



# Gopher Tortoise Scope



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## Background

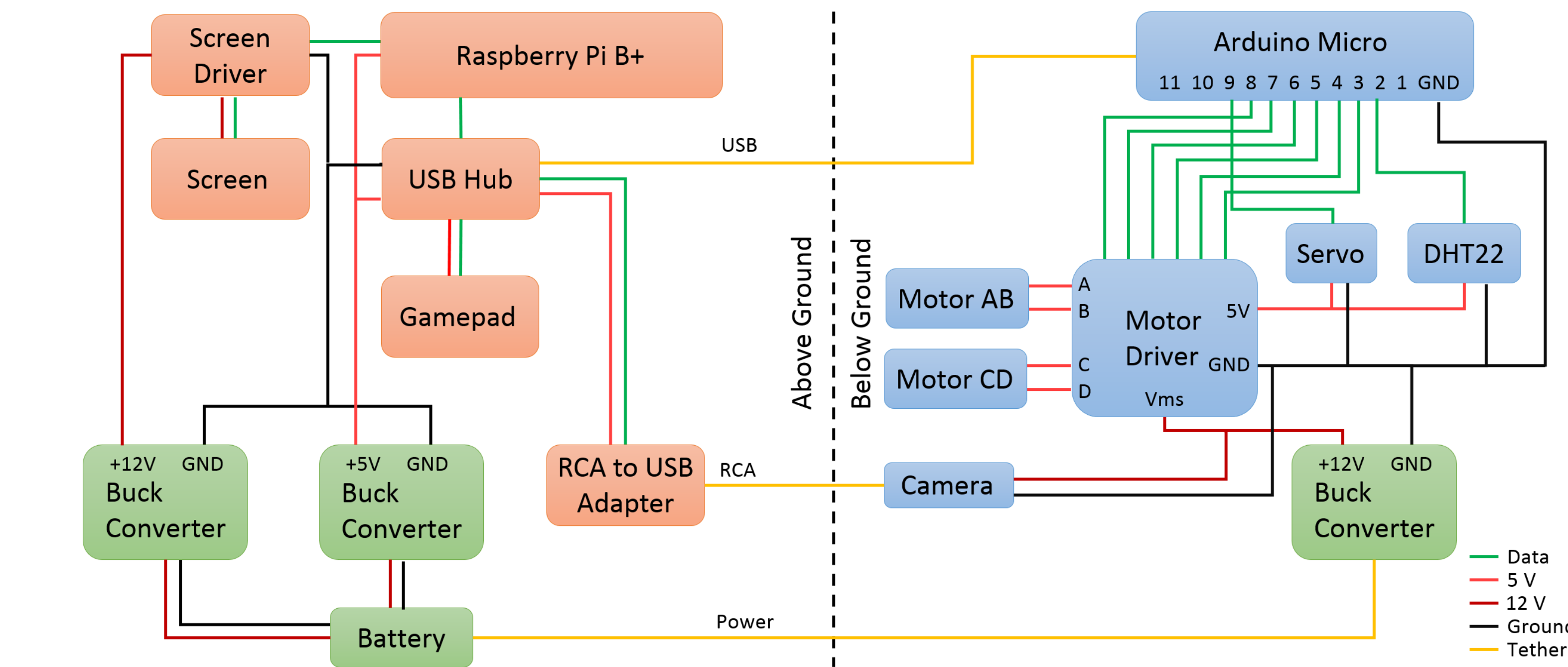
Tall Timbers is a research station that studies the Gopher Tortoise. To find these tortoises, researchers must be able to see inside their burrows, which can reach up to 50 feet in length. Our goal is to enhance the surveying process by designing an affordable and capable scope.

## Specifications

- Infrared camera transmits a live-feed of the burrow
- Sensors to measure temperature and humidity
- Gamepad control allows user to drive a treaded rover
- User interface with screen and software capable of storing video and images
- Battery life of eight hours
- Scope can be replicated for less than \$1000



Gamepad button mapping.



A schematic illustrating how the major components of the scope will fit together.

