The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Centre is a major actor in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

**Contexte et atouts du poste**

**Within the framework of a partnership (you can choose between)**

- collaboration with GRANIT IRISA team in Rennes

A prototype is expected, more specifically dedicated to the monitoring of professional cyclists using specialized body sensor network. The Immermove platform will offer experimental facilities required for this Postdoc.

**Mimetic** Inria team is associated with M2S laboratory (Movement, Sport, Health) of the University of Nantes 2 is part of the top 200 in the Shanghai ranking of the best universities in the sports sciences. The M2S laboratory is interested in the effects of sports and physical activity on performance and health. The M2S lab pursues this goal using multidisciplinary approaches, specifically coupling movement analysis and synthesis based on both experimental data and digital humans models. To do so, the laboratory can rely on an exceptional Immervore technical platform that includes a virtual reality room (12x4x4 m) and a sports hall (30x20x10 m) dedicated exclusively to the analysis of the movement. This platform includes various motion analysis equipments such as optical and inertial motion capture systems, external force evaluation and electromyographic systems.

Is regular travel foreseen for this post? No. Mainly communication in conferences. “Travel expenses are covered within the limits of the scale in force”.

Annual Gross Salary: 31,000 euros.

This Fellowship is co-funded by Université Bretagne Loire and Labex CominLabs.

The COMIN Labs laboratory of excellence (for “COMmunication and INformation Sciences Laboratories”) brings together 1100 researchers, more than 500 of whom are permanent between Brittany and Nantes, who come from a dozen institutions (universities, research organisations, grandes écoles). This project must contribute to the improvement of digital uses, particularly in the health field by relying on mobile platforms with enhanced functionalities (eg monitoring of physiological and physical parameters). This project of excellence brings together the following partners: CNRS, INSEEM, INRIA Rennes Bretagne Atlantique, University of Rennes 1, University Nantes 2, University of Western Brittany, University of South Brittany, University of Nantes, Nantes Mining Schools, INSIA Rennes, ENS Cachan - Bretagne, Telecom Bretagne, Supélec.

**Mission confiée**

**Assignments:**

With the help of Guillaume Nicolas and Nicolas Bideau, the recruited person will be taken to propose innovative solutions and methods to transpose the tools and methodologies used in motion capture from optoelectronic equipment to inertial unit devices, in the specific cycling application domain.

It is carried out within a collaborative framework between the Granit team at IRISA (http://www.granit.irisa.fr/) and the M2S laboratory (http://m2slab.com). The Granit team is recognised in the field of algorithm design and transmission systems architectures able to adapt to their environment.

The overall objective of the Moonlight project is to combine these research skills and interests to design and implement a new generation of embedded systems capable of analyzing sporting movement in actual practice situations. The main application of this project concerns the analysis of pedaling movement in real cycling conditions (road, velodrome etc.). The implementation of a solution to this problem requires to bridge several knowledge gaps: Firstly regarding sensors, it is necessary to design a hardware and software architecture capable of precisely measuring movement parameters over long periods of time and over a large area of capture. Secondly regarding movement pattern recognition, it is necessary to reconstruct the movement of athletes from a reduced set of data from elementary sensors (inertial, magnetic, radiofrequency, etc.). One of the main challenges is to accurately estimate the joint angles from the sensors to calculate segmental coordination. The accuracy of these calculations is paramount to be able to analyze and optimize performance while preserving the physical integrity of athletes.

**References:**


Camille Pouliquen, Guillaume Nicolas, Benoit Bideau, Gérard Garo, Armand Megret, Paul Delamarche, Nicolas Bideau. Impact of power output on muscular timing activation and 3D kinematic during an incremental test to exhaustion for professional cyclists. Submitted to Journal of Electromyography and Kinesiology


Collaboration:
It is carried out within a collaborative framework between the Granit team at IRISA (http://www-granit.irisa.fr/) and the M2S laboratory (http://m2slab.com). The Granit team is recognized in the field of algorithm design and transmission systems architectures able to adapt to their environment.

Responsibilities:
The person recruited is responsible for proposing new methods and algorithms, develop prototype and test it in laboratory and real conditions.

Steering/Management:
The person recruited will be in charge of co-managing the Moonlight collaborative project, co-organizing meetings and reports.

**Principales activités**

Main activities (5 maximum):
- Propose software solutions for computing relevant information based on inertial sensors, with signal processing to enhance the quality of the collected data.
- Develop programs and interfaces to design a prototype.
- carry-out experiments and tests, to evaluate and calibrate the prototype.

Additional activities (3 maximum):
- Write documentation
- Write reports
- Write and present papers in international conferences and journals

**Compétences**

Technical skills and level required:
- Biomechanics and motion capture (optoelectronics and/or inertial units)
- Mechanics of solids
- Signal processing
- Scientific computing (ex: MATLAB, Java, C/C++)

Languages: English is expected with good practice

Relational skills: work in a group of scientists, dynamic, curious, interested in both signal processing software development and experimental set-ups.

Other valued appreciated: interest in sports

**Avantages sociaux**

- Subsidised catering service
- Partially-reimbursed public transport

**Rémunération**

Monthly gross salary amounting to 2653 euros