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TECHNOLOGY CONVERGENCE AND NEW OPPORTUNITIES IN GNSS

Abstract

Technology convergence is becoming more and more important for the development of new technologies and business. Especially in the 'Industry 4.0' and '4th industrial revolution', the importance of technology convergence is highly emphasized. Global Navigation Satellite System (GNSS) has become an indispensable element in the daily lives of modern people. Position, navigation, and timing (PNT) information generated from GNSS is increasingly utilized in various fields such as traffic, environment, agriculture, communication, and security. GNSS technology is also contributing to create new markets as it is converged with other technologies like autonomous vehicles, unmanned aerial vehicles, and so on. In addition, as GNSS devices continue to become smaller and less expensive, and as location-based IT services expand, demand for GNSS devices as consumer goods also increases. These trends are expected to accelerate as new services require more precise PNT information and their applications become wider especially in the field of 'Big Data' analysis in connection with the Internet of Things (IoT) technology. On the other hand, as Europe, China, Japan, and India enter the GNSS field, which has been monopolized by the United States and Russia, the global growth of PNT services is also expected. In this study we identify technology convergence trends associated with GNSS. After constructing technology network using International Patent Classification (IPC) information of US patent, we calculate the convergence index, which can be measured by the Jini coefficients and the Rao-Stirling index to investigate the change of technology convergence trends. Then we explore emerging opportunities in the application of GNSS through the network analysis, which can measure eigenvector centrality and betweenness centrality of each of the technologies that make up the IPC network.