

## Lecture 40: Creating Simulations for Time Dependent Problems

- Some Basic Commands

- *getframe* returns a movie frame. The frame is a snapshot of the current axes or figure.
- *movie* plays the movie defined by a matrix whose columns are movie frames (usually produced by *getframe*).
  - *movie(M)* plays the movie in matrix *M* once.
  - *movie(M,n)* plays the movie *n* times. If *n* is negative, each cycle is shown forward then backward.
  - *movie(M,n,fps)* plays the movie at *fps* frames per second. The default is 12 frames per second.
  - The movie function displays each frame as it loads the data into memory, and then plays the movie. This eliminates long delays with a blank screen when you load a memory-intensive movie. The movie's load cycle is not considered one of the movie repetitions.

- Creating a Movie for  $\sin(x)\sin(t)$

- A Basic Program

```
function M=movie_demo;
clf;
t=linspace(0,2*pi,100);
x=linspace(0,2*pi,100);
% Record the movie
for j = 1:length(t)
    y=sin(x).*sin(t(j));
    plot(x,y);
    title('Movie');
    M(j) = getframe; % 'snaps' a picture (i.e. sets the frame)
end
% Play the movie twenty times
movie(M,20,25)
```

- But we end up with an access problem.
- We can overcome this problem by writing an extra loop to determine min/max *y* values.

```
% This is an extra loop that will determine the minimum and maximum of y.
% I wish to use these values to set the limits of the axis when recording
% the movie.
YMAX=[];YMIN=[];
for j = 1:length(t)
    y=sin(x).*sin(t(j));
    YMAX=[YMAX,max(y)]; %build a vector of max y values during each pass
    YMIN=[YMIN,min(y)]; %build a vector of min y values during each pass
end
ymax=max(YMAX); %finds the maximum of the YMAX values
```

- Then insert this command in the movie loop.

```
ymin=min(YMIN); %finds the minimum of the YMIN values
```

- Run Movie.

### **Homework 40**

1. Write a function  $S\_Wave(a,c)$  that will create a movie of the function  $\sin(ax)\sin(ct)$ . What is the effect of increasing  $a$ ? increasing  $c$ ?
2. Write a function  $T\_Wave(a,c)$  that will create a movie of the function  $\sin(ax+ct)$ . What is the effect of increasing  $a$ ? increasing  $c$ ?
3. Demonstrate the animations to me in class.

