

"Source-filter" Model

- Musical instruments
- Speech



"Filter" => a linear time-invariant system

A bit about LTI systems...

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Example: the Guitar

Source = Plucked String

=> Periodic vibration

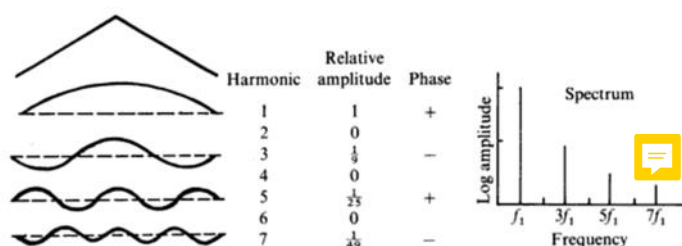


Fig. 2.5. Frequency analysis of a string plucked at its center. Odd-numbered modes of vibration add up in appropriate amplitude and phase to give the shape of the string.

From: Rossing & Fletcher, Principles of Vibration and Sound

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Filter = Guitar body

=> Sympathetic vibrations according to its resonances

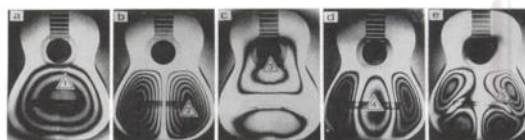
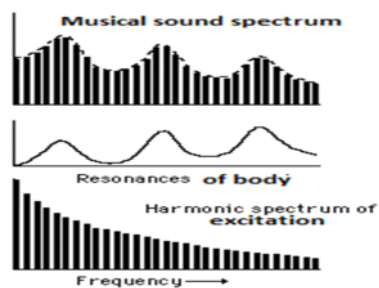


FIGURE 9.8. Vibration modes of a classical guitar top plate glued to fixed ribs but without the back (Jansson, 1971).



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Applications: sound transformation



Note: in most cases, source and filter are strongly coupled.