Motorized Camera Slider for Time Lapses

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Abstract:

This project will involve making a camera slider with motors added to it to slowly move a camera as it takes a time lapse. Everything will be controlled by a Raspberry Pi including the movement of the motors as well as all of the different functions of the camera such as time between shots, shutter speed, ISO, etc. There is already software built for Linux that will interface with most cameras using shell commands. The challenges will be building the motorized slider, creating the software that would control the motors and the camera, and coming up with a way to interface with the Raspberry Pi even in remote locations away from power sources and internet. A motorized camera slider makes for an overall better, more dynamic time lapse; especially when it comes to things like astrophotography.

Results:

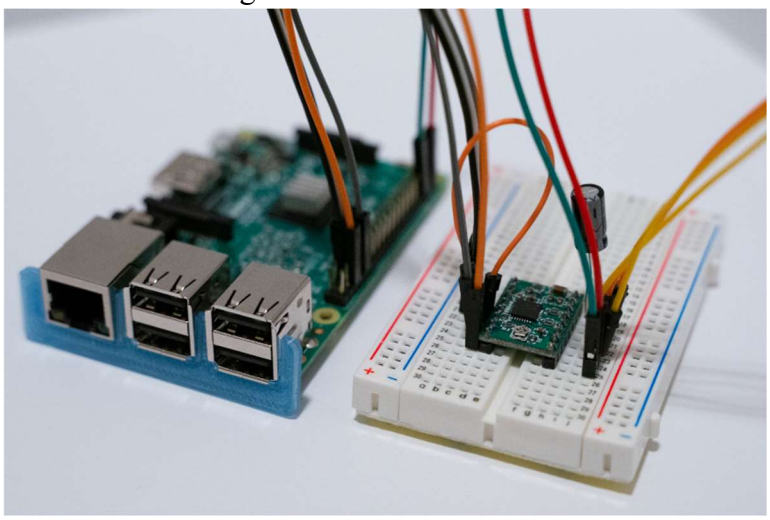
As mentioned in the hardware section below, I used a linear rail with 3-D printed parts on each end to hold the stepper motor and pulleys that would be used to run the slider. I chose a stepper motor because they are very precise, and it is easy to control their exact movements. The pulley on the stepper motor is connected to a timing belt, which is connected to a plate with wheels that rolls along the linear rail. On the plate I have a mount that works for most cameras that have a 1/4 inch mounting screw hole.

I have a Raspberry Pi that controls when the camera moves as well as when it takes a picture. I wanted these controls to be in one central location otherwise you might get a blurry photo if the slider is moving and while at the same time taking a picture.

Possible future additions include a printed circuit board to eliminate most of the wires, a second stepper motor that would allow the camera to rotate, and an app with the ability to control the slider's settings through Bluetooth.

Hardware:

- Raspberry Pi 3 B+ - used to control the stepper motor and to tell the camera when to take pictures.
- BIQU A4988 Stepper Motor Driver - used to translate pulses from the Raspberry Pi into signals that drive the stepper motor.
- Nema 17 Stepper Motor - connected to the timing belt, which is connected to plate on which the camera sits. This moves the camera along the track.
- 1.5 Meter V-Slot Linear Rail – Used as the main frame of the camera slider.
- 6mm Wide Timing Belt - driven by the stepper motor and connected to the gantry plate



- BIQU Gantry Plate - plate that hold the camera mount
- Andoer Tripod Head - used to mount my DSLR camera
- Various 3D Printed Parts - mounts on each end of the linear rail, parts to connect tripods

to linear rail, and various tools used to put the slider together.

Code:

When the python script that controls the slider is run, the user is asked a series of questions to learn the settings for that particular time lapse. The software then checks if the camera is on/connected and also gets the camera's shutter speed. Some calculations are then made and the time lapse is run according to the user's specifications.

I made sure to add lots of error checking in the code such as making sure user gives the correct input and, as mentioned above, making sure the camera is actually on. I would definitely like to add more in the future such as making sure the settings aren't beyond the speed/distance limits of the slider as well as checking the memory left on the camera's SD card and the camera's battery level.

The current code can be found at: https://github.com/smadeux/Camera-Slider

Video:

The video I made about the camera slider can be found at: https://youtu.be/wuSsToc3es8