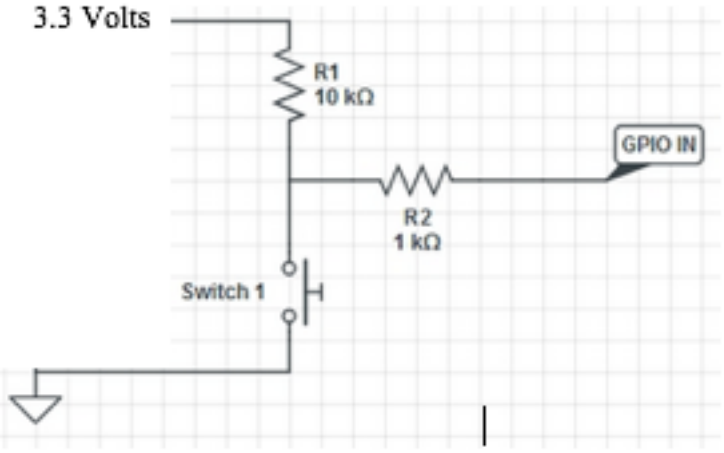
Homework 2

1. What is the difference between a Linux pipe and a FIFO (or a named pipe)? What can you do with a FIFO (named pipe) that you cannot do with a pipe?
2. In Lab1, we used the guide "Using a fifo with mplayer" currently linked in the 'Guides' section of canvas. This guide is based on a link noted at the end of the document. The link, https://milesalan.com/notes/mplayers-fifo/, also describes the use of a fifo with mplayer however it has one very confusing aspect. What is the source of the confusion that makes this guide a bit challenging to understand?
3. List all the pins on the R-PI GPIO connector used by the piTFT screen. Explain what each pin is used for by the piTFT.
4. For the R-Pi 3, Model B, list all possible GPIO pins that may be used for projects and labs. Identify the maximum set (when not using any special functions). Also, list the minimum set, when special functions (and the Adafruit 2.8 inch piTFT) are used.
5. In Lab1, a shell script named "start_video" was created to run mplayer and video_control.py by using a single command. What is the correct ordering of operations within this script in order to this shell script to terminate correctly? Comment on the order of the calls within the script as well as which operation should run in the foreground and which should run in the background. Hint: Correct shell script operation should return to a command prompt (the $ in a command window) if everything completed in the correct order.
6. If you run the date command on the ECE5725 server, the date and time are accurate. The RPi does not have a battery-backed real-time clock so how does the RPi maintain accurate time? When would it be appropriate to add an external, battery-backed real-time clock to the RPi?

7. For the following RPi GPIO circuit, describe why R2 is necessary in the figure:



   Describe a possible 'software situation' that would damage the GPIO without R2. How does R2 prevent the problem? Why is the value of 1k ohm selected for R2?

8. Describe pygame screen elements including a surface and a rect. How are these used to animate an image? How would they be used to establish a touch screen button? Draw a step by step diagram illustrating the process of animating 2 frames of an animation on the PiTFT.

9. Lab 2 involves a GUI for starting and stopping an on-screen animation. Develop a graphic 'storyboard' of how the control panel and the various screen menus will appear; these will be drawings or sketches of the control and display menus. Also, create a logical flow (for example, state machine diagram or pseudo code) that describe the design of the controls for the GUI which will control the animation. This logical flow should describe how the code will move through the various menu functions.

10. In Lab1 and Lab2, you use a python code video_control.py, for example, to respond to buttons connected to the RPi GPIO pins. video_control.py passes these events to an instance of mplayer, controlling the video under playback. The two processes communicate using video_fifo. mplayer and video_control.py are launched from the bash script, start_video.

    Describe what would happen if start_video is run WITHOUT first creating the fifo video_fifo. In this special case, if you press a button, what it the response of video_control.py? What is the response of mplayer? Will video_fifo be correctly created? Will control of mplayer be correct?