

# A Potential Energy based Clustering Algorithm of Nodes for Network Media Services

Jiali You\*, Pengfei Zheng\*\*, Jinlin Wang\*

\* *National Network New Media Engineering Research Center, Institute of Acoustics,  
Chinese Academy of Sciences, China*

\*\**University of Chinese Academy of Sciences, China*  
[youjl, zhengpf, wangjl}@dsp.ac.cn](mailto:{youjl, zhengpf, wangjl}@dsp.ac.cn)

**Abstract**—For some media service systems in Internet, providing the service in real time is the key point to obtain the satisfying performance. In order to get good user experience, nodes are often organized as groups and the nodes in a same group can cooperate with each other. Accordingly, how to organize the nodes is an important problem that affects the performance of systems. Usually, enough node capability and the required media content are the two essential elements of nodes to provide the media service. In this paper, the relationship among nodes about these two elements are analogized as the spring tension and gravitation between particles, and a novel potential energy based clustering algorithm is proposed to generate node groups for media services. Moreover, an overlay structure for several media service applications is designed, in which a priority neighbor list is generated for each node by the proposed clustering approach. Based on this structure, nodes in the priority neighbor list may be the potential service helpers in the future. To evaluate our algorithm, a service scenario is simulated and different parameters in the media system are discussed adequately. Compared with some other clustering algorithms, if the potential energy based clustering algorithm is used, there is a chance to improve the service response time obviously and the average execution time of tasks can be reduced.

**Keyword**—Media service, cluster, potential energy, overlay structure, node group



**Jiali You** is an associate professor of the National Network New Media Engineering Research Center, Institute of Acoustics, Chinese Academy of Sciences. She received her B.S. in Computer Science from Communication University of China in 2003, and Ph.D in Signal and Information Processing from the Institute of Acoustics (IOA), Chinese Academy of Sciences (CAS) in 2008. From July 2008, she joined the National Network New Media Engineering Research Center, IOA, CAS. Her research interests include P2P streaming network, distributed storage technology, content distribution network and network virtualization.



**Pengfei Zheng** is a Ph.D. student at the National Network New Media Engineering Research Center, Institute of Acoustics, Chinese Academy of Sciences. His current research interests include network virtualization and P2P streaming network.



**Jinlin Wang** is a Professor, Doctor Supervisor, Director of DSP Center, Director of Network and New Media Technology Research Center. He graduated from Mathematics Department of University of Science and Technology of China with his bachelor degree in 1986. After he got his master degree from Institute of Acoustics, Chinese Academy of Sciences in 1989, he began to work in the institute and was engaged in the study of digital signal processing. He had been the principal of many projects affiliated to "863 Program". His current research interests include digital signal processing, application of DSP, digital TV source and channel decoding technology and receiving system, IP network technology and network streaming media, structure and new service of wideband network, mobile terminal technology and its value-added service, the third generation mobile communication technology, modern wireless communication technology.