

Universality of Population Distribution

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Abstract

Many people live near the place in which many persons live. This is called agglomeration effect of population. Agglomeration effect is one of the important factors which decide the distribution of population. It is possible to examine the agglomeration effect by measuring the spatial correlation among the population living in place separated some distance. As a result of investigating the spatial correlation of various location, it turned out that there is an universal property which does not depend on the location.

Keyword: Population Statistics, Agglomeration, Universality

1 Introduction

The population distribution has studied for a long time. Zipf's law [1] that the size distribution of city's population is a power-law has been known well. There is a problem of how to define cities' area when we observe the population distribution. Tail of the power-law distribution is composed by mega cities. Dividing the mega cities into several small cities, the tail of the distribution becomes thin. Because of the difference of the definition of the city, the population distribution becomes not power-law distribution but log-normal one. The city region was decided by geographical, historical, and administrative factor. In Ref. [2], the authors proposed the method which decide region of the cities by city clustering algorithm. In this research, we divide space by the method which is not concerned with shape of cities. Our aim is to find the property of population distribution which does not depend on either countries or local areas.

We have investigated the population distribution by using a method for spatial division by same size squares. In this method, we can control the scale of the spatial division by the size of the squares. There are several universal properties of the population distribution observed by our method.

Especially, the property observed by the small

size scale spatial division is important. There is no locality in distribution of logarithm difference of the population in two squares separated from each other in the case that the scale of the spatial division becomes small. The property of the distribution of the logarithm difference is concerned with a correlation coefficient of the population in two squares. This correlation is one of the indices to measure agglomeration of population. In this research we will clarify the universal property concerned with population agglomeration.

References

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