

Highlights

- ▮ **Complex dynamic network model of DSS:** the discretized structure system (DSS) can be regarded as the complex dynamic network, in which the discretized elements are chosen as the dynamic nodes and the time-varying stiffness as the dynamic link relations between them;
- ▮ **Dynamics of stiffness:** The dynamical model of stiffness variation is regarded as the behavior of link subsystem, which is represented by the differential equation coupled with the displacement and velocity state of discretized elements, which is seldom shown in the existing literature;
- ▮ **UUB Stability of nodes by the stiffness dynamics:** In case of the external force is loaded, the coupled term in stiffness variation dynamics is mathematically synthesized to influence the elements achieving the uniformly ultimately bounded (UUB) stability in Lyapunov sense, which is seldom discussed in the existing literature.