Study of the handspinner speed with arduino and python/scipy

Method

A proximity detector realized with a LED, a photoresistor and an arduino board is realized. The duration between pulses is computed and RPM is calculated.

Data are processed in order to define several parameters of a physical model.

Physical model

We want to express the rotation speed N of the handspinner.

Inertia I is storing the rotational energy and a friction torque T from air and bearing is removing energy.

$$T = I\frac{dN}{dt}$$

We can estimate that that friction torque T will be a function of the speed N. This function shall be decreasing, as friction with air and brearing should be higher at higher speed.

There is no acceleration due to friction when $N = 0$, hence $T(0) = 0$.

Mathematical model

We have:

$\frac{dN}{dt} = f(N)$ with $f(0) = 0$.

Numerical test

We realize a first experimentation. We calculate the speed from intervals between detection pulses.

[figure_1-1.png]