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# Load control algorithms for adaptive structures

Problem statement

Multi parameters systems are defined as having more than one parameter that can influence the systems behaviour. Here the effect of adding a second independent load parameter was analysed. Such systems have more complex equilibrium states and thus also require more advanced path following techniques.
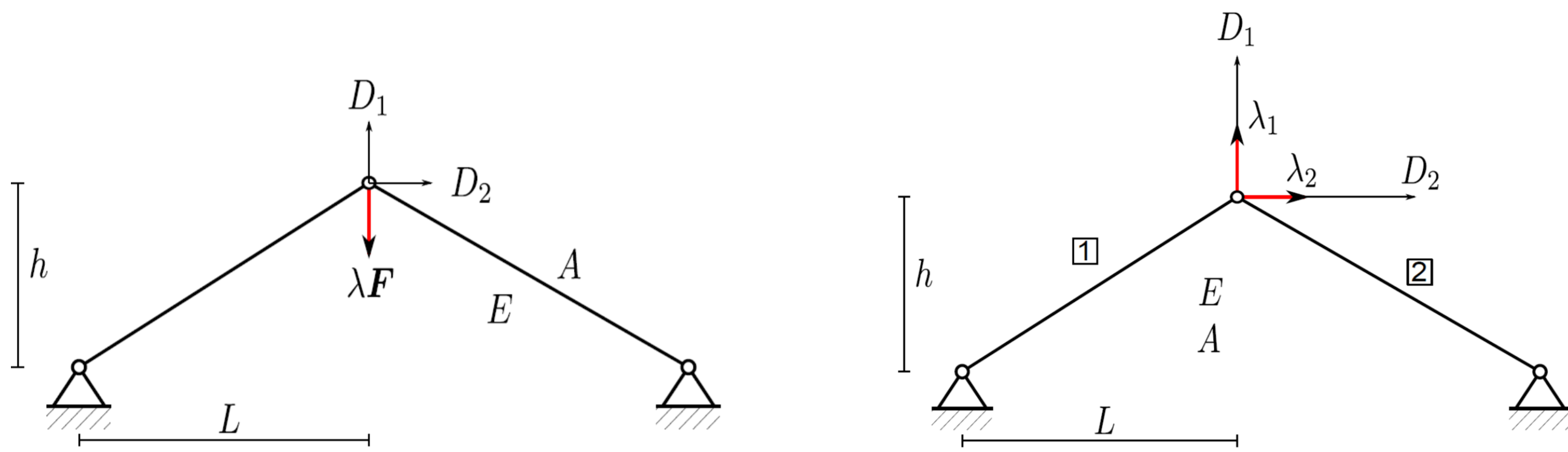

Single vs mult-parameter systems: Each load component is scaled by an independently variable load scaling parameter.

