



Master in Photonics – “PHOTONICS BCN” Master ERASMUS+ “EuroPhotonics”

MASTER THESIS PROPOSAL

Dates: April 2020 - September 2021

Laboratory: C4 – Robotics Lab & D4 Photonics Lab
Institution: UPC, Universitat Politècnica de Catalunya
City, Country: Barcelona, Spain

Title of the master thesis: Photonics Nano-Sensors for Collaborative Robots

Name of the master thesis supervisor and co-supervisor: Sandra Bermejo, José A Lázaro, Ramon Bragos

(for external proposals a co-supervisor from the program is needed)

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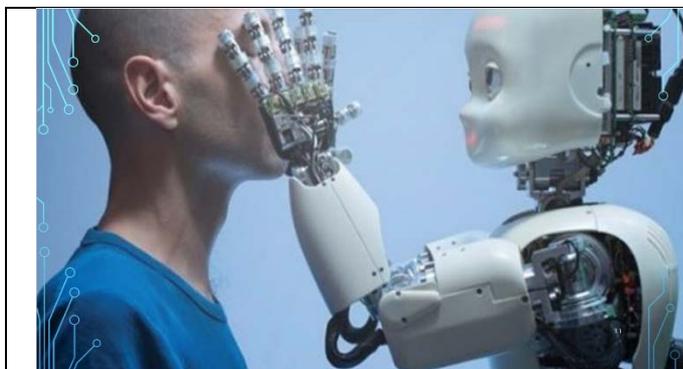
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Keywords: Photonics, Nano-Sensors, Bio-robotics, Collaborative Robots

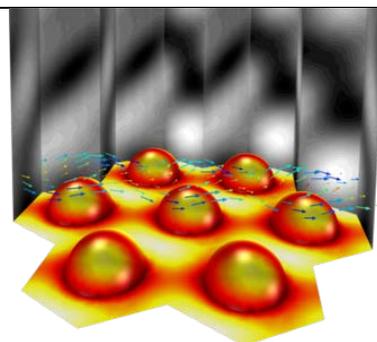
Summary of the subject (maximum 1 page):

Collaborative Robots are developing touch sensitivity in order to be collaborate with humans, take care of them, etc. opening the door to a robot-human collaboration future (Fig A). Several technologies are contending on providing this touch sensitivity. Softness, precision, speed of the sensor, are key figures of merit for the alternative technologies.

Photonic technologies are also showing a promising alternative by nano-structures of different materials a gold, silver or more modest and cheap, silica (Fig B).



A) Providing touch sensitivity to Collaborative Robots with Photonic Nano-Sensor



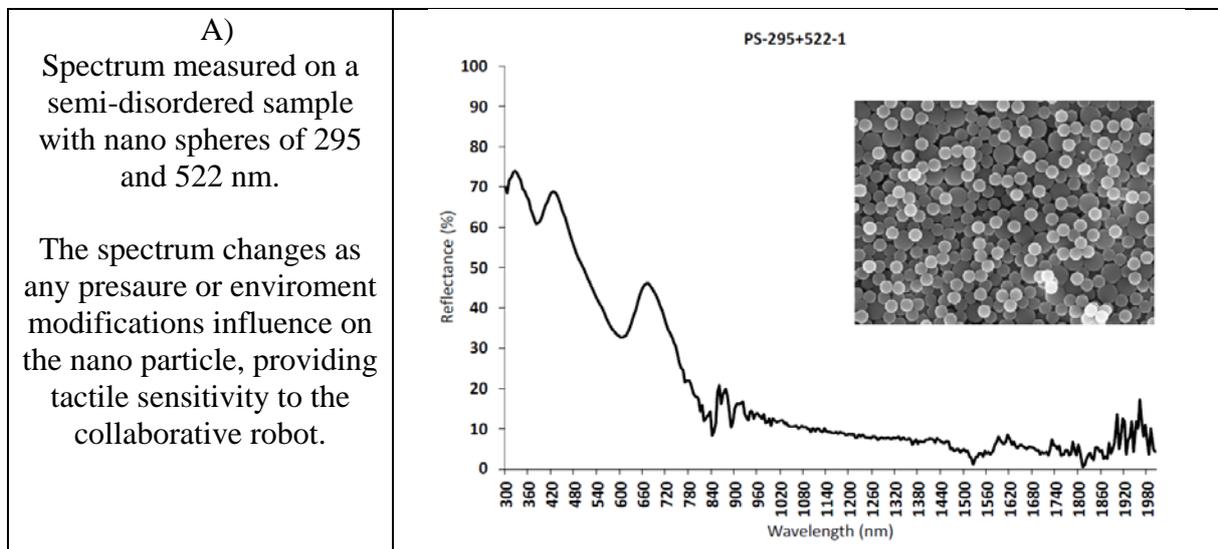
B) A plane wave is incident on a reflecting hexagonal grating. (Comsol©)



This project focus on developing this “Touch Feeling” for Robots.

Here different technologies collaborate:

- the Clean Room facilities for fabricating the Nano-materials (Inlet Fig C)
- Photonics simulations (as in Fig B) for predicting the size of the required nano-particles
- Lab measurements (as in Fig C) for detecting transmission or reflection spectra changes “sensing” pressure and other environment changes.
- Also Artificial Intelligence providing the Robots with the “Touch Feeling” from those sensors.



You can decide what aspect attracts you more.