

Tugas v sistem pengaturan Formasi dan kolaborasi

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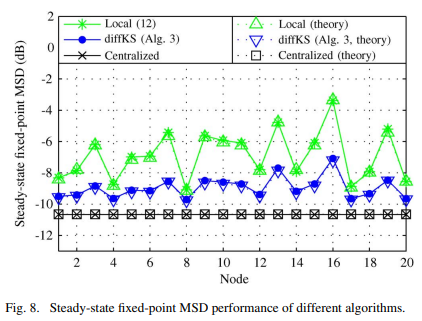
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1. Researcher investigates the problem of distributed Kalman filtering and smoothing, in which a set of nodes must collaboratively estimate the state of a linear dynamic system. Their primary emphasis is on diffusion strategies in which nodes only communicate with their immediate neighbors and information is diffused across the network via a series of Kalman iterations and data aggregation. Researchers investigate the problems of Kalman filtering, fixed-lag smoothing, and fixed-point smoothing, and propose diffusion algorithms to solve each one. Researchers investigate the mean and mean-square performance of the proposed algorithms, provide expressions for their steady-state mean-square performance, and investigate the convergence of the diffusion Kalman filter recursion. The proposed algorithms are then applied to the problem of estimating and monitoring the position of a projectile. Comparing our simulation results to the theoretical expressions, Researcher observe that the proposed method outperforms existing methods.

"Distributed Kalman Filtering" refers to a class of estimation algorithms that extend the traditional Kalman filter a popular algorithm used in many applications to estimate the state of a system in real-time for use in decentralized or distributed systems. This could be particularly beneficial in scenarios where you have a network of sensors spread over a large geographical area, and where it would be impractical or inefficient for all data to be sent to a central location for processing. In such a scenario, each sensor or node in the network could run its own Kalman filter, using both its own observations and sharing information with neighboring nodes to improve the quality of the state estimates.

The term "Diffusion Strategies" in the context of distributed estimation often refers to a particular method for sharing and combining information among nodes in a network. Instead of only sharing raw sensor data or final state estimates, nodes might share intermediate computational results. These shared intermediate results, when properly combined, can improve the quality of the state estimates compared to other methods. This is especially the case in networks where communication bandwidth is limited, or where privacy and security considerations make it undesirable to share raw sensor data.

"Smoothing" typically refers to techniques used to refine estimates of a system's past states, given all the data up to the present time. In a traditional Kalman filter, the filter estimates the current state based on all previous data, a process known as filtering. A smoother, on the other hand, estimates the state at some past time based on both past and future data. This can often lead to more accurate estimates, at the cost of additional computational complexity and the need to store and process future data. The result of this paper shows that the algorithms for diffusion kalman filtering, fixed-point smoothing, and fixed-lag smoothing have been analyzed the convergence and provided steady-state mean and mean-square analysis.



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Description automatically generated

1. There are 3 nodes or agents that are accounted for by a measurement model.

value will always be updated through the equation.

We can change equation above to

Where is the sum of the identity matrix to the Laplacian matrix of the graph ( is a graph whose relationships between *nodes*).

and itself can be obtained from

It can be seen from the explanation above that and will affect the response of the nodes. The selection of the value of the two cannot be done carelessly. To achieve convergent values, it is necessary.

example, graph is a graph with three *nodes*  connected by two *directed edges* . The assumed *weight* for each *edge* are 0.5 and 0.6 then, . Determined

dan

Simulate in MATLAB, assumption the initial state 0.1, 1, 0.4 respectively.



*The state* of each *node* will eventually converge after several iterations. This is because the highest eigenvalue of the matrix , 1.6568. If weight become 0.8 and 0.8



Changes in *the state* of each *node* no longer converge. Finally, give weight 0.2 and 0.3.



State changes again converge with smoother changes. Although the iterations required to reach convergent values are a bit slower.

1. In the Input-Output problem, we divide the graph into two groups, namely the floating node group and the I/O group node.

a).

dan

Then,

dan

Then, we calculate the dynamics using the help of MATLAB and getting results.



indicates unstable or convergent dynamics. Although the graph used is controllable.

b).

dan

Then,

dan

Then, we calculate the dynamics using the help of MATLAB and getting results.



shows dynamics that cannot be said to be unstable but also unstable. The value of each *state* rises and falls around the value.

1. System in

will become uncontrolled if it is symmetric input. symmetric input where the graph will be a symmetric input if and only if there is nonidentity automorphism for So that the input indicator vector remains invariant in the process.