Creating a video from your program

If you are writing OpenGL programs using Qt (C++) or Java (JOGL), you can create a video from the animation that your program is showing. This is a simple two-step process:

1. Take a screen capture during every frame and save it as a PNG file.
2. Combining all the screen captures into a video.

Taking a screen capture from your program

Please look at the `ScreenCapture` example on Blackboard to see how to do this.

Java users (JOGL):

1. The `View` class contains a method called `captureFrame`. This method can be called any time to capture the frame buffer and save it into a file.
2. The `JOGLFrame` class's display method calls `view.captureFrame(…)` and passes it a file name. This also makes sure that the frames are stored as "numbered stills", i.e. with names "image001.png", "image002.png", "image003.png", etc. This put the frames in the correct order and makes exporting to a video easy.

C++ users (Qt):

1. The `OpenGLWindow` class contains a method called `captureFrame`. This method can be called any time to capture the frame buffer and save it to a file.
2. The `OpenGLWindow` class's `paintGL` function calls `captureFrame(…)` and passes it a file name. This also makes sure that the frames are stored as "numbered stills", i.e. with names "image001.png", "image002.png", "image003.png", etc. This put the frames in the correct order and makes exporting to a video easy.

Exporting numbered stills to video

1. Download the free program `ffmpeg`. This is a well-known open-source program, so you can trust it.
   You may find it here: https://www.ffmpeg.org/. Look for your platform.
2. Open a command-prompt/terminal. Verify that `ffmpeg` works.
   a. On windows, you can do this by simply double-clicking on the "ff-prompt" batch file that is included in the ffmpeg download.
   b. On Macs, download the dmg file and put it in a folder.
      i. If you know how to, add the ffmpeg executable to your PATH, so that you can run it from anywhere.
      ii. If you do not know how to, move the numbered stills to the same folder as ffmpeg, so that the next step works.
3. Navigate to the folder that contains your numbered stills (for step b(ii) above, this will be the same folder as the ffmpeg executable).
4. Type
   ```
   ffmpeg -i image%03d.png -codec mpeg4 -vb 30M out.mp4
   ```

   This command looks for numbered stills "image001.png", "image002.png", etc. in the current folder, and uses the mpeg4 encoder to export a video named "out.mp4".
5. You may also try
   ```
   ffmpeg -i image%03d.png -c:v libx264 -s 484x460 -vb 30M -pix_fmt yuv420p out.mp4
   ```

This command makes a video of size 484x460 that can be embedded directly using HTML5's "video" tag.