Research Proposal Presentation

Development of measurement techniques of stress-strain state of lifting machinery components

Centro Interdipartimentale di Studi e Attività Spaziali «G. Colombo»

Scuola di Dottorato in Scienze Tecnologie e Misure Spaziali (STMS) CICLO XXXIII

Curriculum: Misure Meccaniche per l'Ingegneria e lo Spazio (MMIS)

LORENZO CAPPONI

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Tutor: Prof. Gianluca Rossi

Overview of the presentation

- Objectives of the research
- Collaboration with the Industry
- Issues related to lifting machinery
- Standard measurement methods e development
- Summary of three-years doctoral research activity

Research Proposal

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PhD Student: Lorenzo Capponi

Main objective:

Development of measurement techniques of stress-strain state of lifting machinery components

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Intermediate objectives:

- Innovative measurement chain
- Innovative data acquisition and management software

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Number of emploees: 22 000 Revenue: 7.3 billion (US$)

President: Matthew Fearon

Senior Director Umbertide: Francesco Aiello

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United States
Australia
Brazil
China
France
Germany
Italy
Japan
Netherlands
Russia
Singapore
South Korea
Spain
Sweden
United Arab Emirates
United Kingdom

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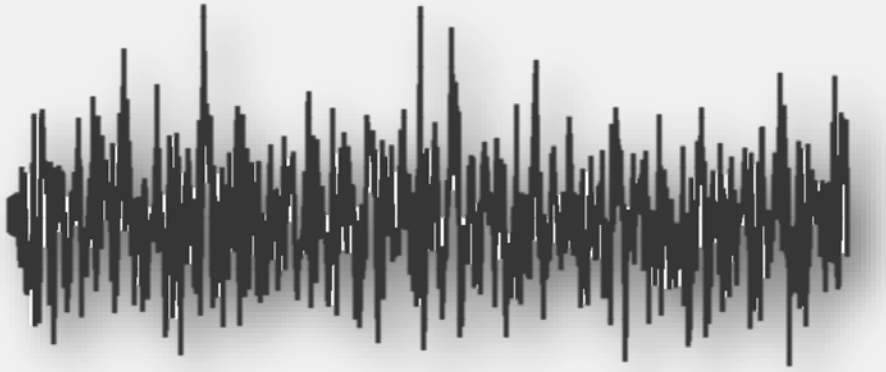
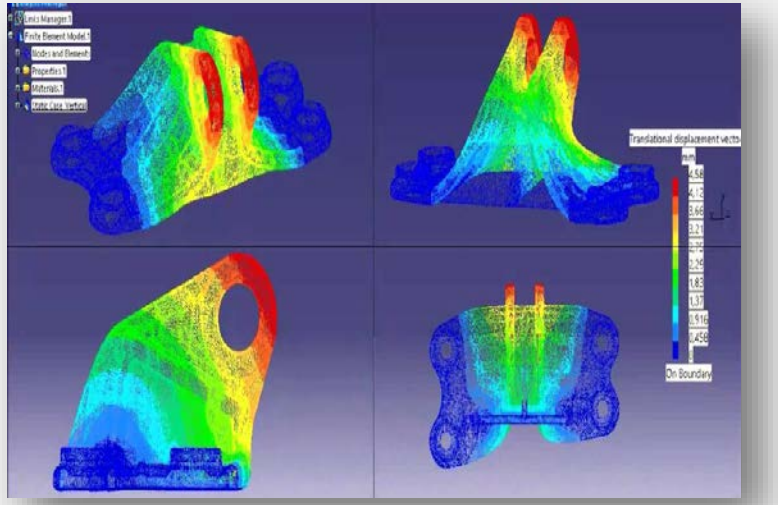
MATTER OF INTEREST



