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**Study on the hierarchical property between the functional classes in protein-protein interaction network** YOUNG-JIN KO, SOON-HYUNG YOOK, YUP KIM, Department of Physics and Research Institute for Basic Sciences, Kyung Hee University — Detecting community structures and hierarchy among communities have been one of the most attractive research topics in complex network studies. In this study we regard each protein as an oscillator which interacts with its neighboring proteins. In order to define the hierarchy among the functional classes based on the synchronizability of each functional classes, we introduce a parameter  $r_{link}$ . Here  $r_{link}$  represents the fraction of all possible links whose ends nodes are synchronized. From the numerical simulations we find that the hierarchical structure between functional classes does not depend on the coupling strength. We expect that this result provides a clue to understand the mechanism to form the specific structure of PIN. Some possible relationships between the observed hierarchical structure of the functional classes and the properties of the PIN are also discussed.

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