

INVESTIGATING MAINTENANCE-FREE SOLUTIONS THROUGH SOFT METAMATERIALS BASED ON BIOMIMICRY AND ANTIFRAGILITY PARADIGMS

MSc. Graduation Project – Mechanical Engineering / Industrial Design Engineering / Civil Engineering

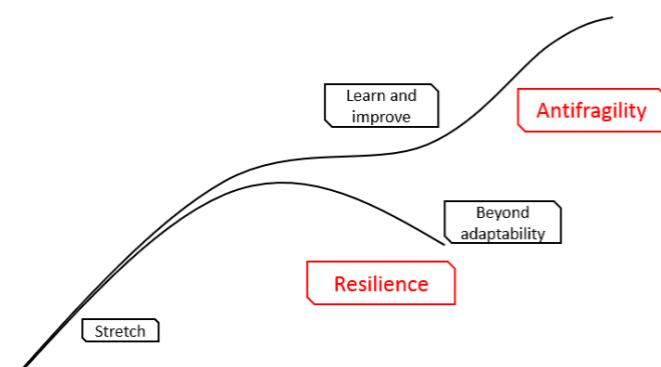
“Some things benefit from shocks; they thrive and grow when exposed to volatility, randomness, disorder, and stressors and love adventure, risk, and uncertainty” Nassim Nicholas Taleb

Objective

The main objective of the assignment is to investigate, design and fabricate novel soft metamaterials that could help engineers and designers in creating maintenance-free solutions bio-inspired and self-adaptive, following an Antifragility-based approach.

The problem and the opportunity

Biomimicry is the study of emulating and mimicking nature, where it has been used by designers to help in solving human problems. Biomimicry argues that nature is the best, most influencing and the guaranteed source of innovation for the designers as a result of nature's 3.85 billion years of evolution, as it holds a gigantic experience of solving problems of the environment and its inhabitants. Learning by nature, men have developed a wide range of novel materials, with unconventional properties, from materials with negative Poisson's ratio to super lenses that go beyond the diffraction limit. On the other hand, over the last decades, the world of engineering is facing a big technological revolution, where technical systems are becoming more complex. Antifragility Engineering is based on the principle that shocks and perturbations can make the system stronger. By following the principles of Antifragility, the designer can actively reduce the need of maintenance actions during the life time of the system.



Research objectives

Studying the state of the art of soft metamaterials and their possible applications for reducing or cutting to zero maintenance operations in specific industrial sectors, the research will focus on designing possible self-adaptive / responsive materials inspired by nature. The final goal is to achieve new material/system able to go beyond normal operation boundaries, learn from unexpected events and become stronger.

Student Profile

For this assignment we are looking for students who are proactive, analytical and out-of-the-box thinker. She / he has to be able to analyse, explore and find possible applications in different industrial sectors.

Supervision

University of Twente:

dr.ir. Vanessa Magnanimo (v.magnanimo@utwente.nl) – room N 223 / dr.ir. Alberto Martinetti (a.martinetti@utwente.nl) - room W 247)