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STRUCTURED LIGHT AND ITS APPLICATION

Franco-Finnish Workshop

Research topic: **Physics**

Place: **Tampere University**

Institutions involved: **Tampere University, Centrale Marseille**

Dates: **03/11/2021** to **05/11/2021**

Program: **Maupertuis Programme**

PRESENTATION

The topic of this workshop was “structured light”, which is the study of the tailoring of light to convey to it an interesting and/or desirable structure in space and/or time. Structured light has been the subject of an extensive and extraordinary research effort during the last decades, following the invention of the laser in 1960. This work has resulted in many stunning applications, such as optical tweezers for manipulating cells and particles with light, optical guiding of atoms, novel imaging techniques, light carrying orbital angular momentum, laser material processing (such as welding, cutting, and drilling), and several others in different fields of photonics, and, more generally, applied physics. In addition, the field of structured light has also been applied in the quantum optics domain, where structure is used as a quantum information carrier. Although much seems to have been already achieved, this is but the tip of the iceberg, as this research field still offers enormous possibilities to find new applications and fundamental discoveries. At the workshop, the latest developments of the participating groups were presented and discussed with the intention of serving as a seed for future collaborations and joint projects.

ACTIVITIES AND OUTCOMES

Many of the main research groups working on the topic within both countries were able to participate and discuss about research and educational collaborations, as well as about interactions with the industrial world. In addition to oral presentations by members of each group, the event also included poster sessions, group discussions, and social events that were essential to cement connections between the participants. The number of participating groups was kept small so that each person could interact with all others. There were numerous topics discussed : the spatial and temporal tailoring of the shape of light beams, the properties of light near interfaces with metals, applications in microscopy and other forms of imaging, applications in laser cutting and material processing, manipulation and control of light with novel materials such as graphene or liquid crystals, quantum properties of light and their use in information processing and computation, fundamental properties of quantum states of structured light, the use of artificial intelligence to model the propagation and structuring of light.