**ChinStick Build Instructions**

By Aaron Weinstein

* Parts Needed
  + Arduino Leonardo/Micro (must be mouse and keyboard enabled)
    - Breadboarder version is smaller and easier to solder permanent connections
    - <http://cal-eng.com/?wpsc-product=breadboarder-32u4>
  + QuadMouse device or equivalent components
    - <http://www.broadenedhorizons.com/quadmouse-switch-enabled>
    - Two joysticks with 4 directional momentary switch outputs
      * Placed side by side
    - 4 different colored LEDs with current limiting resistors
      * Visible on top of enclosure
      * Not necessary when using GUI
    - Project Box
      * Big enough to house all components
      * Holes cut out on top for LED visibility
      * Hole cut for USB cable accessibility
      * 2 holes side-by-side for joysticks
* Soldering Acess Wires
  + QuadMouse
    - Cut out all circuitry
      * Find any component that isn’t a joystick switch, status LED, or LED resistor and get rid of it
    - Add access wires
      * Establish a common ground between components
        + Find ground pin on each switch and solder a wire to it, connect this wire to ground pin of next switch (create a chain connecting all switches)
        + Connect the LED resistor ground pins to the chain

Use a 5v supply to test direction of LEDs

* + - * Add access wires
        + Solder in a long wire to the output pin of each switch
        + Solder in a long wire to the power side of each LED
        + Solder in a long wire to the common ground chain
  + Custom Build Instructions
    - Make/Find Box and place components on it
      * Place joysticks side by side, adjust spacing to user’s needs
      * Place LEDs on top, pointing out, with appropriate resistors for a 5v supply
    - Solder in access wires
      * Establish a common ground between components
        + Find ground pin on each switch and solder a wire to it, connect this wire to ground pin of next switch (create a chain connecting all switches)
        + Connect the LED resistor ground pins to the chain

Use a 5v supply to test direction of LEDs

* + - * Add access wires
        + Solder in a long wire to the output pin of each switch
        + Solder in a long wire to the power side of each LED
        + Solder in a long wire to any piece of the common ground chain
* Build Instructions Continued
  + Wire into Arduino
    - Plug switch outputs into Arduino digital pins
      * Doesn’t matter what order, modify joyStickPins[] array in code to match
      * The code is pre-set to
        + Left Up: 8
        + Left Down: 6
        + Left Left: 7
        + Left Right: 9
        + Right Up: 3
        + Right Down: 4
        + Right Left: 2
        + Right Right: 5
      * All listings in order leftUp, leftDown, leftLeft, leftRight, rightUp, rightDown, rightLeft, rightRight
      * IMPORTANT: WHEN VIEWED FROM THE TOP, ALL SWITCH DIRECTIONS ARE REVERSED, the up switch is located on the bottom, down is on top, left is on the right, and right is on the left
    - Plug LED power wires into Arduino digital pins
      * Doesn’t matter which, determined by ledPins[] in code
      * Default: {13, 12, 11, 10} from left to right
    - Attach common ground to ground output on Arduino
    - Plug USB cable into Arduino and computer
  + Test Arduino
    - Consult “Software Guide.docx” for uploading code
    - Leave cable plugged in
    - Test functionality
      * Run with GUI and insure that all functions work properly
    - Directional issues
      * You may have called two directions backwards, change the corresponding pins either in the code or on the Arduino
    - Direction or LED not working
      * Check access wire solder connection and Arduino connection
      * Check common ground connections
      * Is everything plugged in?
    - Code issues
      * Re Upload code
      * Still not working?
        + Upload “blink” code, check if that works
        + Then put chinstick code back in
  + Finalize connections
    - Once you have checked the functionality with temporary connections
    - Unplug USB cable
    - Solder wires into Arduino
    - Run same tests again to make sure connections stayed the same
  + Put in box
    - Open the box
    - Place joystick board and Arduino inside
      * Be careful of bare wires and short circuits
    - Add tape and screws to secure board and Arduino from shaking around
    - Make sure joystick paths are clear
    - Make sure LEDs are visible
    - Make sure USB cable is plugged into Arduino
      * Attach strain relief to keep it there
      * Shouldn’t come out unless you open the box and unplug from Arduino
    - Carefully add the cover
  + Test
    - Run the code and test extensively
    - Adjust speed settings for computer
    - Modify scheme and mode settings for personal preference