Equilibrium surfaces

- The equilibrium state is transformed from a path to an equilibrium surface in four dimensional space
- Two visual configuration are used to represent this surface
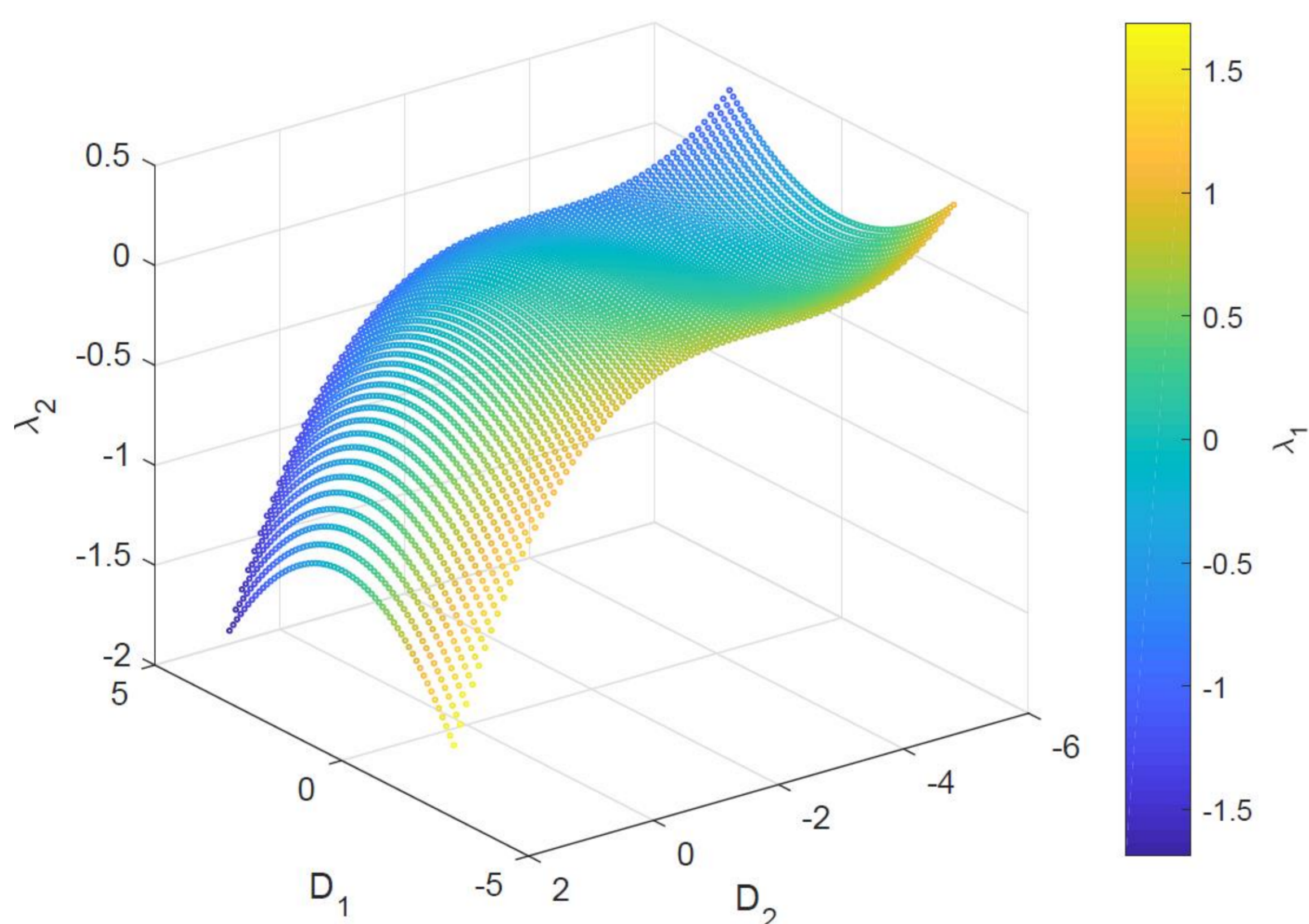
Equiliubrium surface portrayed as a function of both displacements and one load variable. Fourth dimension represented through colour gradient scheme.
