ファクターグラフを用いたシステム同定と応用
（Iterative Model Identification and Tracking using Distributed Sensors, and its Applications）

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<u>Abstract:</u> Model identification and tracking are the fundamental tasks in Wireless Communications systems. Especially, with the development of fifth generation (5G) or beyond 5G (B5G) communication system, accurate model identification is an indispensable part of such applications: geolocation, autonomous vehicle systems, information propagation network and agricultural monitoring, etc. The basis of model identification and tracking is that estimate the parameters related to the model and predict their behaving state through various kinds of measurements obtained from sensors.

In this talk, we focus on the obtaining of measurements from the distributed sensors because (1) compared to conventional stand-alone radars, distributed sensing systems are flexible to be implemented in practice without requiring large hardware cost; (2) the computational complexity of the algorithm conducted at the fusion center with an iterative manner, using the gathered messages from distributed sensors, is significantly reduced while keeping the appropriate accuracy of model identification. In terms of model identification, since the measured data sets obtained by the distributed sensors do not straightforwardly represent the system models, mathematical properties of the functions that connects the measurement and the parameters have to be taken into account. The algorithm we introduced is the factor graph (FG) approach which represents the functions. Since with a Gaussian message assumption, only mean and variance of measurements are required to be exchanged and updated at each iterative timing over the FG, the computational complexity is drastically reduced. For model tracking, we proposed a unified FG combined with Extend Kalman Filter (EKF-FG). The current state can be achieved by letting observation state output form model identification FG to refine the prediction state which is calculated from the previous state at each timing step.

We will, first of all, introduce the basic knowledge of the FG and sum-product algorithm (SP). Next, we will talk about the proposed iterative model identification and tracking method applied to the generic model. Then, we will demonstrate the effectiveness of the technique by applying it to geolocation and tracking. The performance of the proposed technique will be introduced by analyzing the simulation results. At the final part of this talk, we will conclude our current research work and give the future plans.