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Singular-point reproducibility for physical phenomenon in supercritical plasma analyzed by network model MASATAKA KOSHIBA, SHIGEYUKI MIYAGI, University of Shiga Prefecture, TSUYOHITO ITO, University of Tokyo, YUSUKE SUGIYAMA, OSAMU SAKAI, University of Shiga Prefecture — A complex network is one of the techniques for analyzing and evaluating a complexity in uniform low-temperature plasma [1]. The previous studies on chemical reaction networks revealed the roles of species by using centrality indices derived from the macroscopic structure of the networks. However, when plasma reaches a supercritical state, another structural property emerges; it becomes necessary to consider not only chemical reactions but also physical spatial structures with density fluctuations. Consequently, macroscopic physical phenomena having singular points, such as thermal conductivity and discharge breakdown voltage, are observable in experiments [2]. In this regard, if physical network structures in non-uniform plasma have feedback loop(s) in their information flows, the loops can create singular point(s) in calculations of a network model which is similar to a recurrent neural network, which is demonstrated in this study. To reproduce a singular point in our theoretical model, a specific range of the physical parameters is a key issue, which is comparable to those in experimental setting. [1] O. Sakai. K. Nobuto, S. Miyagi and K. Tachibana, AIP Adv. 5, 107140 (2015). [2] T. Ito, H. Fujiwara and K. Terashima, J. Appl. Phys. 94, 5411 (2003).

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