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| Title | 時代ごとの都市道路網の面積分布の違い 江戸と明治 |
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| Citation | |
| Issue Date | 2013-03 |
| Type | Thesis or Dissertation |
| Text version | author |
| URL | http://hdl.handle.net/10119/11282 |
| Rights | |
| Description | Supervisor : 林幸雄, 知識科学研究科, 修士 |

A Difference in cell area distributions of the urban road networks – Case study for Edo and Meiji –

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March 2013

Keywords: cell area distribution, log-normal distribution, urban road network

We analyzed cell area distribution of urban road network of Edo and Meiji period. Road network is one of consists that compose of city. Recently cell area distribution have analyzed actively by many researcher. Analyzing road network is stronger against old period than other consists because it is possible to get data even if we get a map.

The maps that we analyzed are 2, one is last Edo period – manen fast year: 1860 – and other is last Meiji period – around Meiji 40 years:1907 –. We use a tool that software contains within and calculate cell area of Tokyo's 23 wards that enclosed with road by hand working. After calculating all cell area, we made graph of cell area distribution from getting data and compare Edo period, Meiji period and related research data, for example, slope or difference of distribution.

But we can't make cell area distribution direct from data of cell area. This is because 2 reason, one is that number of area calculated cell area is a few. Another reason is that it is the rare case that cell area assent perfect. Even more, it is the miracle that a lot of areas assent perfect.

So in this paper, we make cumulative distribution of cell area once, and fit the function of cumulative distribution of log-normal distribution.

By doing this, we estimate constant μ and σ , substitute μ and σ log-normal frequency function. This is the way of cell area distribution in this paper.

This is the way of cell area distribution in this paper. As well, the reason that using cumulative distribution of log-normal distribution in this paper is 3 point. First it is smoothing by cumulative. Second it is used in related research. Third it shows heavy tail distribution when we settle data.

Both Edo period and Meiji period cell area distribution's slope are about 2. Also Meiji's slope is larger than Edo's one. But Meiji's first fitting isn't near original data. So function fit again with data of $A > 10^5$. New fitting is better than before one, and its slope became larger than first fitting of Meiji period.

2 functions cross about $A = 10^{4.25}$. Cell area of Meiji period is increase from Edo period in area of $A < 10^{4.25}$. On the other hand, cell area of Meiji period is decrease from Edo period in area of $A > 10^{4.25}$, and rate of decrease of Large cell area is larger than small cell area. Cell areas of Edo period are about 13000, and one of Meiji period are about 25000. Cell area becomes twice from Edo period to Meiji period. Large and comparatively small middle area in Edo period keeps outer frame and cut small inside by road network. Middle area in Edo period lost at Meiji period by take away original road network and put new road network one more time.

East area of Tokyo's 23 wards didn't touch road network. Central area of Tokyo's 23 wards is heavy comparatively small middle area, so keep out frame. West area of Tokyo's 23 wards touch large scale road network renewal had many middle size areas.