Postdoctoral subject :
Wavelength coding of digital information transmitted between systems in free space

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Context of the thesis :
Wireless indoor optical communication is essentially based on the use of electromagnetic waves (Radio Frequency, Wi-Fi, Bluetooth, etc.). They flood the space and it becomes necessary to:

- find alternatives to prevent the health and security of people living in a daily exposure,
- overcome the frequency reservation constraint inherited by the Radio Frequency (RF),
- Design redundant solutions more robust to failures or electromagnetic malicious attacks.

Wireless optical communication seems to be a good candidate to meet these challenges because the waves used in such a technology are no more in the « radio » spectrum. Moreover, compared to Wi-Fi or RF, wireless optical communication allows the disappearance (or decrease) of the hardware infrastructures such as cables or fiber-optic networks which generally freeze the possibility of the network reconfiguration.

Postdoc description :
The aim of the project is to develop wavelength-based encoding schemes of the data exchanged by the systems. The data origin could be either sensors or internal system state. The wavelength of the single optical emitters or the combination of the wavelengths of several optical emitters is used in the coding schemes to allow direct identification of the transmitted data of one or several receiving systems. This combination can be used to identify without ambiguity the emitting system. Furthermore, the method can allow data compression, in an encrypted manner, so that a large amount of information can be transmitted in very few pulses. Whatever the application, the main interest of this coding method is to enhance the security during the data transmission.
Key words: Digital electronics, instrumentation (electronic design, optics), development of combinatory optimization algorithms

Project tasks:
The candidate will have to:
- Perform a survey on free-space communication between systems (optical, RF, coding schemes, etc.),
- Design the electronic functions of the data acquisition and its coding at the transmitter and the photo-receiver end,
- Manage the development of the photo-receiver prototype,

Participate in the combinatory optimization algorithms development aimed to avoid / reduce ambiguous cases when parallel transmissions are performed.

Candidate's profile :
The candidate must have a strong background in digital electronics. He/she will have to design compact optical emitting-receiving devices which will provide a wavelength-selective transmission in

free space between systems. Furthermore, the candidate must have programming skills (C, C++, Labview) for data acquisition and handling.

The resources of the Electronic Department of the UTC will be an additional support to the project.

Candidates Interested in experimental development (optics, instrumentation) are encouraged to apply.

<u>Documents required to apply :</u>

- Last diploma
- Curriculum vitae
- Motivation letter
- Recommendation letter from previous employer and contact (e-mail and phone)