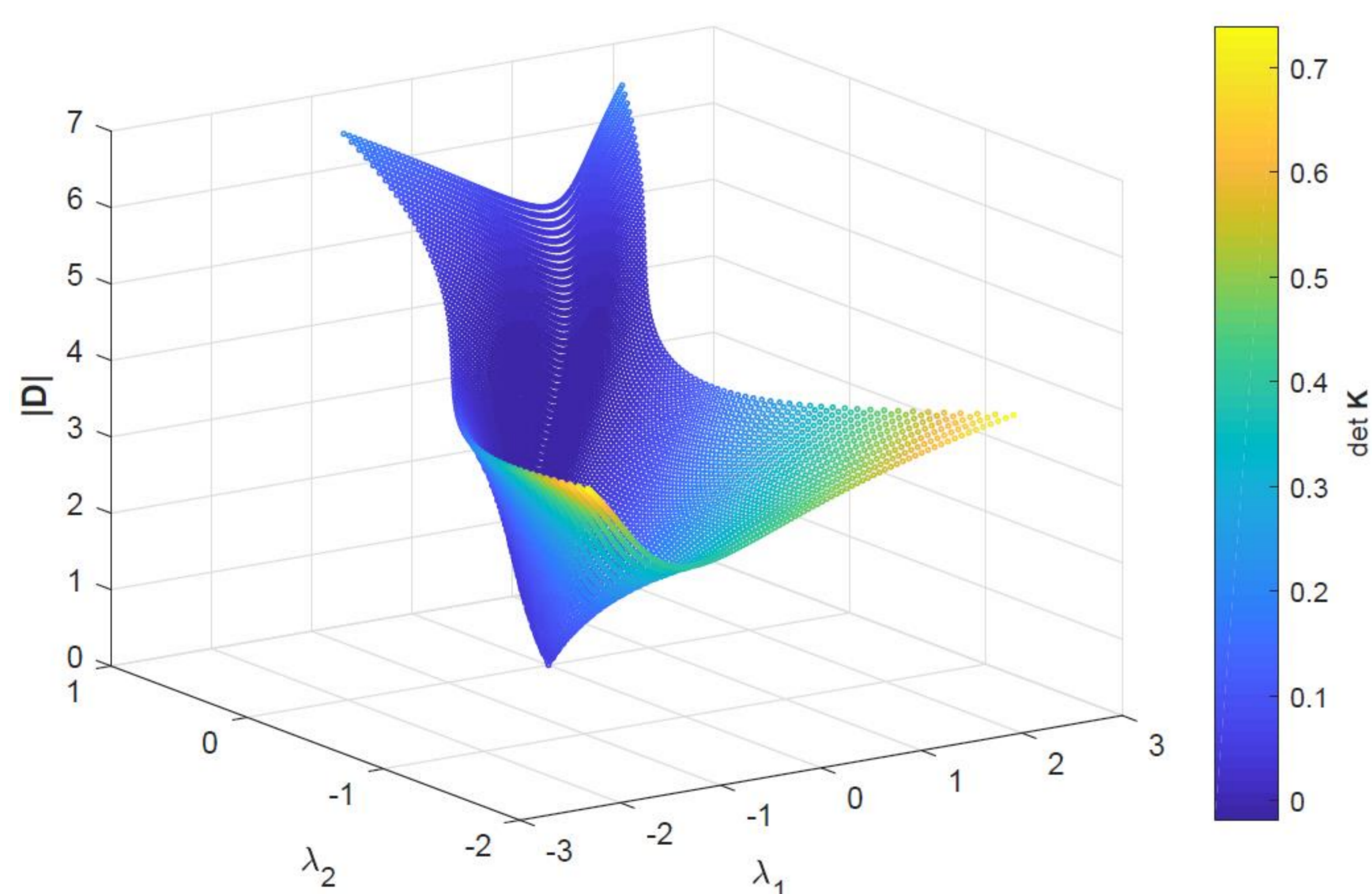
Equilibrium surface illustrated by considering the load scaling parameters and the magnitude of the displacement vector. Fourth dimension is allocatable for system variables.
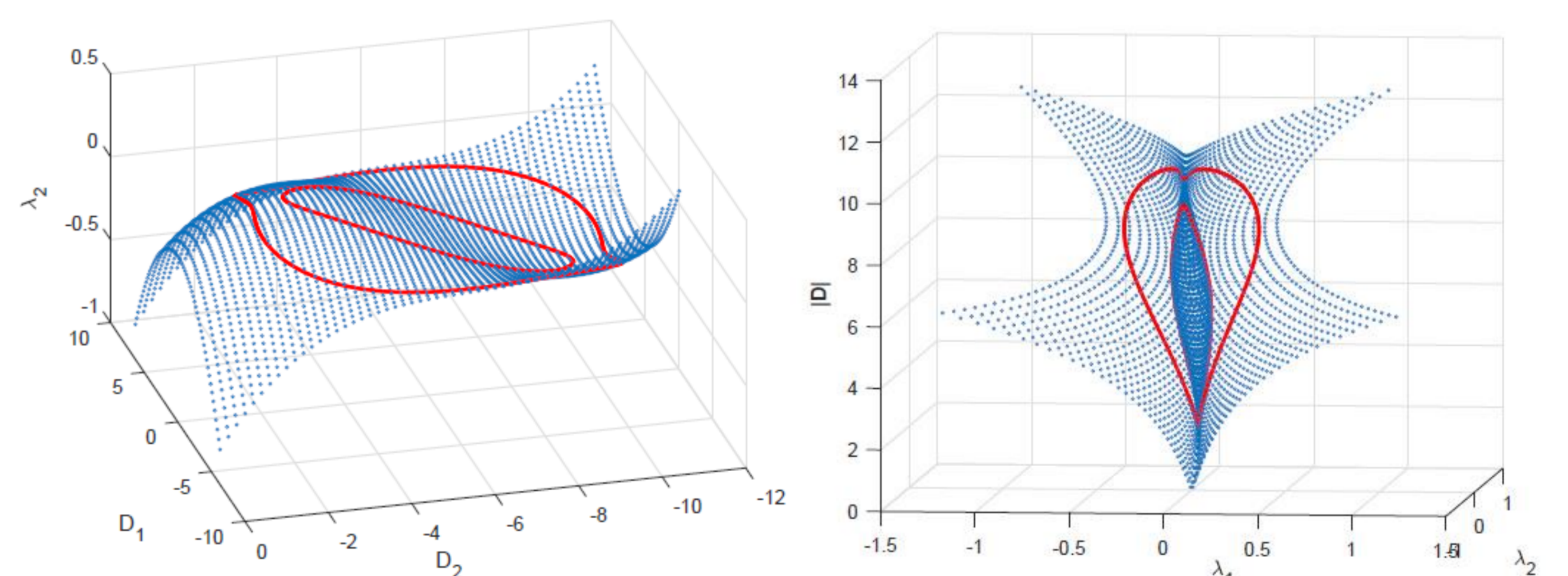
Multi-parameter tracing algorithm examples

