
Detecting the location of damaged components in MDOF structural using the transmissibilities of NOFRFs at super-harmonic

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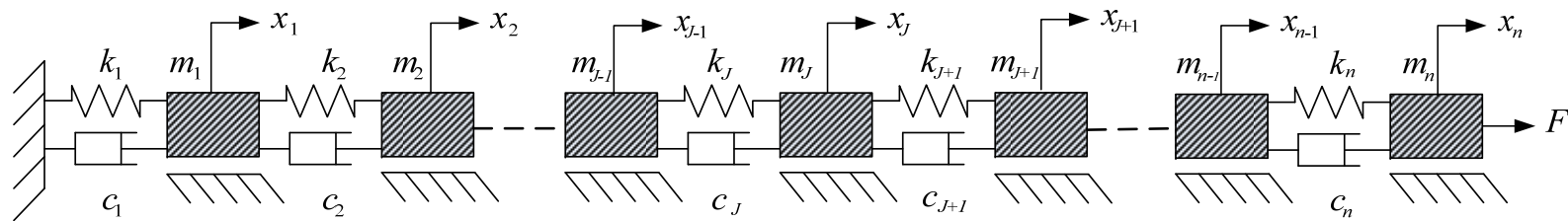
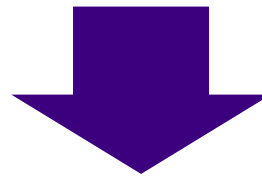
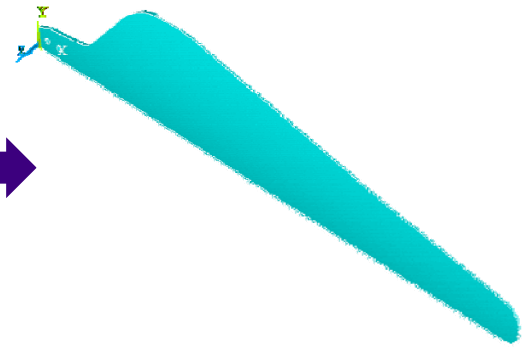


Contents

- **MDOF systems and their simplified models**
- **Possible faults in MDOF systems**
- **Detecting the location of damaged components**
- **Case study on cracked cantilever**
- **Conclusions**



MDOF systems and their simplified models



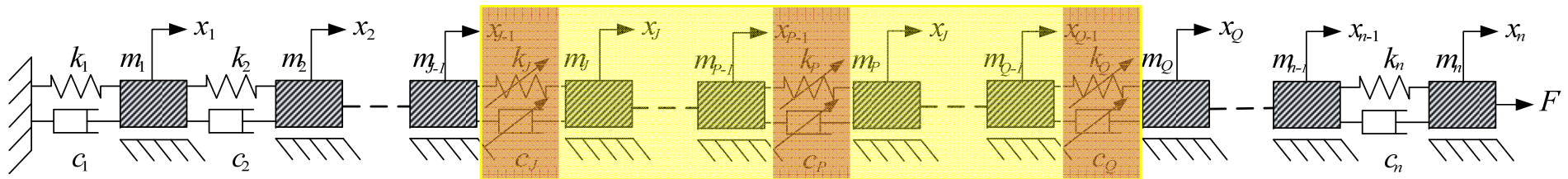
Possible faults in MDOF systems

If certain damage happens in MDOF system, it may behavior linearly or nonlinearly. In my case I am considering the damage which can be modelled nonlinearly by stiffness, such as cracks.



