Spatial and Temporal coherence

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Spatial coherence is a concept of wave disturbance describing the correlation between periodic transmitted energy (wave signals) from one point to another; it can also be said that it is a mutual interdependence or connection of variable wave quantities of two different points in a given instant of time; the coherence is presented as a function of distance and mapped as correlation against an absolute distance between points in question.

While spatial coherence is concerned with the phase correlation of waves in different observation points, **temporal coherence** entails the phase correlation of waves at a given point in space at two different instances of time; it is the measure of the average correlation between the value of a wave and itself delayed by a certain period of time depicting the characteristics of how well a wave can create an interference with itself. The delay on which the correlation effect is emphatically low is denoted by the degree of $\tau_c$ (coherence time)\[3\], a state at which there is a significant shift in amplitude.

**Michelson–Morley experiment**

Showing Temporal Coherence

When one of the mirrors is moved away gradually, the time for the beam to travel increases and the infringes become dull and finally are lost

**Young's interference experiment**

---- Showing spatial coherence

If the space between the two slits is increased, the coherence dies gradually and finally the infringes disappear

Ø References

1. Interference and coherence definitions [Online source]

2. Interference and Coherence applet [Online source]
   Url: http://serc.carleton.edu/NAGTWorkshops/deepearth/activities/40826.html

3. Temporal and spatial coherence definitions [Online source]

4. Interference description [Online source]
   Url: http://www.physicsclassroom.com/class/waves/u10l3c.cfm