and use it as a kaleidoscope. The more the number of mirrors we use, the more number of images are formed, the better the pattern looks.

Also instead of rotating each and every object or mirror, I can rotate the plane itself keeping the mirrors stationary to get a pattern. In this case all my objects will be moving with the same speed.

We can make this act as a magnifying glass just by allowing it to go through one reflection and multiplying it with a multiplication factor.

EXPERIENCE

I have learnt a lot of new things from this Project. I have used matplotlib library for this Project. So I got an opportunity to learn this library. Apart from that, I brushed up my Python knowledge. I learnt about graphing and animation for this project. In fact first I thought of doing this Project in Unity 3D but it has many inbuilt functions and my work became too easy so I had done it using matplotlib. I have learnt many things because of this Project which otherwise I wouldn't have. I hope I can do these kind of Projects in future and learn more.

REFERENCES

Pyplot Tutorial(https://matplotlib.org/users/pyplot_tutorial.html)

<https://jakevdp.github.io/blog/2012/2018/matplotlib-animation-tutorials>