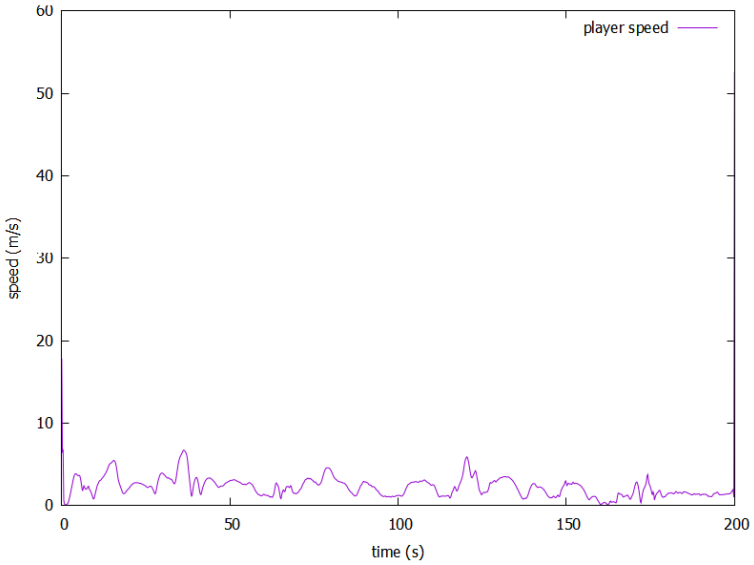
Q2(c) :

Max speed : 52.5641 m/s (Copy from C++ Program)

Plotting by gnuplot :



Q2(d) :

If using slice(), then the length of speed is (Ndata-2) and acceleration is (Ndata-4). However, symbols errors are always displayed when I used slice() and I don't know how to fix, so I use .shift() instead of slice().

In the case with .shift(), the lengths of speed and acceleration are the same (= Ndata), because .shift() always returns a same-size valarray and the element of the end is replaced by 0.

Q2(e) :

Dominant error comes from the measurement noise (± 0.2m) in the input positions, which is a random observational error. For mitigation, we can smooth the positions before differentiating.

For precision, **double** is better for real-valued variables since it has 15 digits

Q2(f) :

We can fit an interpolation curve (e.g. a cubic spline) through the measured positions.