Vibrations



Stress-Strain State

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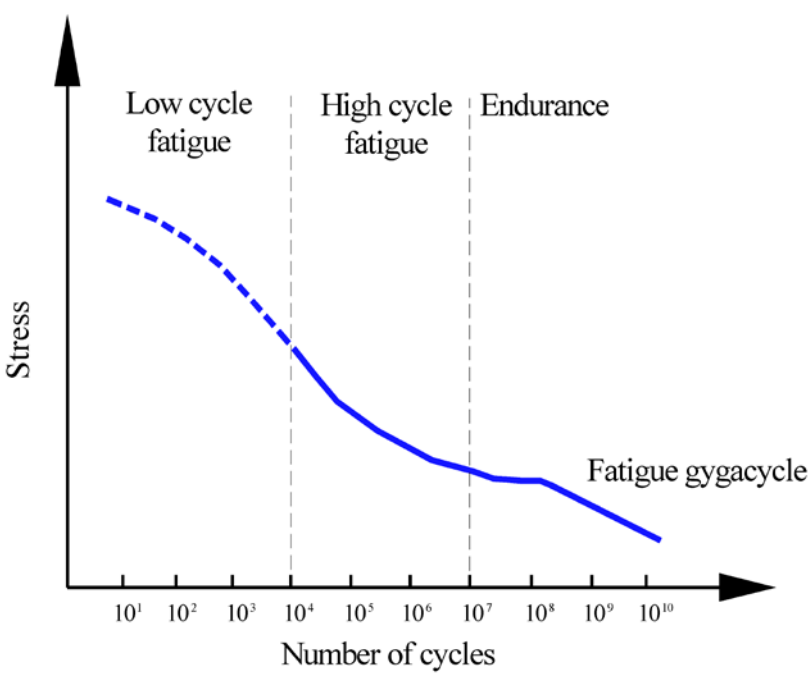
MAIN ISSUES



Fatigue Life

Comfort and noise analysis

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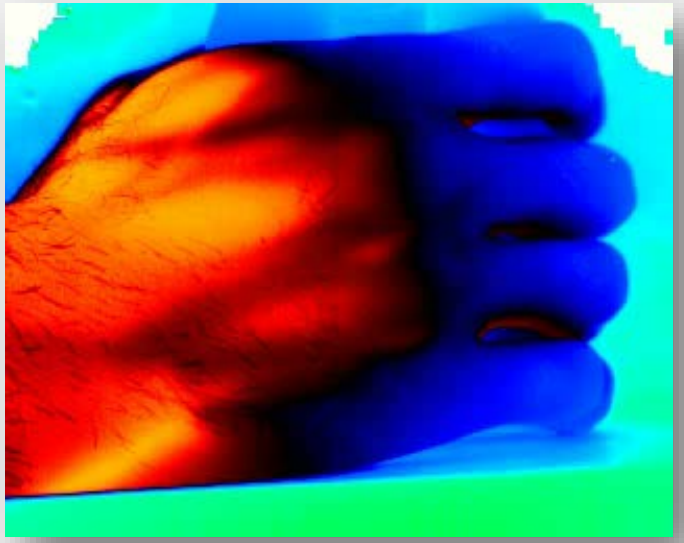
Thermoelastic Stress Analysis

$$\Delta T = \frac{-\alpha\, T}{\rho\, C_p}\ (\Delta\sigma_x + \Delta\sigma_y)$$



- α = Thermal expansion coefficient
- C_p = Specific heat
- ρ = Density
- T = Absolute Temperature
- $\Delta\sigma_{i,j}$ = Variation of surface tension in two orthogonal directions lying on the surface

Hypothesis:

- Isotropic, homogeneous and linear elastic behavior
- Adiabatic processes

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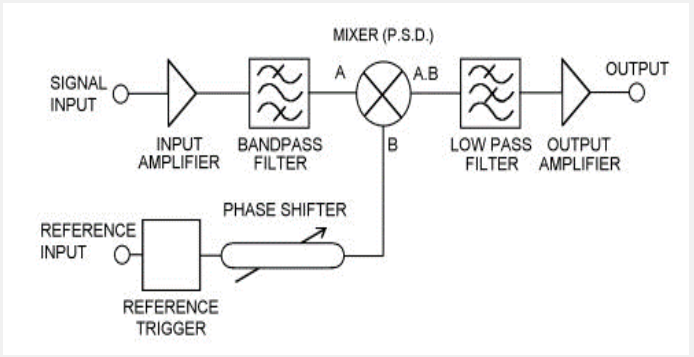
Thermoelastic Stress Analysis

