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Sampling of discrete materials
II. Quantitative approach—sampling of zero-dimensional objects

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Abstract

Parts II and III of this series are initiated by a joint discussion of features related to the lot. Part II then delineates the central elements of the Theory of Sampling for zero-dimensional objects. It is necessary to be brief within the limited format of the present tutorial series, but all essential model rigour has been maintained. An attempt has been made to focus on the central mathematical theoretical core of TOS while also showing how this relates directly to sampling practise (materials, equipment and procedures). A highlight of the latter issue concerns experimental estimation of the Fundamental Sampling Error (FSE). Part II is also fundamental for further developments in Part III, as it presents a complete overview discussion of the basic sampling operation of the one-dimensional object as well.

Keywords: Discrete; Quantitative approach; Zero-dimensional objects; Sampling of Particulate matter; Theory of Sampling

1. Joint introduction of parts II and III: three-, two-, one-, zero-dimensional models

- *Strictly speaking*, all material objects, lots *L*, occupy a three-dimensional Cartesian space. From a practical as well as a theoretical standpoint, however, it may be useful to *represent* a physical object by a *model* of a smaller number of dimensions.
- *A three-dimensional model* alone can represent *bulky lots L*, e.g., an ore body and similar.
- *Flat objects*, such as a sheet of paper, a steel sheet, the *thickness* of which is:
  - *small* in comparison with the two dimensions of its surface,
  - *practically uniform* (with a tolerance of, say, 20%) can often be well represented by a *two-dimensional model.* From a physical and mathematical standpoint, every element of the object is represented by its projection on a plane (often horizontal). We often have occasion to work on lots *L*, which can be considered as practically two-dimensional.
- *Elongated objects* such as a rail, a cable or a flux of matter whose *length* is:
  - *very large* in comparison with the two dimensions of its cross-section,
  - *practically uniform* (with a tolerance of, say, 20%) can be well represented by a *one-dimensional model*. From a physical and mathematical standpoint, the lot is here represented by its projection on the axis of elongation.
- *Discrete objects* such as lots made up of a large number of unspecified units*,* assumed to be *independent* from one another; i.e., populations of non-ordered units can, by extension and by convention, be *defined* as *zero-dimensional* objects. There are two cases:
  - *Unit masses are more or less uniform* (with a tolerance of, say, 20%): Here, conventional statistics can be applied.
  - *No hypothesis of uniformity of the unit mass is made.* Conventional statistics cannot be applied. We shall here deal exclusively with this most realistic case.

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