Embedding Animations in LaTeX

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In this document I will provide a simple tutorial for inserting animations into documents created using LaTeX.

In section 1 we will create a GIF file using the math computing software Maple. Section 2 will briefly detail how you can take a GIF file and convert it into a series of ordered images using the software https://imagemagick.org/. Finally in section 3 we will use the animate package to place our animation into a document.

If you already have an animation in the form of a GIF file you would like to use you can proceed to Section 2.

1 Creating an animation in MAPLE

In this section I will use Maple to create a short video. If you prefer a different software, use whatever method it requires to make a GIF file.

For this tutorial, we will animate the tangent line as we traverse the Lissajous curve parameterized by:

$$x = \sin(2t) \tag{1}$$
$$y = \cos(3t)$$

The tangent line at a point on this curve $(x(a), y(a))$ is parameterized by

$$x = 2\cos(2a)t + \sin(2a) \tag{2}$$
$$y = -3\sin(3a)t + \cos(3a)$$

Figures 1, and 2 show the Maple code used here. To create the animation I make a sequence of plots using the `seq` procedure in Maple and plot this sequence using the option `insequence`.

```
> x := sin(2*t):
  y := cos(3*t):
> view_window := [-1.5..1.5, -1.5..1.5]:

> Liss := plot([x,y,t=0..2*Pi],color=blue,view=view_window);
```

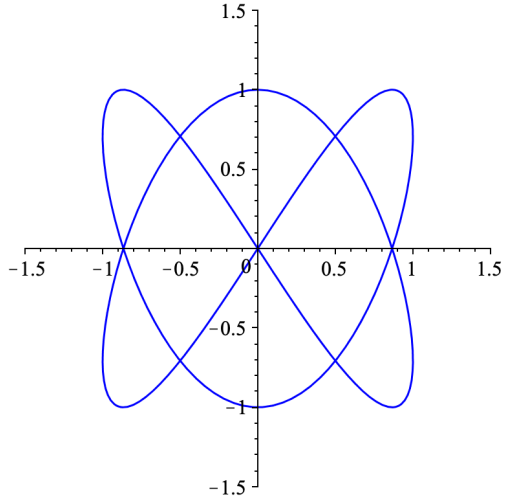

Figure 1: Maple code producing Lissajous curve.

```
>
> x_tan := a -> eval(diff(x,t),t=a)*t + eval(x,t=a):
  y_tan := a -> eval(diff(y,t),t=a)*t + eval(y,t=a):

> Liss_tan := a -> plot([x_tan(a),y_tan(a),t=-10..10],color=orange,view=view_window):
>
> animation := seq(plots[display](Liss_tan(2*Pi*a/100),Liss),a=0..100):

> plots[display](animation,insequence);
```

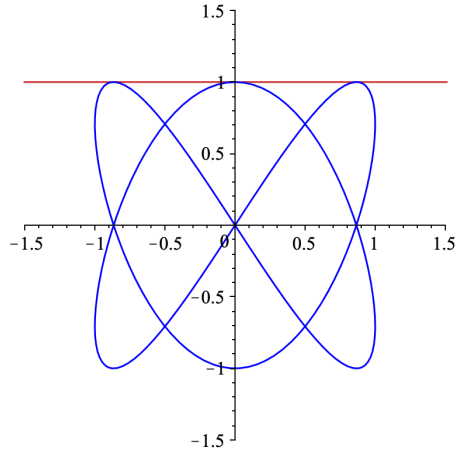

Figure 2: Maple code producing the animation of the tangent line traversing the Lissajous curve.

Clicking on the animation will show a toolbar (see Figure 3) that will let you play the animation and alter the frames per second. When the animation runs as desired you can export it by right-clicking on the animation and exporting as a GIF (see Figure 4). Create a folder called "animations" located in the same folder that your TEX file is in and save this GIF to the "animations" folder.

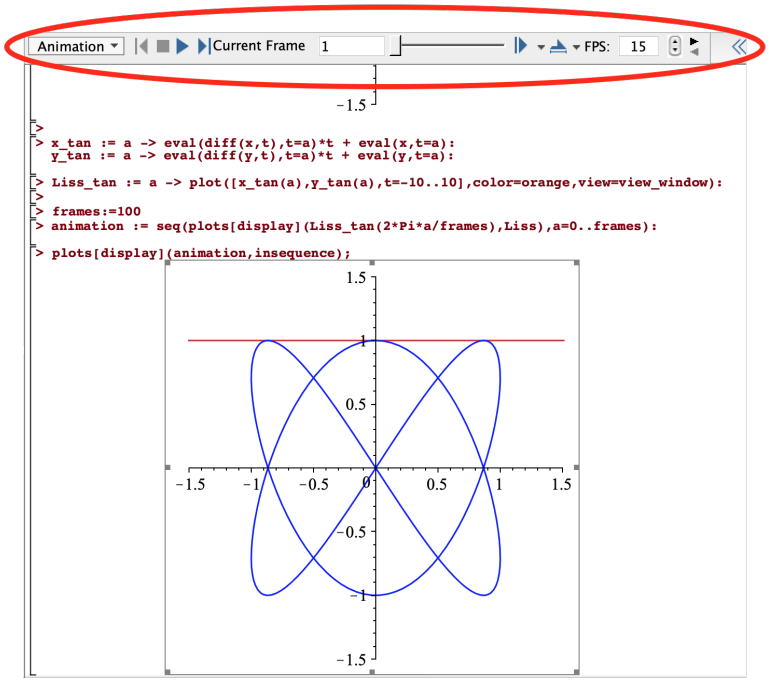

Figure 3: Clicking on the animation will display a toolbar near the top of the window.