Possible faults in MDOF systems

All above MDOF system with nonlinear fault can be simplified as the following nonlinear lumped mass-spring model



The aim of my research is to find the location range of the damages



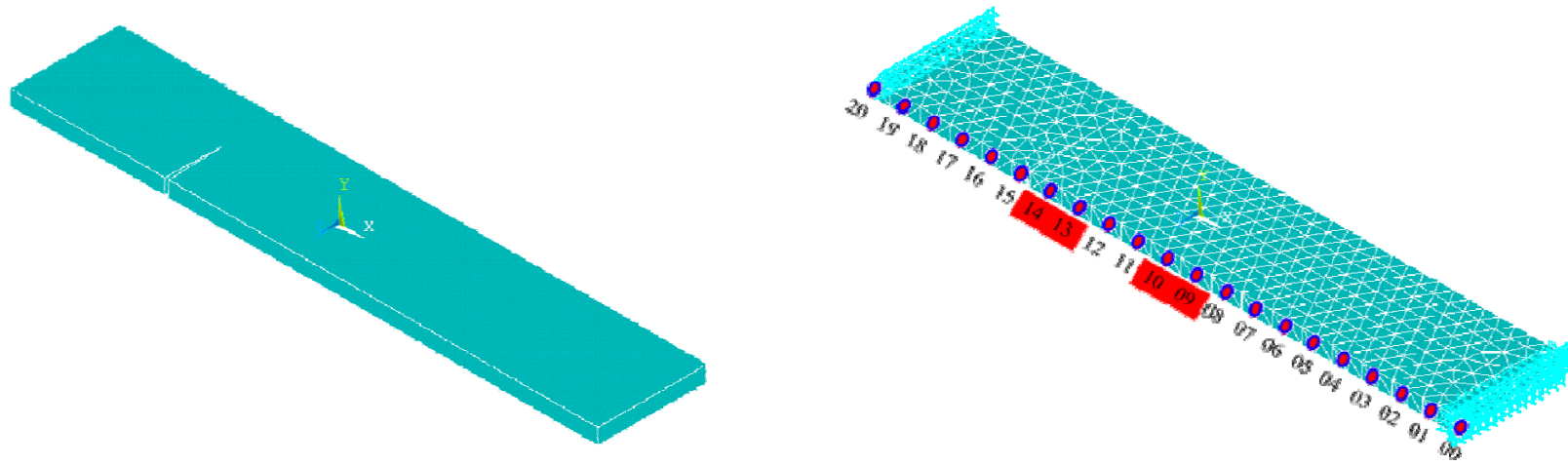
Detecting the location of damaged components

$$D_i = \left| \left\{ \frac{X_i}{X_{i+1}} \right\}_1 - \left\{ \frac{X_i}{X_{i+1}} \right\}_2 \right|$$

If the index is equal to zero, both the i th mass and $(i+1)$ th mass are not connected to nonlinear component, or else the $(i+1)$ th component may be nonlinear



Case study on cracked cantilever

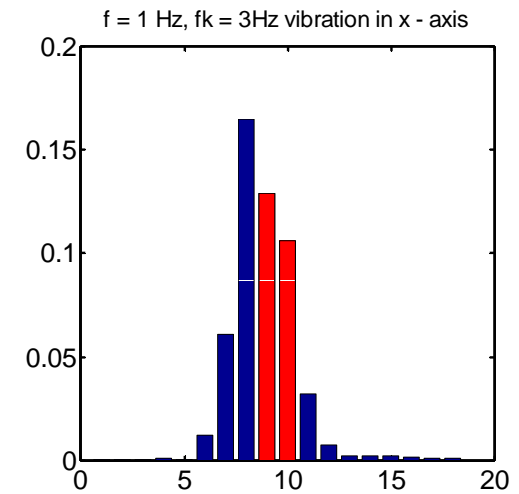
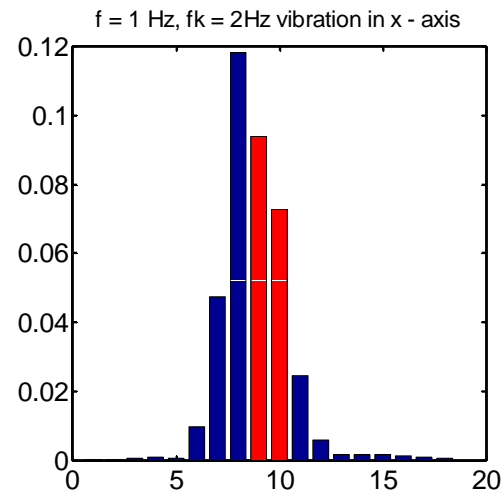
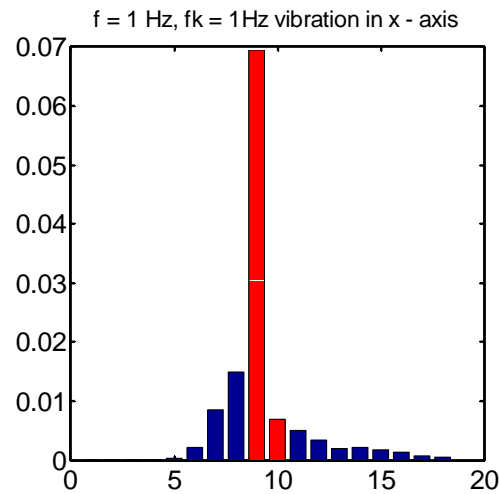


