Using JavaScript© and Mathematica© to Create Animated Web Pages

Presented by

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ABSTRACT

The World Wide Web has significantly changed the landscape of graduate and undergraduate education. Student access to the Internet makes distance-learning modules a preferred method of instruction for some students and faculty. Mathematics is one discipline that has lagged behind this trend in education. The development of meaningful mathematical modules is critical to distributing mathematics education over the Web.

This talk will demonstrate Websites that have been successful in delivering a variety of mathematical topics from a typical undergraduate PreCalculus and Calculus course. These sites were developed using Mathematica©, MathType© and JavaScript©.

To preview a site created with these methods look at
http://www2norwich/frey/TaylorPolynomials/ .

Participants will be given instructions on how to get started on creating their own animated Web pages.

BIO

Cathy Frey has been teaching mathematics at Norwich University since 1985. Her areas of expertise are Actuarial Science and presenting mathematics over the World Wide Web. She has developed several web based instructional modules on a variety of topics covered in undergraduate Mathematics courses. At the Joint National Mathematical Meetings in New Orleans this past January, Cathy presented her *Taylor Polynomials Web Site* at the contributed paper session entitled "Projects and Classroom Demonstrations that Make a Difference." At the Association for Vermont Independent Colleges Faculty and Staff Retreat in November of 2000 Cathy led the workshop entitled "Current AVIC Examples of Web-based Instruction". She led a workshop entitled "Web Development Workshop" at the June 2001 meeting of the Northeast Section meeting of the Mathematical Association of America.   She will be the primary presenter for a 4 day Short Course "Integrating the Web Into Mathematics Instruction", for the Northeast Section of the Mathematical Association of America to be held at Plymouth State College, June 23 – 27, of 2002.

Introduction

I have had great success illustrating ideas difficult to grasp for many students using animated Web pages created using graphs from Mathematics©, equations from MathType© and some JavaScript. I have created pages for Precalculus as well as calculus students using these techniques. I have uses animated Web pages to illustrate modeling temperatures with trigonometric functions, the Unit Circle and the definition of Sine and Cosine, approximations using Taylor Polynomials, etc. Once you have learned the process of creating such pages the possibilities are endless. If you are familiar with Mathematica©, it is easy to translate a table of graphs to an animated gif file, or to a series of gif files that can be used to create an animated Web page. The advantages of the animated Web page are: being able to display the graph of the equation with each equation, having power to move one slide at a time, or display the animation and stop/start at any time, or to go directly to a particular slide. In my talk I will show several Web sites I have created using this method. Links to all of these sites can be found at:

<p align="center">http://www2.norwich.edu/frey/ictcm/</p>

If you are interested in creating animated Web pages using this process, all files you will need to get started can also be found on the same page listed above and instructions to create a sample page are listed below.   If you have any questions, problems or comments as you begin this process please feel free to contact me at frey@norwich.edu.

Step 1: Downloading the Files

From the url http://www2.norwich.edu/frey/ictcm/ download the Mathematica © notebook, Web_Development.nb, zip file containing equations and files necessary to create the demo site. You can also download additional copies of the instructions from this site.

Step 2: Unzipping the files

Use WinZip to unzip the file containing all equations, and JavaScript© pages, and the Mathematic© notebook used to create the sample page. If you do not have a copy of WinZip you can download a free trial version from the site
<p align="center">http://www.winzip.com</p>

Step 3: Generating the Graphs

1. Open Mathematica©.
2. Open the Web Development workbook.
1. On the File menu, choose open.
3. Execute each cell in the notebook in sequence.

The first cell generates a table of graphs; the second exports the table as an animated gif file.

First we must create a table of graphs..

```
In[44]:= y =
    Table[Plot[Cos[n θ], {θ, 0, 2 π},
      Ticks → {{0, Pi / 4, Pi / 2, 3 Pi / 4, Pi, 5 Pi / 4, 3 Pi / 2, 7 Pi / 4, 2 Pi}, {-1, 1}},
      ImageSize → {300, 300}, PlotStyle → RGBColor[1, 0, .5]], {n, 1, 6}];
```

Next we export the table as an animated gif file...

```
In[46]:= Export["AnimCos.gif", y, ConversionOptions → {"AnimationDisplayTime" → 1, "Loop" → True}];
```

You can insert this animated gif in any Web page, using your favorite Web editor.

The next three cells create individual gif files for each of the graphs; we will use these graphs as slides in our animated Web page.

```
In[53]:=
    Clear[filename];
    filename[k_] := "c:\MAA\ExamplePage\Image" <> ToString[k] <> ".gif"
In[55]:= Clear[filewriter];
    filewriter[t_] := (Display[filename[t], #, "GIF"]; #) &
```

Next we create the same table of graphs, but change DisplayFunction to Filewriter, which exports each individual graph to a gif file.

```
In[57]:= Table[Plot[Cos[n θ], {θ, 0, 2 π},
    Ticks → {{0, Pi / 4, Pi / 2, 3 Pi / 4, Pi, 5 Pi / 4, 3 Pi / 2, 7 Pi / 4, 2 Pi}, {-1, 1}},
    ImageSize → {300, 300}, PlotStyle → RGBColor[1, 0, .5],
    DisplayFunction → filewriter[IntegerPart[n]]], {n, 1, 6}];
```

Step 4: Generating the Equations & Explanation file

MathType© was used to generate all equations, MathType© allows us to export equations as Gif files, and these files can then be used in our web page. All equations generated for the sample page are in the Example page folder. The files used are p0.gif, p1.gif, p2.gif, p3.gif, p4.gif, p5.gif, and p6.gif.