Thermal Camera



Signal-Processing: Lock-in Amplifier

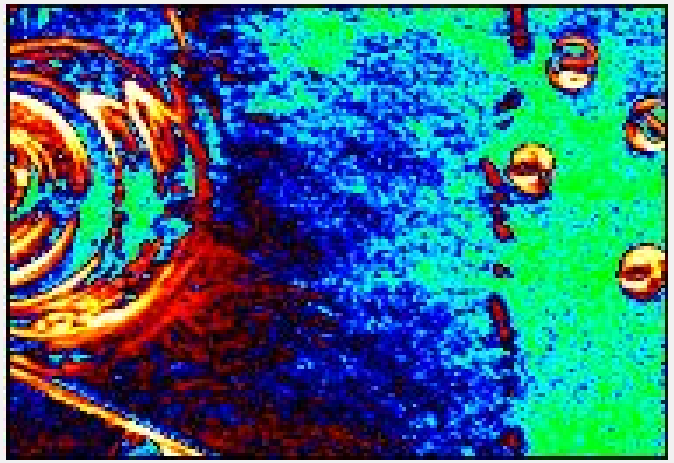


Image Analysis

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GOM Metrology System

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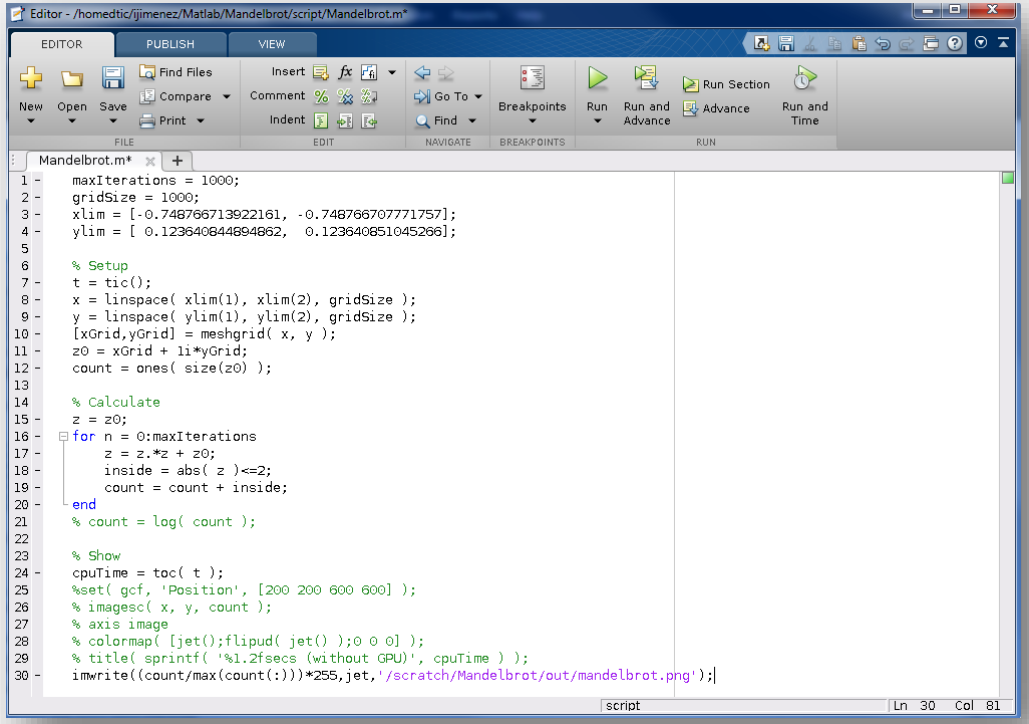
DEVELOPMENT



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PRELIMINARY STEP

- DEPTH STUDY OF THEORY
- ANALYSIS OF LIFTING MACHINERY
- APPLICATION OF STANDARD METHODS

DEVELOPMENT

- INNOVATION OF TEST BENCH
- MEASURING
- DOCTORAL COURSES, SEMINARS, CONFERENCE, EXPERIENCE ABROAD

RESULTS

- DATA ACQUIRED ANALYSIS
- WORKING ON RESULTS
- WRITING THESIS

Grazie per l'attenzione