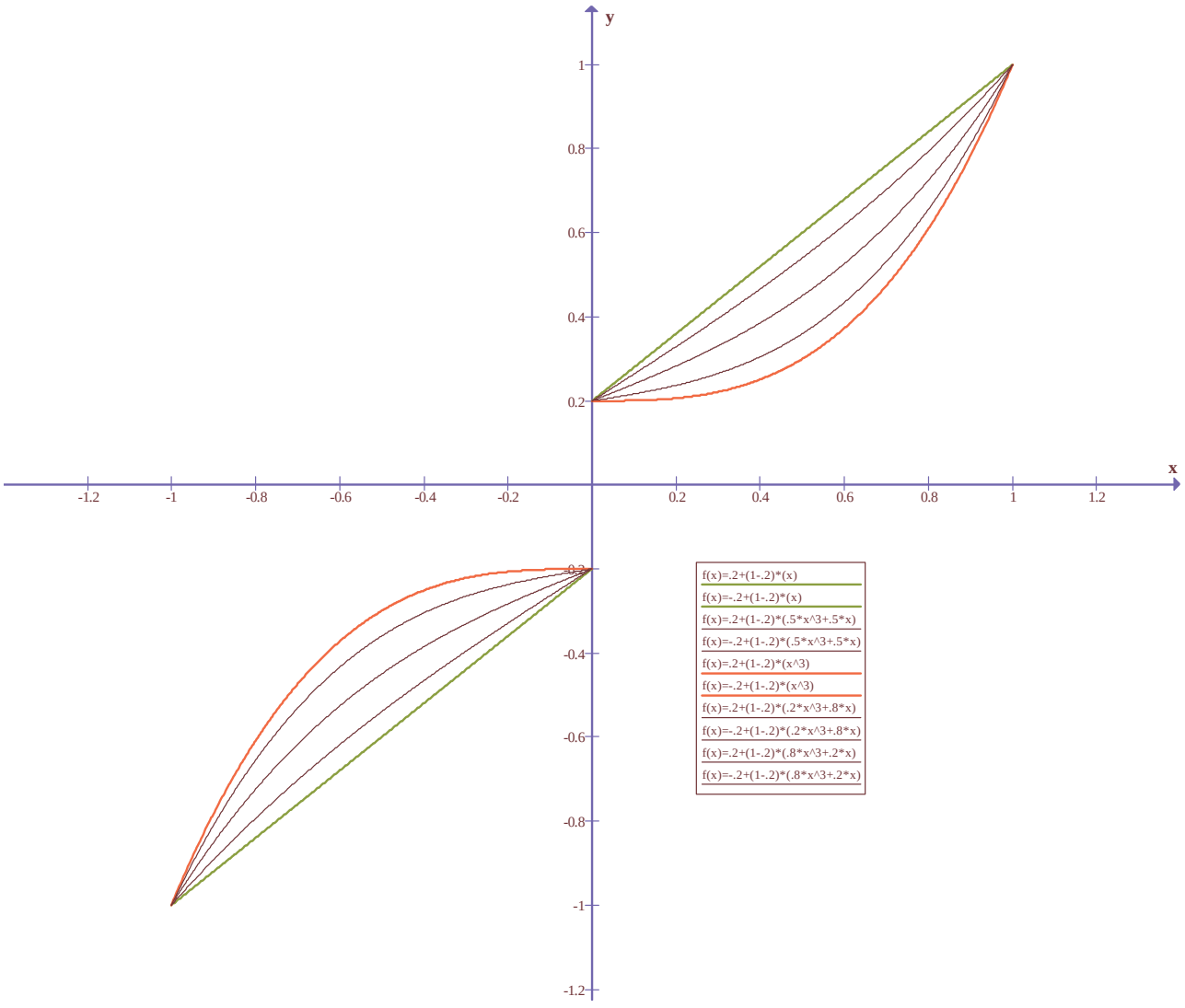
12/27/2010b Ether

2-parameter joystick sensitivity adjustment

This is file "2parm.pdf"

This is a revision of the 12/22/2010 paper. This revision adds a 2nd adjustable parameter "b" which adjusts the y-intercept (inverse deadband). Read the 12/22/2010 paper first; some details have been omitted here.

Refer to the graph below when reading the description on the following page:



Let X be a joystick axis (or other signal) with value ranging from -1 to +1.

Consider the function

$$g(x) = \begin{cases} b + (1-b)*[a*x^3 + (1-a)*x] & \text{for } x>=0 \\ -b + (1-b)*[a*x^3 + (1-a)*x] & \text{for } x<0 \end{cases}$$

Plot g(x) for b=0.2 and a=0,0.2,0.5,0.8,1.0. This gives a family of curves with range –1…1 as shown in the graph on the previous page.

The gain of g(x) is equal to (1-a)*(1-b) when x=0, and (2a+1)*(1-b) when x=1. Unlike the 12/22/2010 paper however, the "gain crossover" (x value for gain=1) for the 2-parameter function is not the same for all parameter values.

You can set the "a" parameter (low input gain adjustment) equal to a hard-coded constant in your software, or you can use (for example) the throttle on a joystick to vary the value from 0 to 1 so the driver can select the desired sensitivity. You can do the same for the "b" (inverse deadband) parameter. You can have separate parameters for different signals (eg different joystick axes).