The replacement servo arrived. The present ones rotate 180 degrees and the new one is 360. It is the tilt servo that was DOA.

I must be a glutton for punishment, as I thought: Hmm it would be great to have a pan of 360 vs the present 180. That meant that I had to totally dis-assemble the unit, replace the good 180 pan with the new 360 servo and replace the DOA 180 tilt with the old 180 pan.

To control a servo, you send a pulse width modulation (PWM) signal, a series of repeating pulses of variable width where the width of the pulse determines the position to be achieved by the servo. A typical servo motor expects to be updated every 20 ms with a pulse between 1 ms and 2 ms. With a 1.5 ms pulse, the servo motor will be at the natural 90 degree position. With a 1 ms pulse, the servo will be at the 0 degree position, and with a 2 ms pulse, the servo will be at 180 degrees. You obtain the full range of motion by updating the servo with a value in between.

So I suspected I would have to conduct some testing to determine the position for 360 vs 180. However I found a big problem. A 360 servo is NOT an 180 servo with twice the available positions. It is a continuous servo, as the children's song goes:

The wheels on the bus go round and round
Round and round
Round and round

In other words, with a 360 servo, you control direction, clockwise/countercockwise, NOT position.

Remember my NOTE TO FILE: Test all the electrical components BEFORE you assemble those with tiny nuts/bolts.

It is now updated to: Test all the electrical components, **for implied purpose**, BEFORE you assemble those with tiny nuts/bolts.

Failure is the key to success; each mistake teaches us something.

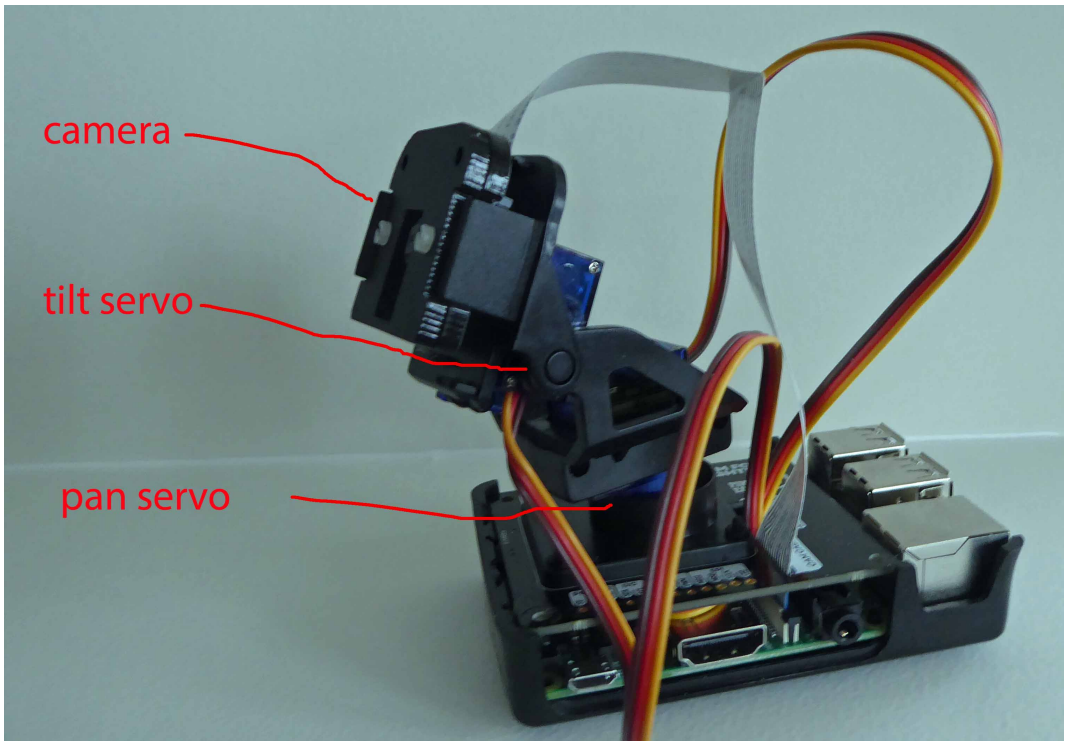
When you live in a hinterland, you cannot purchase robot stuff locally. Since this was my second failure, I decided to talk to some experts. The company, buyapi, that sent the new correct servos, is located 4km from where I lived in Ottawa, or 5000km from here. I suspect that if I still lived in Ottawa, I would require a much larger budget.

The pan tilt assembly is now rebuilt, hopefully for the last time, and works. I attached it to the top of one of my raspberry PI platforms. I converted the last camera face detection/tracking software so that it would run on this platform and added code to move the pan/tilt device so that the face would stay near the center of the image.

The mathematics is semi easy. Center of image is Xc,Yc. Center of face is Xf,Yf. Distance to pan position is Xc-Xf and to tilt position is Yc-Yf. Next determine angle change for each distance.

The basic code works and now I must tweek some of the parameters to adjust to how fast/slow the face moves and how much the servos move to “match” that change. The servos only have two speeds, on/off and the command you send is to tell them what angle, from -90 to +90 to move to.

So the question is what could this be used for? What if the system had a projectile delivery system attached to it, like a paint ball or nerf ball gun. With a distance device (ultrasonic) attached, it could fire the projectile at deer when they are within range. One can only imagine what the defence industry does with this capability.



Contrary to popular belief, completion of one project does NOT decrease the NEXT_TO_DO list. It actually creates a greater list of projects, things to learn, books to read and previous projects to expand.

It also increases my believe that research must be both basic and applied. **Basic research** is that which fills in the knowledge we don't have; it tries to learn things that aren't always directly applicable or useful today. **Applied research** is research that seeks to answer a question in the real world and to solve a problem.

The next project will probably be a surveillance camera with motion detection. It is predicted that this will be a $62B, yes billion, industry within a few years.