Parametric 3 axis manipulator with tiltable electrode holder and optional servo mounts*

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*inspired by the Backyard Brains „Searcher“ Model by Tim Marzullo
(https://backyardbrains.com/products/micromanipulator)

The main difference between this model and the original (aside from minor modifications)
1) The presence of a real z axis (the Searcher z axis is slanted 45 degrees)
2) Option to add continuous rotation micro-servo motors
3) Implementation in OpenSCAD for easy modification / customizer compatibility

printed on Vellemann K8200
PLA; z = 0.35 mm; no supports
Overview of printed parts

- **Base**
  - X axis (Module A)
- **Y Axis**
  - (Module B)
- **Z Axis**
  - (Module C)
- **Electrode holder**
  - (Module E)
- **X motor mount**
  - “M1” (optional)
- **Y and Z motor mount**
  - “M2” (x2, optional)
- **Knob**
  - (x3)
- **X motor mount**
  - “M1” (optional)
List of parts

1) All unique printed parts x1, except for knobs (x3) and M2 mount (x2)

2) Screws:
   4* M4 (80, 75, 50 and 30 mm)
   2* M3 (25 mm)
   6* M3 (6 mm) – optional, for motor mounts

3) Boats:
   6* M4 (normal)
   3* M4 (closing ones)
   2* M3 (normal)
   6* M3 (normal) – optional, for motor mounts
   6* M3 washers – optional, for motor mounts

4) Dremel, grease!, screwdriver, pliers,

5) Superglue (optional)

6) 3* Continuous rotation micro-servos (optional)
Step 1: Grease everything that moves

- All sliding parts
- The 3 main screws

Also, clean all poorly printed parts (sand down / ream)
Everything should slide smoothly when put together
Step 2: Mounting Module D onto C

Slide M4 boat into slot
Enter 50 mm screw

If it sticks out the top (here I used an 80 mm screw) – cut it off to a few mm above the top

Screw on closing M4 boat
Slide over a knob

Turning the knob should be easy, and smoothly move the electrode link (D) up and down. Optional: with D perfectly in place, superglue the M4 boat inside Module D into place
Step 3: Mounting Module C/D onto Module B

Slide 2* M4 boats into slots

Cut screw if necessary

Enter screw and fix with closing M4 boat
Step 4: Mounting Module B/C/D onto Module A

As before, enter 2* M4 boats into bottom of B, feed through screw and fix with closing M4 boat.

All 3 axes should now move smoothly when the respective knob is turned.
Step 5: Putting together the electrode holder

Slot 2 M3 boats into the holder, ream the screwholes if necessary and assemble

Use the remaining ~30 mm M4 screw and boat to mount the holder

If you choose to not add motors, this is the finished (manual) manipulator
Step 6: Adding optional micro-servo mounts

Enter 6 M3 boats into the 6 slots (2 on A, B and C, each)

Screw on the motor holders, use washers if the screw sticks out on the inside
Put on the 3 micro servos. Take the cross-shaped motor clip which comes with the servo and cut all 4 wings almost (!) at the base. These should fit into the grooves of the knobs. Screw motors on with appropriate screws (usually small, sharp ones).
If motors don’t grip nicely, add another M4 boat onto the axis and slide up the knob (or print a longer knob)