MCMC selection of spatially and doubly balanced samples

Roberto Benedetti *
University of Chieti-Pescara, Italy – benedett@unich.it

Simona Andreano
Universitas Mercatorum, Italy – s.andreano@unimercatorum.it

Federica Piersimoni
Istat, Italy – piersimo@istat.it

Paolo Postiglione
University of Chieti-Pescara, Italy – postigli@unich.it

A method for selecting samples from a spatial finite population that are well spread over the population in every dimension, without the use of any spatial stratification is presented. The within sample distance matrix is summarized in a descriptive index that is used to define the probability of each sample to be selected. A set of units with higher within distance will be selected with higher probability than a set of nearby units. Through the standardization of the distance matrix the method can be used to produce equal and unequal probability samples either exact when a linear index is used to summarize the matrix or approximate when products and powers of the mean are used. The high flexibility of the selection algorithm can make possible numerous extensions to deal with some practical topics that are usually met in spatial surveys such as the sample coordination and the spread of units belonging to different domains. Some examples on real and simulated data show that the method gives estimates that are better than those obtained by using a classical solution as the Generalized Random Tessellation Stratified (GRTS) design and that often are even slightly better than those obtained by using recently proposed selection procedures as the Spatially Correlated Poisson Sampling (SCPS), the Pivotal method and the doubly balanced design.

Keywords: anticipated variance; empirical inclusion probabilities; Correlated Poisson Sampling; Generalized Random Tessellation Stratified design.