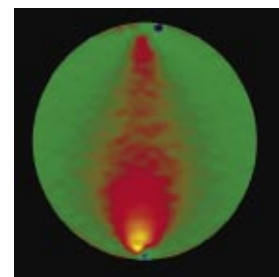
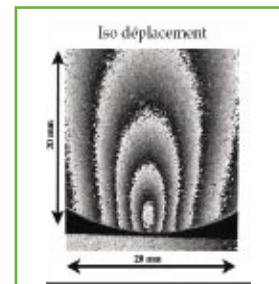
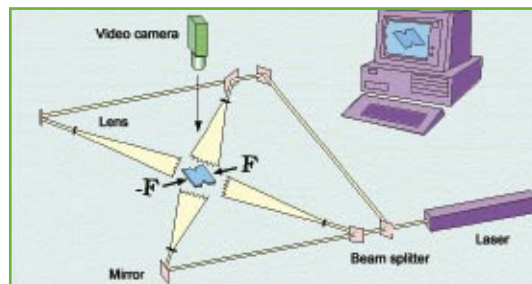




Stress analysis using speckle interferometry

Principle

Based on speckle interferometry, this technique uses the coherence properties of laser beams and enables a non-contact full field approach to viewing micro-displacements on the surface of an object with great accuracy (resolution of $0.1 \mu\text{m}$). Recording is directly onto a CCD camera, and the sample can be viewed in real time on the video monitor while the stress is being applied. Mechanical deformations are obtained by image processing (spatial derivation) from the displacement map. The strain tensor is then determined at every point on the surface using a given strain-stress relationship.

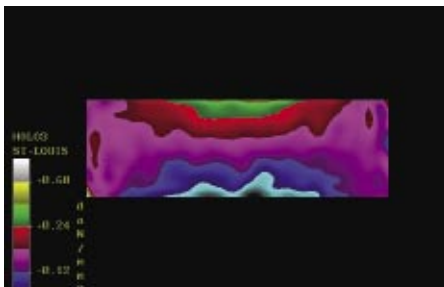
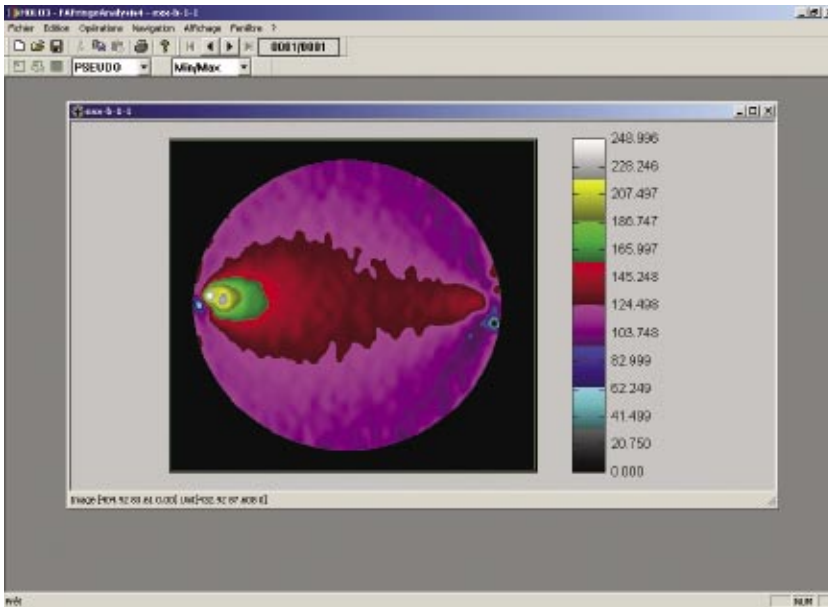


Applications

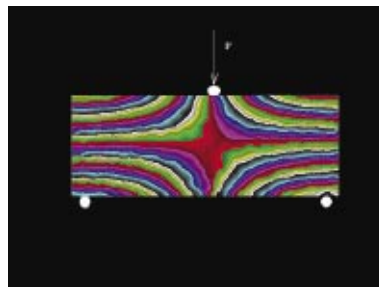
- Validation of Finite Element Modelling
- Analysis of strain-stress relationship
- Viewing behaviour of mechanical assemblies
- Measuring stresses near a contact point
- Behaviour of mechanical connections
- Detecting the plasticity threshold
- Testing the mechanical behaviour of prototypes
- Measuring thermal expansion
- Practical work benches for schools

Image processing

- Image grabbing on a PC using a video card
- Windows software with the following functions:
 - Grabbing, storage and manipulation of images
 - Filtering, masking and geometrical operations
 - Interpretation of interferometric images
 - Special mechanics functions (deformation, stress)
 - Arithmetical and logic operations
 - Open software: possibility for the user of deploying new functions.



σ_{xx} term of the stress tensor.



Iso-déplacement map in x direction.

Characteristics

- 2D displacement field normal to the camera optical axis
Possibility of measuring the 3D displacement field on request
- Strain tensor at each point on the analysed surface
- Stress tensor in the case of isotropic elastic behaviour.
Other stress-strain relationship can be implemented
- Principal stresses, Von Mises ...
- Results presented in the form of vector fields or false-colour images
- Iso-displacements can be viewed in real time while stress is being applied to the object
- Maximum surface analysed: 50 x 50 mm to 1 x 1 m according to the laser used
- Resolution : 0,1 μm .
Spatial resolution: 582 x 752 pixel field
All kinds of materials can be analysed

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