

The questions which I discuss in the Blog last few days arised out of the discussion with Grisha (Vekstein) He asked me the question:why momentum propagates in the string if every point makes just vertical oscillations. The answer is that there are densities oscillations which move along; this is easy to see for the string : see below. Instead answering in this way the question I decided "to touch the left ear by right hand": I considered a string as circular ring of BIG radius and using circulant matrices calculated normal modes,e.t.c. This way seems to be stupid, however the linear algebra which appear is interesting (Hadamard matrices, eigenvectors in \mathbf{C} of circulant matrices) and I will return to this question. However consider the simplest case:

Let string osillates :

$$\frac{d^2x}{dt^2} + \frac{k}{m}x = 0, \text{ then } x(t) = A \cos \omega t + B \sin \omega t,$$