Location of measurements	0.0375	0.075	0.1125	0.15	0.1875	0.225	0.2625	0.3	0.3375	0.375
Number	1	2	3	4	5	6	7	8	9	10
Location of crack									0.35	
Location of measurements	0.4125	0.45	0.4875	0.525	0.5625	0.6	0.6375	0.675	0.7125	0.75
Number	11	12	13	14	15	16	17	18	19	20
Location of crack			0.5							



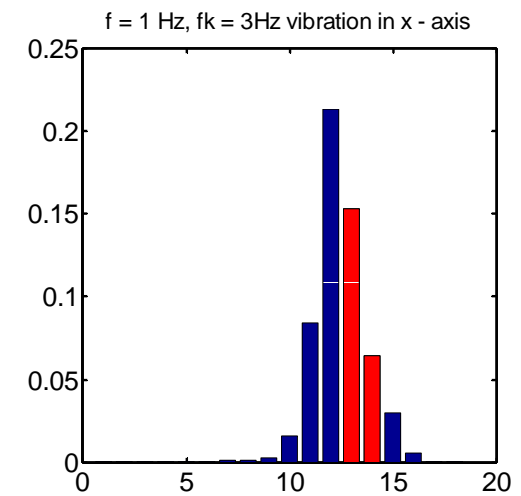
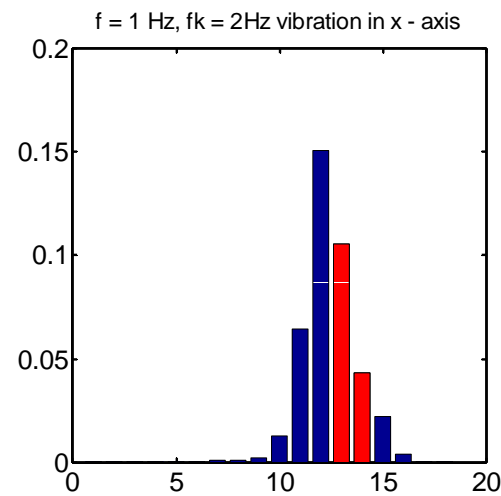
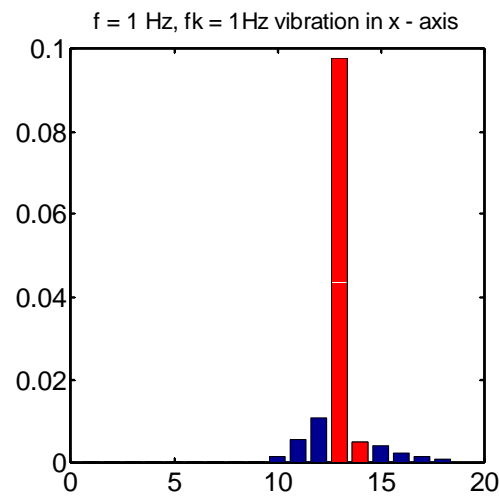
Case study on cracked cantilever

When location of crack = 0.35



Case study on cracked cantilever

When location of crack = 0.5



Conclusions

- **The proposed technique can indicate the location range of damaged component roughly.**
- **It is quite easy to conduct the proposed technique.**



Thanks for listening



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Slide 11