## User Interface

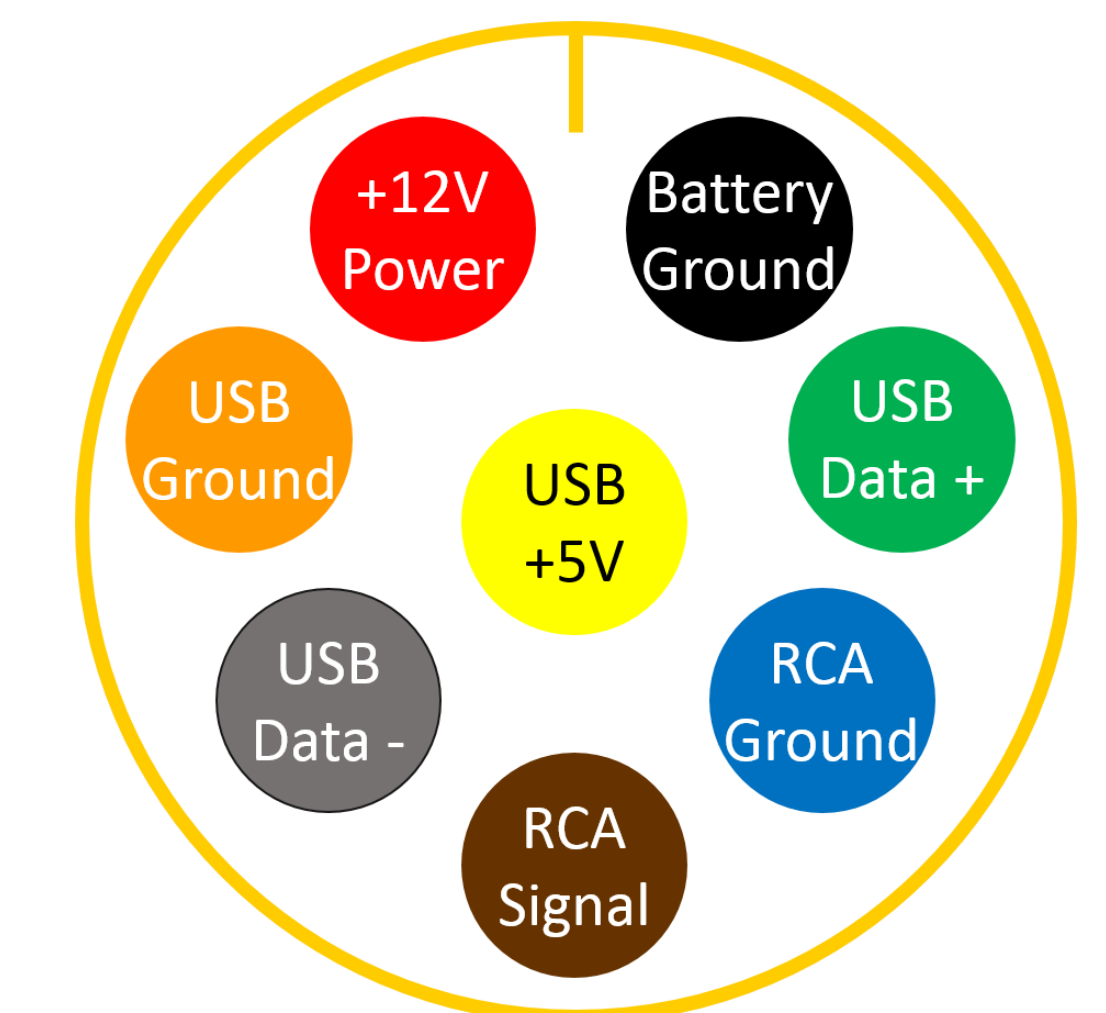
- Raspberry Pi B+ communicates with the Arduino over USB and receives video over RCA
- C++ code interprets button pushes on the gamepad, displays video and stores data
- Gamepad allows user to control the rover motion, access video recording functions, pan the camera and shut down the system
- 7 inch LCD screen displays video feed overlaid with temperature and humidity data
- 32 GB micro SD card has enough storage for 5 hours of video and 2,000 pictures
- Colin Riley: Gamepad programming, Sina Sharifi-raini: Video display and storage, Jane Bartley: Splash-proof enclosure

## Rover

- Arduino Micro reads commands sent from the User Interface (UI) over USB
- C code on the microcontroller interprets user commands and controls rover motion, camera panning and data acquisition
- L298N motor driver controls 2 gearmotors
- DHT22 refreshes every 2 sec. providing temperature data from -45°C to 125°C with ±0.2°C accuracy and relative humidity data from 0% to 100% with ±2% accuracy.
- Wide-angle, infrared camera with built in infrared LEDs sends video to UI
- Colin Riley: Microcontroller programming, Sina Sharifi-raini: Hardware selection, Lester Nandati: panning mechanism

## Tether & Power

- 50 ft. tether contains a coaxial RCA cable for video, a shielded active USB cable for communications and a 10 AWG cable for power.
- An eight-pin waterproof connector is spliced to each end for increased portability.
- Testing found a less than 2% power loss along the length of the tether and insignificant noise
- 12V, 14Ah Lithium-ion battery provides enough power for 5 hours of continuous operation; more than enough for an 8 hour day of scoping
- Battery has an operating range of 13.4V to 11V; voltage is regulated by buck-boost converters
- Battery is rechargeable and has an 800 cycle life expectancy



A cross-section of the 50 ft. tether.