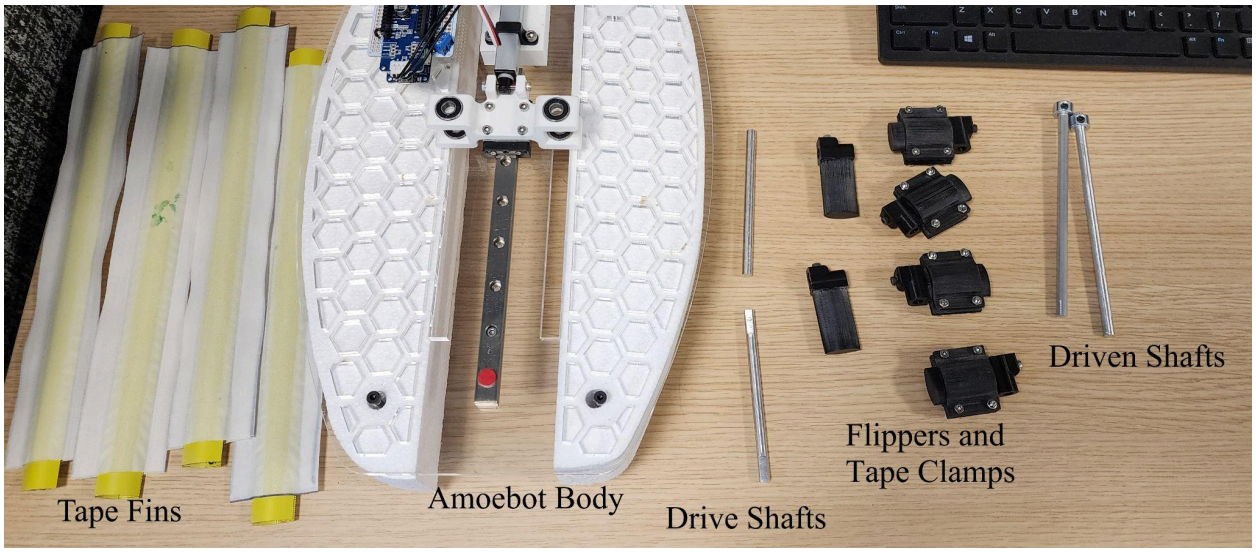
Minibot Components:



Contents of package I sent:
4 tape fins
Amoebot body with circuit board, motors, and floats
2 short drive shafts with filed flat sections
6 Flippers
4 sets of tape clamps
2 longer driven shafts with shaft collar

Assembly Instructions:

1) Attach Shafts
2) Put flippers on shafts
3) Attach tapes to flippers with clamps
4) Connect power supplies

Power supply

The small amoeba needs two supplies of power; a power supply for the microcontroller, and a 12V power supply for the motors and linear actuator.

1) Microcontroller Power

The microcontroller can be powered in a couple different ways; usb power, supplying 5-7V to the power in pins, or a battery.

1a) Usb Power

Generally the easiest, just connect a usb cable from a pc to the connection on the Arduino board. Good for troubleshooting.

1b) Power In

If you have a ~6V battery you can use it to power the arduino through the power in pins on the arduino. Pinout and datasheet for arduino can be found at site linked in references

1c) Direct Battery Connection

There is a direct battery attachment for the MKR so that you can connect a single cell lipo battery to drive the arduino. Uses a JST PH connector. The MKR can charge the battery through a usb connection. Pretty convenient when it works.

WARNING: Make sure that the power direction of the battery matches the polarity shown on the arduino pinout. I had to swap the connections on the small batteries I ordered for previous projects as the positive and negative of the battery connections were opposite those the arduino wanted. If the battery is connected wrong, the arduino will start to heat up rapidly when the battery is attached and the arduino is connected to usb power. This is not fatal to the MKR over a short period, but is probably not good for an extended time and is definitely a sign that the battery is connected backwards.

2) Motor and Actuator Power

The Dynamixel motors run off a 6-12V power supply. Recommended 11.1V (3 cell LiPo battery). This is also regulated down to 6V to drive the linear actuator. Connect power supply / battery to the screw terminal on the circuit board. Red rail is positive, blue is ground.

Motor information:

Type: Dynamixel xl430-w250-t, e-manual link in reference page.
Has position control enabled within 1 revolution with a resolution of 4096 count/rotation (0-4095)
Communication commands can be found at the MKR shield link on the reference page
Electronically limited to stay within upper and lower bounds, can be changed
Motors should be labeled, if not can check which is which by blinking the LED
I just eyeballed the 90 degree measurement, so it's close but you may want to refine the number a bit more for more detailed control patterns.

Motor 1:

- 90 degrees at ~2550
- Decreasing count sweeps towards the back of the bot
- Upper limit: 3000
- Lower limit: 1700

Motor 2:

- 90 degrees at ~1450
- Increasing count sweeps towards the back of the bot
- Upper limit: 2400
- Lower limit: 1000

Linear Actuator:

Model L12-100-50-6-R
Pretty slow, but has enough range to get the job done. Is controlled by an rc servo signal of changing pulse time. Can be commanded through arduino with use of servo library. Linear actuator datasheet and Library link in references.

Has three wires, white, red, and black. If actuator comes unplugged from circuit board, replace it on the pins so that the black and red wires line up. The white wire should connect to the green wire from the arduino.

I do not remember what pin I put the linear actuator on. I think it was A4 as in the code below, but you may want to double check that one.

1ms pulse fully retracted
2ms pulse fully extended

Example Linear Actuator Code:

```
#include <Servo.h>

Servo LA; //Servo pin name
#define pin A4 //Define arduino pin to use for communication



void setup() {
  // put your setup code here, to run once:
LA.attach(pin); //Attach the servo object LA to pin number “pin”
Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  LA.writeMicroseconds(1000); //write servo time in ms
  Serial.println("Low");
  delay(5000);
```

```
  LA.writeMicroseconds(2000);
  Serial.println("High");
  delay(5000);
}
```

References

MKR Pinout / documentation: https://docs.arduino.cc/hardware/mkr-wifi-1010

Dynamixel References
XL430-W250T Motor: https://emanual.robotis.com/docs/en/dxl/x/xl430-w250/
Dynamixel MKR shield: https://emanual.robotis.com/docs/en/parts/interface/mkr_shield/

Linear Actuator Datasheet, Model L12-100-50-6-R
https://www.actuonix.com/assets/images/datasheets/ActuonixL12Datasheet.pdf

Arduino Servo Library:
https://www.arduino.cc/reference/en/libraries/servo/