

~KSU AUV Ultrasonic sensor to Brush Motor Tutorial~

Materials: You will need...

- Arduino Uno Computer Chip w/ usb cord (\$20 - \$25)
- Brushless motor (\$12 - \$22)
- ESC Chip (\$5 - \$25)
 - *some chips come pre-attached to brushless motors
- Sensor Breadboard (\$5 - \$20)
 - *most breadboards are sold with wiring and other electronics
- Ultrasonic Distance Sensor for Arduino (\$0.99 - \$5)
- Circuit wires (>\$3)
- Lithium Ion Battery (\$5 - \$20)

Many of the items above can be found in starter kits for arduino for around \$20 online.

Connecting the Sensor to the Arduino:

1. Place the Ultrasonic sensor in the breadboard facing the longest side; the sensor has four small prongs that should slide into the slots in the board. Notice the labels on the front of the sensor.
2. Attach four wires to slots in the breadboard directly behind the prongs of the sensor; the breadboard is designed so that wires connected to slots on the same row (30,32,31,40, etc) will connect. This is the same effect as taping the wires to the sensor prongs, but is easier to manage and take apart.
3. Go to github.com and search for 'ksuauv_makerfaire_2017' and look at the code for the Arduino and pay attention to the comments out to the side (the messages behind the "//" symbols). The code is meant to convert the output coming from the sensor and calculate that to what the ESC will tell the motor to spin at.
4. Attach the wire coming from the 'trig' prong to D9 port on the Arduino (the black strip with holes closest to the word 'digital'). Attach the 'echo' prong wire to D10, then the UCC prong wire to the 5V port (the black strip on the other side of the chip labeled 'Power'), and the GND prong wire to the GND port on the Digital side (the same side at D9 and D10). This will all connect the sensor signal to the arduino.

Connecting the ESC to the Arduino:

1. The ESC has three sets of wires; two big wires for the battery, a bundle of three wires for the Arduino, and three larger wires for the motor. Connect the brushless motor's three wires to the three output wires, which should be on the opposite side of the battery and arduino wires.
2. The bundle of three wires should have a BEC Output wire (usually red), a negative wire (black/brown) and a Signal wire (yellow/white). Connect a wire from the negative wire to the GND port (the 'Power' side) and connect another wire from the signal wire to port D8.

Setting everything up:

If you haven't already, download 'Arduino Web Editor' from the Arduino website and use our arduino code in the webeditor. From there, upload the code from the computer to the chip via the usb-arduino cord. If it won't upload, check the 'Tools' tab and click 'port' and select 'Arduino Uno' to ensure the code uploads to the chip. Connect the battery to the ESC and listen out for a cheerful beeping sound from the ESC which lets us know that the ESC is connected and ready. Keep the USB connected to the Arduino to power the chip, and try it out by waving your hand at different distances from the sensor. Be sure to keep a tight grip on the motor as it spins so it won't fly out of your hand!