After we built our first prototype robot, we found that controlling it was an issue. The Logitech controllers do not reliably return to true zero when the control sticks are released, and it is hard to control the robot at low speeds. This function attempts to solve both of these problems in one step.

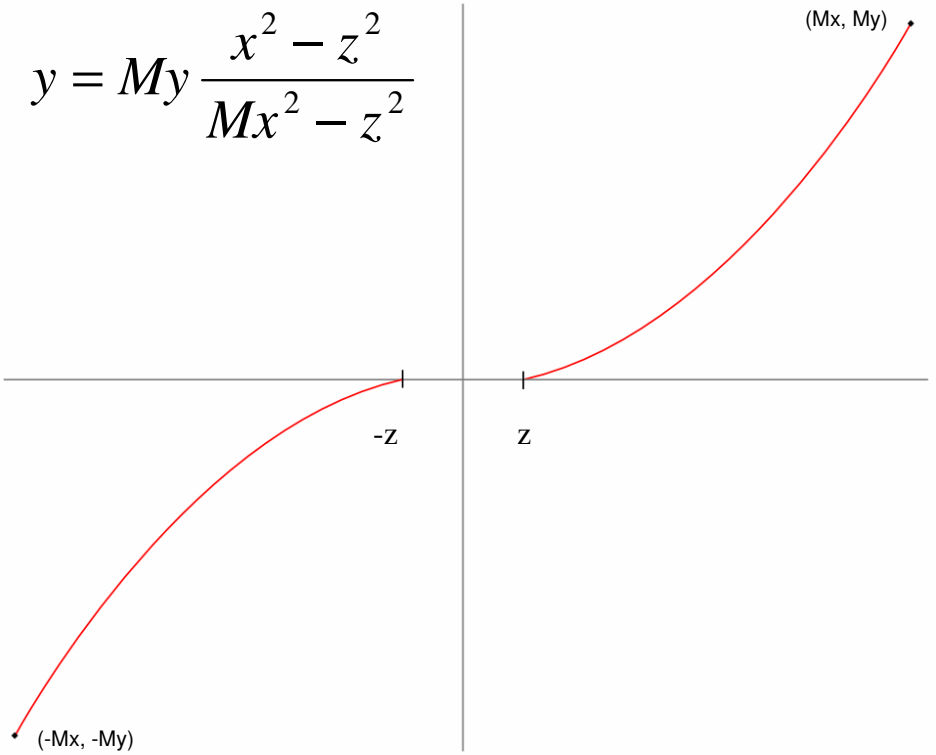
It scales the absolute value of the input from the controllers along a parabola, and zeros all resulting values if they are negative. It then restores the sign, to deliver a curve looking roughly like the one to the right.

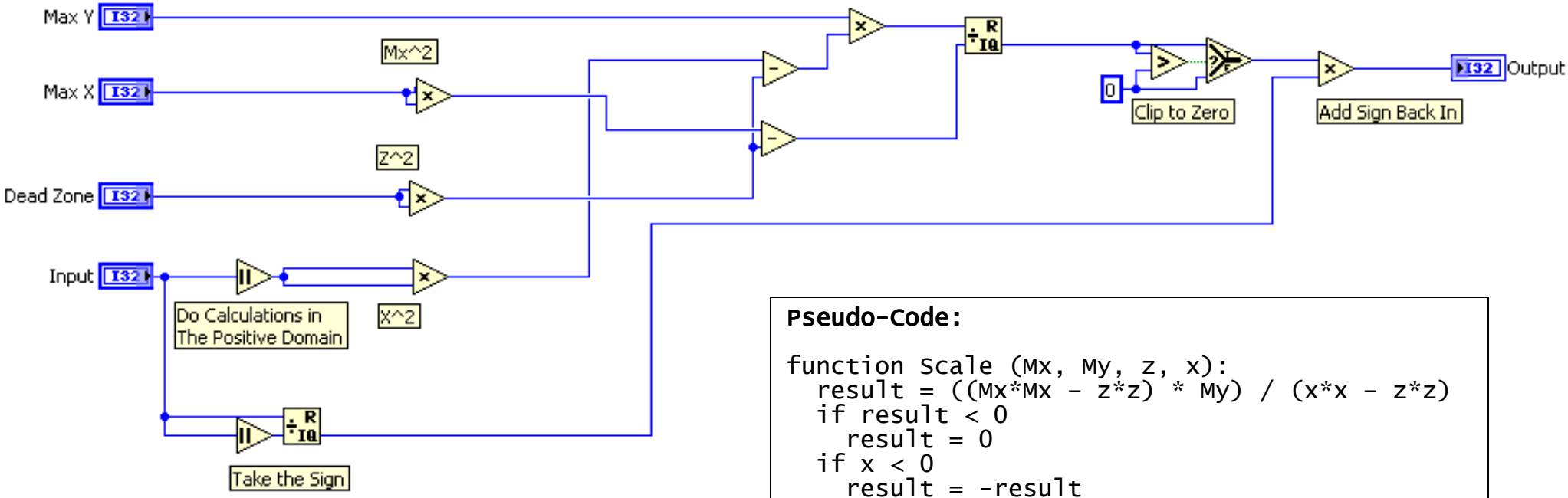
The *Z* value in the function defines the size of the dead zone, by setting the roots of the parabola, and the *Mx* and *My* values define another point on the parabola, which is for convenience defined to be the maximum desired output value at the maximum expected input.

This function has the end result of causing more of the control points to be clustered at low speeds, allowing finer control when necessary, while still allowing full speed control when desired. The dead zone prevents the robot from continuing to drive once the controls have been released.

This function provides a very noticeable increase in maneuverability of the robot, as reported by experienced and inexperienced drivers alike.

$$y = My\,\frac{x^2 - z^2}{Mx^2 - z^2}$$





Pseudo-Code:

```
function Scale (Mx, My, z, x):
  result = ((Mx*Mx - z*z) * My) / (x*x - z*z)
  if result < 0
    result = 0
  if x < 0
    result = -result
  return result
```