1 Bowling

The bowling motion starts with holding the Wiimote essentially vertical, swinging it down slowly behind your body and then moving forward quickly again, finishing approximately vertically near where the motion started. An ideal bowling swing (at least in Wii Sports) finishes with a wrist twist that gives the ball some spin. All these aspects can be seen in my graphs.

During a bowling swing, the Wiimote does not move much along the X axis. It basically stays even with minor variation until the end of the follow through (around time point 80) when I twist my wrist to put spin on the ball.

On the Y axis, the Wiimote begins at -1 because it is held vertically. As you swing the Wiimote backwards to a downward pointing position the Y acceleration gradually increases. As the backswing ends and the forward motion begins you see a dip in the Y acceleration, and then a sharp increase as the fast forward motion begins. As the remote finishes in the vertical position the acceleration drops to -1 again.

The Z motion follows the face of the Wiimote. You can see at the beginning where I pull the remote towards me a bit, and then an increase through the backswing. The forward swing and follow through are almost entirely along the Z axis of the Wiimote and accelerate quite fast, and you can see it bottom out as the remote’s location is reset to approximately the start position.

2 Throw

A throw starts with a wind-up in which my hand moved from a flat position in front of me to something of an upright position behind me, then a throwing motion where the Wiimote moves quickly forward and winds up about where it started.

The X axis is somewhat slow in changing. You see it gradually fall and then raise again as the motion of the backswing causes the Wiimote to tilt. Then you see some major changes as I twist my wrist and make the throwing motion forward.
On the Y axis, the remote begins flat, but quickly goes up to 1 because I start by pulling it backwards. Then it gets flicked more or less upright at the end of the windup, which gives it the slight negative valley. The large peak is the actual throw.

On the Z axis, you see not much change at first, again because the remote is being pulled straight backwards. However, during the wind-up, the face of the remote gets pulled backwards to get it into the end of the wind-up, which leads to a large negative valley. Then during the throw motion, the bottom of the Wiimote leads, giving a huge positive acceleration.

3 ND

To trace ND in the air, I started at the lower left of the N and traced its shape. Then, when the N was complete, I reset the remote to the upper left of the area being used to trace it. For the D, I traced the left side of the D downwards and went back up before drawing the curve. I held the remote from the top instead of the bottom, which had the effect that at the bottom of the letters the remote was tilted slightly down, and at the top it was tilted slightly up.

The strongest indication of the motion in in the Z axis. A single motion tends to be a peak or valley that begins or ends at 1. We start at 1, because when the remote is flat, gravity gives an acceleration value of 1. Then, when you start moving you get a peak and when you slow down to change directions you get back down to 1, and when you begin moving again it begins to go down again. You can see in the figure the way each line of the N has its own peak, and the D behaves similarly.

The Y axis is similar, with two major differences. The first is the base acceleration, which is 0 for the Y axis when the remote is being held flat. The second is the magnitude, which is much less, because the motion is mostly the tilt of the remote changing as I moved it up and down.

The X axis is somewhat unusual. It stays relatively flat for most of the N, except for a slight dip on the leg of the N that moves sideways. Then, there is a large fluctuation when I move quickly from the end of the N to the beginning of the D, and another large fluctuation when going around the curve of the D at the end.

4 Other Commentary

I polled the Wiimote every 100000 system ticks. According to MSDN, a tick is about 100 nanoseconds, so 100000 ticks is about 1/100th of a second. The data does contain experiments at 500000 ticks and 1000000 ticks (1/20th and 1/10th of a second), but the 100000 tick data gave good curves without being noisy.

The data was relatively consistent across all runs. The main difference was the time from when collection was started to the start of the motion. For the graphs above, I chose data that were relatively consistent in this regard, so as to make the graphs more clear. However, all 10 instances of each motion are included in the data file.