- **Load control algorithm**
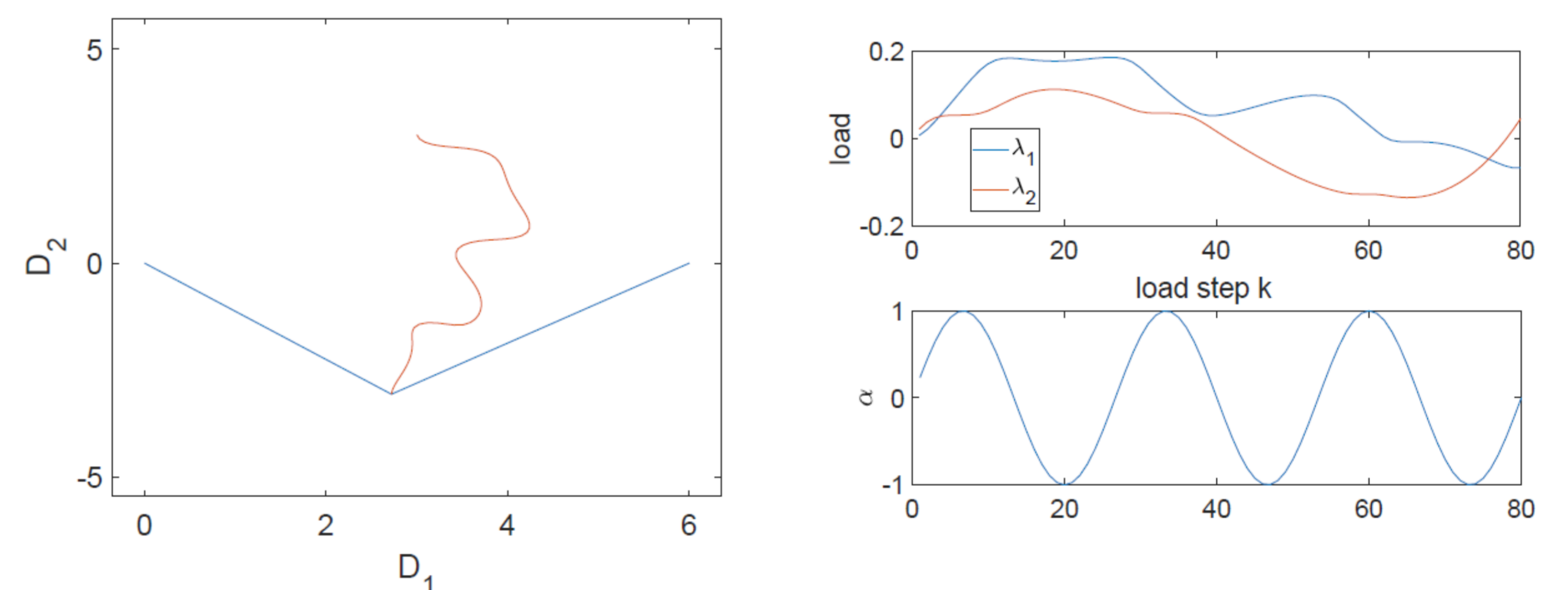
Control the relative change of the load increments in the form of a sin function by varying α between -1 and 1.

- **Critical boundary tracing algorithm**

Tracing both critical boundaries for a pyramidal truss arch using a combination of extended systems and the arc length equation for multi parameter systems.
Left: Visualisation of all variables
Right: Using the magnitude of the displacement vector

Literature

- Mohamad Rezaiee-Pajand, B.M.(2013). Stability boundaries of two-parameter elastic structures. *International Journal of Solids and Structures*

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