Rennen.Tech.Talk

with George Costa

Dynamics of BMX: Speed

What is Speed?

This may sound like a silly question but it is important to define. Speed is the rate of change of distance versus time. This simply stated is how much distance you travel in a given amount of time, see equation 1. Speed is also known as Velocity, or to be more precise Linear Velocity.

Equation 1. $$Speed = \frac{Distance}{time}$$

Sounds easy right? But sometimes this is truly difficult to measure. Most BMX'ers who care to monitor their performance use a typical bicycle speedometer. The most useful features of these devices are the maximum speed function. This records the fastest that your wheel travels and you can look at the result later on when you have a chance to catch your breath. This is useful feature but when you are trying to fine tune your track performance it may prove to be impossible because you do not know where you achieved this max speed. Also keep in mind how these devices work. There is usually a wheel magnet that attaches to your spokes. Every revolution the magnet closes a switch and time is measured. In addition during the setup of the speedometer you enter a calibration number for a BMX wheel. This gives the computer information about distance. Given distance and time the velocity can be computed based on equation 1. The speedometer does this all for you.

Back to how the measurement is taken, I mentioned that a speedometer can only measure speed once per revolution. For a 20" BMX wheel this means a speed update every 5.25 feet, for a cruiser its worse at 6.25 feet. We all know that races are won and lost sometimes by a matter of inches. These speedometers are great for their price but we should realize their limitations.
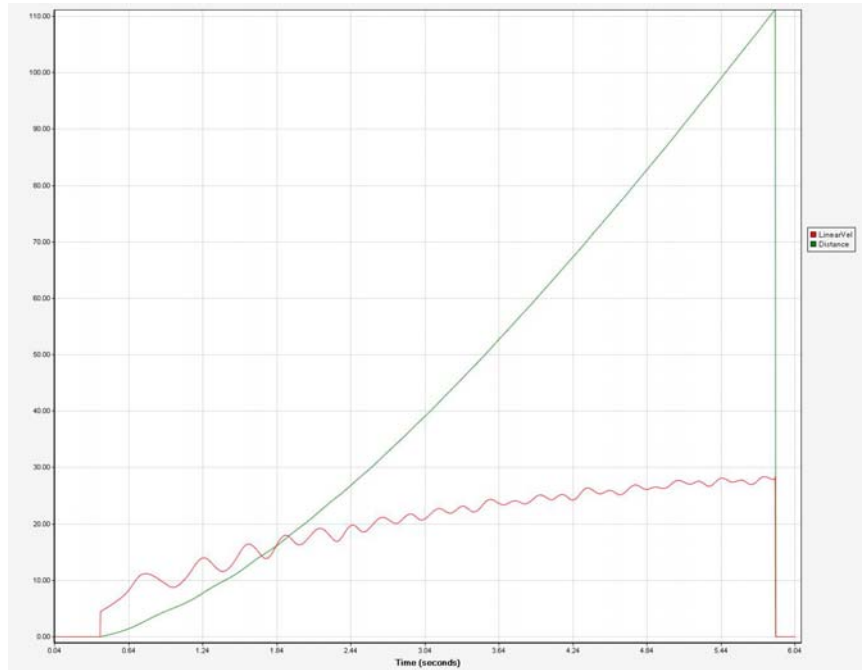
What other solutions are there? Aside from a stopwatch and really good eye! Last year at the ABA Grands we at Rennen introduced a revolutionary BMX training tool that solves many of these problems. It's called G-Cog and below is a graph of some of the kind of data we can look at.

We can see here that the rider using the G-Cog is able to see how fast he/she went in a sprint along with the distance traveled. We can also see that these graphs both change in a

Figure 1. Plot of Distance (ft) and Linear Velocity (mph) versus Time (s)

non-linear fashion, which proves that the concept of speed is simple in basic terms but in reality can be very difficult to measure in practice. Data like what has been presented above can be used to precisely fine tune different aspects of your ride. You can finally answer questions like how fast did I go and where is this occurring? You can also use G-Cog to refine your sprint routine. You can see what your maximum upper speed threshold is and at what distance you achieve that. In addition G-Cog can take data up to 250 times per second, so for a typical BMX race (~30 seconds) that's several thousand data points!

We will continue to use G-Cog in upcoming Tech Talk installments to help us really examine some of the dynamics of racing. For those of you interested the data presented in Figure 1 is of your W4 Elite Masters Rider and G-Cog test pilot Mr. Tim Dinger! Hope you enjoyed the article!