Chapter 3

Goal of This Thesis

By visually inspecting any set of measurements of the counting scale under study in the case of a constant load without any kind of external perturbations, we find a swarm of points oscillating around a mean value. That indicates us that the accuracy of the sensors is much higher than their fidelity. Then, as we measure the rank in which these points use to oscillate, we find out that it has the same magnitude order and it is bigger than the weight of one of the units to be counted. That can be seen on figure 3.1, where ten steps take place corresponding to ten falling units into the scale after a stationary period.

As a consequence of this spreading, in order to infer the number of pieces in the scale, not only a weight value can be taken into account, but a whole set of them is needed. The number of points and the reliability of the inferred average value will depend on the statistical behavior of the measurements.

The goal of this thesis is, firstly, to make a statistical analysis of the weight measurements. Some basic data of the statistical distribution like the typical values of the variance or if it is homocedastic or heterocedastic, are crucial to establish an algorithm that infers the number of units in the scale. Some further information, like a description of the probability density function can be usefull to improve the algorithm or to adapt it if some requirement (like the reliability or the rapidity of the response) is changed.

Secondly, relying on results from the statistical analysis, an algorithm to carry out the computation of the units in the scale is also to be developed in this work. This must be suitable in stationary situations as well as facing vibrations of the ground. For this task, the following specifications are given by Georg Fischer AG:

- Significance level: 1%
- Maximal instant increment of the number of units: 5
- Maximal weight: 2000 Kg
- Unitary weight: 147 g

The aim of this thesis is *not* to study the mechanical characteristics of the installation nor its improvement nor its influence on the measurements. As well,

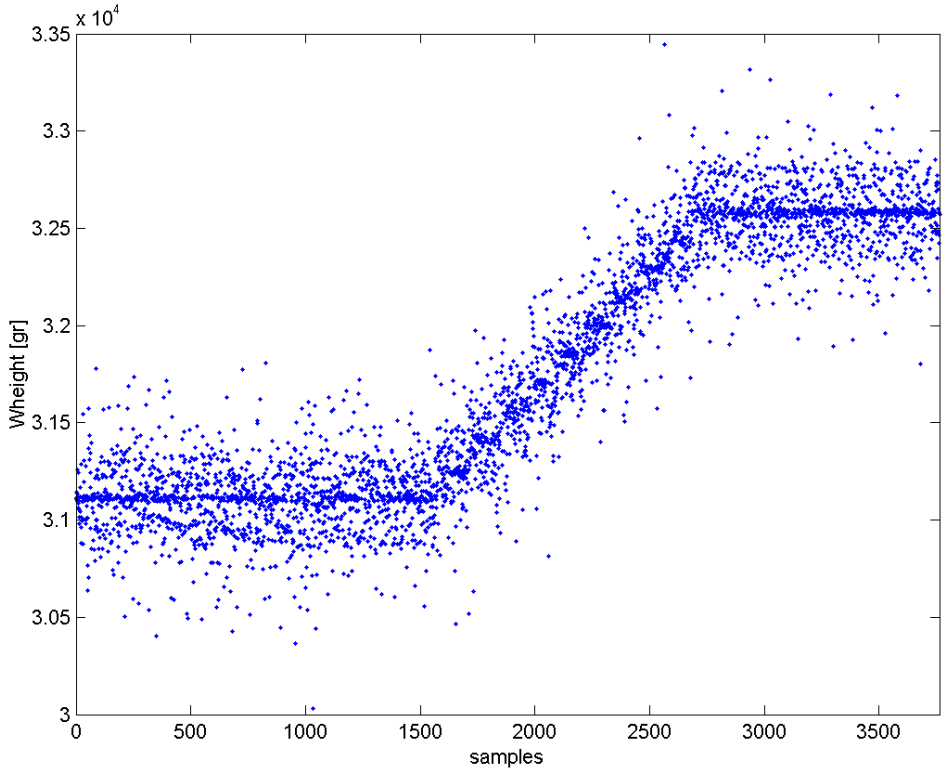

Figure 3.1: Data spreading and steps corresponding to single falling units.

it is *not* the goal of this thesis to implement the developed algorithms in any specific programming language and *also not* to detect nor eliminate temporary perturbations of the measures unless ground vibrations.