

Holographic Interferometry(H.I)

- The laser was used to create 3-dimensional images called holograms
- The “weird pattern” that came from the movement of the setup in the laser system led to the development of H.I
- These patterns record the actual motion of the object has experienced

Holographic Methods

- The diagram shows the methods to making a hologram and the second diagram is used to create the holographic interferometric patterns using the hologram created from the first diagram

Experiment: The interference created by PZT (Piezo electric tube)

- The main objective of the experiment is to use a PZT to create a deformation and record the deformation on a hologram
- The setup is similar to the holographic methods
- The path lengths of the reference beam the object be the same to maintain the coherence of the laser.
- In order for the light to interfere and create a hologram it must be coherent.
- The next diagram show the setup used to connect the PZT and also the result obtained at different voltage levels
- As the voltage is increased the number of wavelength increase and vice- versa
- The final diagram shows a detailed explanation of what happens when the dark and light patterns are generated

ESPI (Electronic Speckle Interferometry)

- This methods can be used to obtain interferometric patterns same as holographic methods.
- This methods uses speckle patterns to generate results
- The comparison shows the result from both the methods. From this diagram, holographic Interferometry has a more digitized output compared to ESPI

Comparison between ESPI and holographic Interferometry

Characteristics	H.I	ESPI
Recorded Information	field of waves of the object	granularity of the surface
Information results from	Interferometry of two reconstructed states of the object	electronic speckles two speckle patterns
Measuring range	20nm to 25nm	50nm to 10nm
Recording media	holographic plate	CCD sensor
Light source	laser	laser
Evaluation method	with computer using phase shift methods	
Time for recording and evaluation	a few seconds to a minutes	few seconds

Application of H I

Disadvantages of holographic Interferometry methods

- As with most sensitive equipment, small movements in the atmosphere can cause the deformation of the object to turn out incorrectly
- The range for measuring the displacement is fixed

Conclusion

- The first impression, H.I seems to be application for only testing various situations in which an object can experience
- H.I is also applied to many other fields such as art and other areas not related to the engineering scope
- Machines, materials and even structures have been tested with HI. The results from these methods are used to improve the efficiency and the standards at which machines, structures and materials are made.
- The laser is a powerful ally in the development of technology, and this is evident in the use of laser in holographic Interferometry

References

- <http://www.ee.washington.edu/lasers/ee48896/projects/ke11/report/report.htm>
- <http://www.chemeng.ed.ac.uk/people/henry/masstran/cdg/cdgintro.html#holog>
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