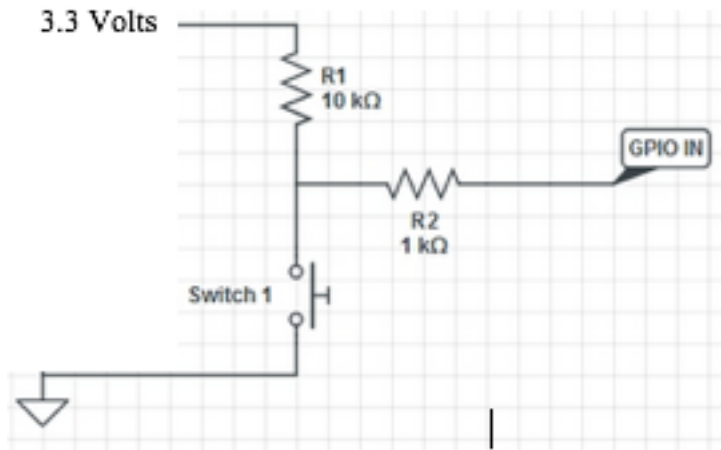


## Homework 2

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 blackboard. 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, related to naming of elements in the example. 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 4, 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 all 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. 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 is the response of `video_control.py`? What is the response of `mplayer`? Will `video_fifo` be correctly created? Will control of `mplayer` be correct?

9. While using the PiTFT buttons to control video, you may have encountered a problem with some of the buttons. It might appear that you had several ‘hits’ of the buttons when you pressed the button only once. There are several causes for this issue; what is one problem that could cause this issue? (hint: there are at least three possibilities observed by teams in the lab).
10. Describe pygame screen elements including a surface and a rect. How are these used to animate an image? Draw a step-by-step diagram illustrating the process you would use in PyGame to animate 2 frames of on the PiTFT.