Complex Networks from Chinese characters and history of Western Han and Hsin Mang

(漢字與西漢及新莽歷史的複雜網絡)*

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Abstract: Ideas and methods of complex networks have been applied to various physical, biological, and social-human problems [1-3]. We used network theory to analyze the Chinese characters [2] and history of the Western Han Dynasty and Xin Mang [3]. The Chinese chracters including oracle bone inscriptions (OBI) in Shang Dynasty (1600-1046 BC), Chu characters (CC) in Warring State Period (476–221 BC), characters in dictionary Shuowen Jiezi (SJ) edited in Eastern Han Dynasty (23-206 AD), and in Kangxi Dictionary (KD) edited in 1710-1716 . Such Chinese characters were constructed via combinations of roots. When two roots appear in the same character, they are connected by a link and a complex network of all roots of a character set thus forms. We calculated the clustering coefficient, the average shortest distances between nodes, the degree distribution, etc., of each network, which indicate that all roots networks have characteristics of small world and scale-free. From OBI, Chu, SJ, to KD, the parameters of the networks have consistent evolution trend.

   Western Han was established by Liu Bang in 202 BC, and eliminated in 9 AD by Wang Mang who established a new Dynasty called Xin or Xin Mang, which lasted only from 9 AD to 23 AD and was replaced by Eastern Han Dynasty (23 AD-220 AD). This research was based on Shi Ji by Sima Qian (司馬遷史記) [4] and Han Shu by Ban Gu (班固漢書). .From established networks, we identify key persons and key events in the Western Han Dynasty and Xin Mang. We find that besides some famous emperors, generals, and ministers, some queens and villains (小人) also play important roles in the evolution and transition of the history [3].

[1] Liming Pan, Tao Zhou, Linyuan Lu and **Chin-Kun Hu:** Reports, **6**, 22955 (2016).

[2] Po-Han Lee, Jia-Ling Chen, Fu-Hsuan Shen, Po-Cheng Wang, Ting-Ting Chi, Zhi-Ren Xiao, Zih-Jian Jhang , Yeong-Nan Yeh, Yih-Yuh Chen and Chin-Kun Hu: Evolution of root networks of Chinese characters, preprint.

[3] Yi-Ru Pan, Wen-Jong Ma, Chen-Yu Chang, Hui-Jie Yang ,Ting-Ting Chi, and Chin-Kun Hu, preprint.

[4] Ting-Ting Chi, Shih-Chieh Wang and Chin-Kun Hu, Physica A, 437, 408 (2015).