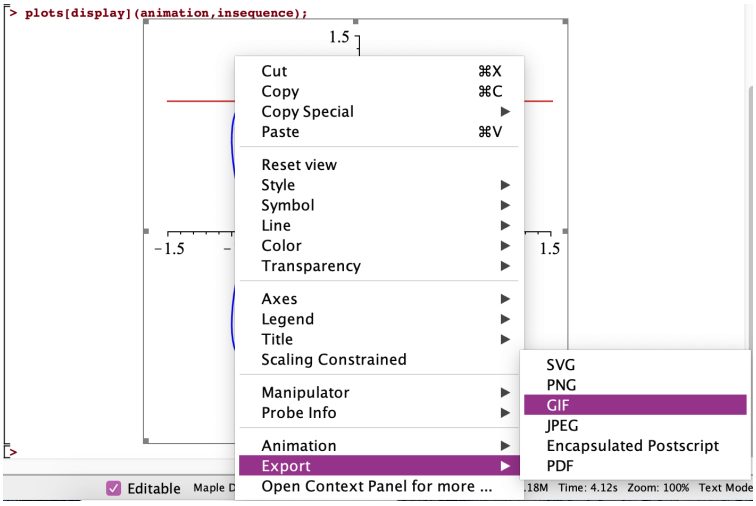

Figure 4: Export then animation from Maple by right clicking and selecting GIF.

If you want to include this animation on a website, you can just go ahead and use the GIF file you just exported. If you want to embed this into a document created with LaTeX continue to the next section.

2 Preparing GIF file for use in LaTeX

The LaTeX package used in this tutorial requires a sequence of figures and will not accept the GIF file as it is. In this section we will take the GIF file and convert it to a sequence of PNG files. There are likely many different ways to do this, but I will be using the software ImageMagick here.

If you do not already have it installed, you can download ImageMagick to your computer along with the command line tool here: `https://imagemagick.org/script/download.php`.

Using terminal or command prompt (depending on your operating system) navigate to the folder containing the GIF file and use the command:

```
convert -coalesce file_name.gif file_name.png
```

or

```
magick convert -coalesce file_name.gif file_name.png
```

this creates a sequence of PNG files with the names `file_name-#.png` where `#` denotes the frame from the original GIF file.

3 Embedding the animation

Here we will use the package `animate` to embed an animation. Make sure the `\usepackage{animate}` and required `\usepackage{graphicx}` lines are placed in your preamble. Using the command `\animategraphics[options]{frames_per_second}{file_name-}{0}{last_frame}` will place the animation in your document. The `\animategraphics` is similar to the command `\insertgraphics` and you may wish to put it into a figure environment.

The animation in Figure 5 is inserted using the following command:

```
\animategraphics[loop,autoplay,width=\linewidth]{15}{animations/Liss_tan-}{0}{100}
```

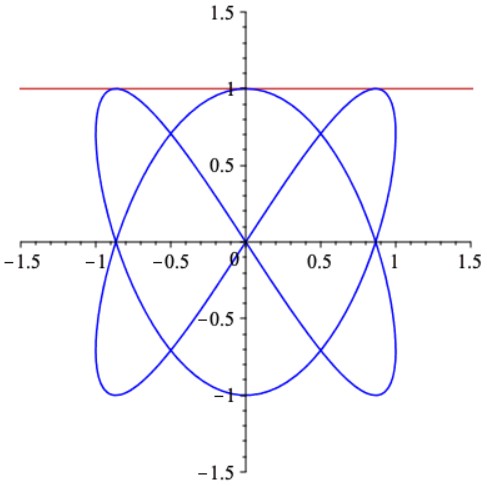

Figure 5: An inserted animation (note that it will only play if opened in Adobe Acrobat)

While this is a simple example, there are many useful options for the `animategraphics` command that can be found in the documentation linked below.

Useful links

I owe my knowledge of the `animate` package and how to use ImageMagick to convert a GIF appropriately to the TEX Stack Exchange user AlexG who provided this information to someone else looking to embed an animation using LATEX in the following post: `https://tex.stackexchange.com/a/240387`

You can find documentation of the `animate` package and many interesting examples of its use here: `https://ctan.org/pkg/animate?lang=en`

The link to download ImageMagick and documentation can be found here: `https://imagemagick.org/`