Step 5: Editing the Web page to accommodate your Graphs and Equations

1. Open Microsoft FrontPage©.
2. On the File menu, choose open.
3. Locate the ExamplePage folder.
4. Double-click on the index file.
   Notice three tabs at the bottom of the screen, labeled Normal, HTML, and Preview. We will use all three of these views.

6. We modify the header of the page. In the Normal View, use your mouse to highlight **Put your title here**.
7. Click on the Insert menu, click on Picture and From File.
8. In the Look in drop down list, select your hard disk.
   The names of all folders and files on your hard disk are displayed in the Open Dialog box.
9. Locate the ExamplePage folder, double-click on the ExamplePage folder.
10. Double-click on the p0, to insert the equation into your spreadsheet.
11. Click the HTML tab, and click on line 30 (`var n = 13`), change the 13 to 6 since we only have 6 graphs and equations.

```
//*********************************************************************************
// You will need to update the figures here to the # of graphs and equations in your animation
//change n from 13 to the appropriate value for your animation
//*********************************************************************************
var n = 13
var Grafs=new Array(n)
var Eqns=new Array(n)
```

If you need to adjust the height and width of your graphs and equations, make these changes on lines 150 and 156 respectively. We do not need to adjust these values.

```
<!--****************************************************************************-->
<!--If you choose a different size graph, you'll need to adjust the width and height below-->
<!--****************************************************************************-->

  <p align="center"><img src="ExamplePage/image1.gif" name="photoslider" alt=" " width="300" height="300">

<!--****************************************************************************-->
<!--If you choose a different size equation, you'll need to adjust the width and height below-->
<!--****************************************************************************-->

<td height="50%"><img width="165" height="45" name="description" src="ExamplePage/p1.gif" alt=" "></td>
/tr>
able>
```

12. Since we only have 6 graphs, we will delete Options 7 through 13. (You can also add options, if you have more than 13 graphs.) Delete lines 177 through 183.

```
            <option value="image7.gif">Option 7 Text</option>
            <option value="image8.gif">Option 8 Text</option>
            <option value="image9.gif">Option 9 Text</option>
            <option value="image10.gif">Option 10 Text</option>
            <option value="image11.gif">Option 11 Text</option>
            <option value="image12.gif">Option 12 Text</option>
            <option value="image13.gif">Option 13 Text</option>
```

13. On line 171 change Option 1 Text to Cos[x].
14. On line 172 change Option 2 Text to Cos[2x].
15. On line 173 change Option 3 Text to Cos[3x].
16. On line 174 change Option 4 Text to Cos[4x].
17. On line 175 change Option 5 Text to Cos[5x].
18. On line 176 change Option 6 Text to Cos[6x]. After the above modifications, your options should look like the following:

```
            <option value="image1.gif" -moz-option-selected="">Cos[x]</option>
      <option value="image2.gif">Cos[2x]</option>
      <option value="image3.gif">Cos[3x]</option>
      <option value="image4.gif">Cos[4x]</option>
      <option value="image5.gif">Cos[5x]</option>
      <option value="image6.gif">Cos[6x]</option>
      </select></center>
```

19. Use Save As, to save the file under a new name.
20. Click on the Preview Tab to preview your Web creation. Congratulations, you have just created your first Interactive Mathematical Web Page Animated with JavaScript! Experiment with your new page. If you have any difficulties with your

page, there is a file in the ExamplePage folder called SamplePage.htm, your file should be identical to this one after following above steps.

The Graph of $f(x) = \cos(n\theta)$

$f(x) = \cos(n\theta), n = 1$

Cos[x]

|<< << Movie >> >>| Explain Reload
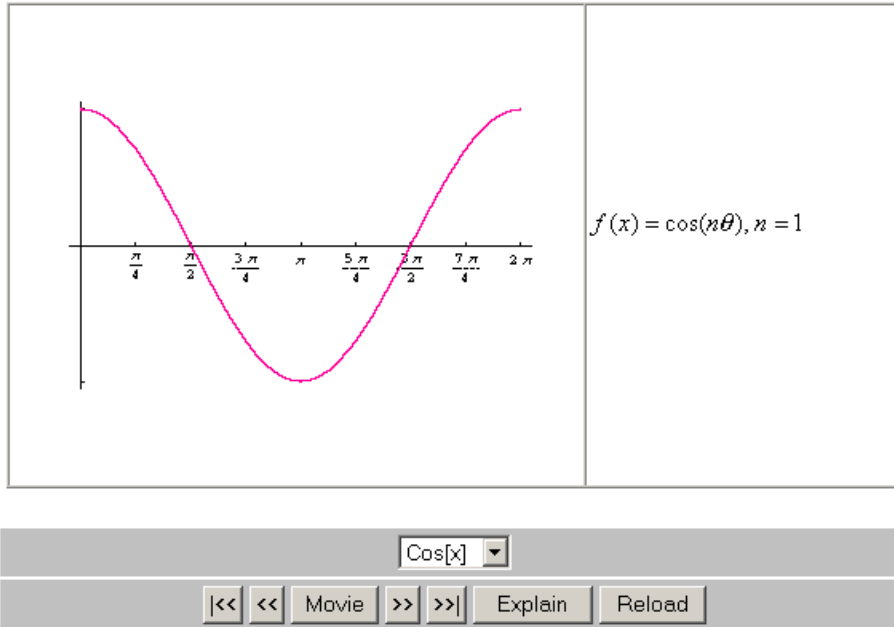
If you have any problems or questions, please feel free to contact me at: