INTERNSHIPS at the Faculty of SCIENCE, UA

ECOLOGY-ENVIRONMENT

E1 – Development of wetland monitoring tools

Subject/Aim : Participation to the development of wetland monitoring tools using mapping methods and treatments of database about vegetation, fauna and pedology maps. The study areas are protected zones in Finland and/or France. Data from Finland are to study links between habitat quality, invertebrate and bird population. Data from France concern former saltmarshes recently purchased by the Conservatoire du Littoral, a French public organization created in 1975 to ensure the protection of outstanding natural areas along the coast. Multiplication of breaches in inner and sea-front dikes translates into a fast-evolving site of increasingly difficult access for ground survey, calling for a synoptic and spatially explicit monitoring.

Tools: Google earth, QGIS, Excel, word, R.
Expected skills: basic knowledge in GIS and statistics could help but are not mandatory, knowledge in ecology are required.
Referent: **Aurélie DAVRANCHE,** ***aurelie.davranche@univ-angers.fr***
Laboratory: **LETG**-Angers UMR 6554 CNRS

E2 – Diachronic cartography of vegetation in different cities of Africa

Subject/Aim: Diachronic cartography of vegetation in different cities of Africa (Marrakech, Algiers, Antananarivo and Toliara) using satellite and aerial photography remote sensing with Idrisi TerrSet software or visual digitizing from google earth images. The student will participate to the creation of a data base under QGIS including presence/absence, species (if possible), ecosystemic functions, land status (private/public), structure (alignment, agriculture, garden, ...), ...

Tools: Remote sensing and GIS. Spot Images, Sentinel images, Landsat images, Google Earth images. Idrisi TerrSet. QGis
Expected skills: Student in geography or biology/ecology or engineering (GIS, remote sensing) A first experience in GIS (QGIS) would be a plus
Referent: **Aude Nuscia TAÏBI,** ***audenousia.taibi@univ-angers.fr***
Laboratory: **LETG**-Angers UMR 6554 CNRS 2 boulevard Lavoisier 49045 Angers
https://www.researchgate.net/profile/Taibi_Aude
http://www.univ-angers.fr/fr/_plugins/mypage/mypage/content/a.taibi.html
http://vegetal.hypotheses.org/

PHYSICS

P1 - Simulation of a liquid confined inside a nanopore.

Subject: Using virtual experiments we will study the extent of cooperative length scales in confined supercooled liquids in relation with Adam et Gibbs theory. Cooperativity spontaneously appears in liquids when supercooled, with a length scale that grows when the temperature drops. However the understanding of this process and its relation with the transition from a liquid to a glassy solid is still an opened subject. The originality of the proposed study is to use periodic boundary conditions in the direction of the finite pore length, to evaluate the modification of the cooperativity length scale induced by the confinement of the liquid inside a porous material. The results will be published in a scientific paper, if they are interesting and trustable.

Tools: PC using Linux operating system.
Expected skills: C Programming, Basic understandings in Physics.
Referent: **Dr Victor TEBOUL, *victor.teboul@univ-angers.fr***
Laboratory: **LPHIA**, UPRES EA 4464, University of Angers

MATHEMATICS

M1 - Introduction to nonlinear reaction-diffusion equations

Subject: This internship is devoted to one of the simplest examples of a nonlinear reaction-diffusion equation, the Fisher-KPP equation. Such PDEs appear in the sciences as models of various physical, chemical and biological phenomena. The goal of the intership consists in:
- understanding various models leading to the Fisher-KPP equation;
- analyzing the main properties of this equation;
- implementing numerical methods with Scilab.

Expected skills: Good skill in analysis (calculus, differential equations, numerical analysis,...)
Referent: **Pr. Eric DELABAERE, *eric.delabaere@univ-angers.fr***
Laboratory : **LAREMA** (*http://recherche.math.univ-angers.fr/*)

M2 – Introduction to differential topology. Winding numbers

Subject: This internship is devoted to the definition of the winding number ofa closed curve in the plane and its application in two contexts: the proof of the Jordan separation theorem and a proof of the fundamental theorem of algebra (every non-constant polynomial has a complex root).

Expected skills: Good skill in analysis (calculus) and first steps in linear algebra

Referent: **Daniel NAIE**, ***daniel.naie@univ-angers.fr***.

Laboratory : **LAREMA** (*http://recherche.math.univ-angers.fr/*)

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INTERNSHIPS at the Faculty of SCIENCE, UA – 2nd round

GEOLOGY

G1 – Role of calcareous micro-zooplankton in the marine carbon cycle

Aims: Planktic foraminifera constitute a major group of the calcareous micro-zooplankton. They are found in abundance in surface waters of the world's oceans where they build a protective calcareous (CaCO3) shell. After death, planktic foraminiferal shells sink through the water column, and settle on the seabed where they are preserved in sedimentary archives. In this way, these microorganisms are supposed to play an important role in the marine carbon cycle, but quantifications are needed.
In collaboration with a Mater student, the candidate will study the spring fauna living in the Bay of Biscay (SW France), and will perform precise weighing of individual shell, in order to evaluate the exported flux of carbonate due to the foraminiferal production.

Tools: binocular microscopy, microbalance (CaCO3 shell mass)
Skill expected: Patience, being meticulous and keen reasoning. Background knowledge in biogeosciences, marine ecology and oceanography.
Referent : Pr Hélène HOWA, ***helene.howa@univ-angers.fr***
Laboratory : LPG-BIAF (actual and Fossil Bio-Indicators), UMR CNRS 6112 ; 2 bd Lavoisier, 49045 Angers CEDEX, France.

PHYSICS

P2 - Seebeck coefficient measurements (difficulty: high)

Subject/aims: In semiconductors physics the Seebeck coefficient may give important information concerning the charge carrier transport such as: majority charge carrier type, carrier charge concertation and carriers mobility. This project propose to improve an existing measurement system in order to control the difference of temperature by computer. The student will improve the interface between the computer and the experimental setup and will measure the Seebeck coefficient for different etalon materials in order to check the precision of the measurements. She / He will also measure the Seebeck coefficient of new materials.

Tools: electrical generators, computers, high precision measuring instruments, electrometers, source-meters etc.
Expected Skills: Labview programming competencies, mathematics logic, basics in physics of semiconductors materials, patience, being meticulous and keen reasoning.
Referent: **Mihaela GIRTAN**, ***mihaela.girtan@univ-angers.fr***

Laboratory: **LPHIA**, Photonics Laboratory (***http://sites.google.com/site/mihaelagirtan/***)

P3 - Magnetic fields studies (difficulty: low)

Subject/aims: The aim of this project is to propose a practical work in order to study the magnetic field created by the electrical current through conductors and coils. All the equipment for the experiment set-up exist and also all the documentations in English. The data acquisition for distances and magnetic fields is done automatic and transferred to computer by Wi-Fi. The student will realize the set-up and test it, translate the documentation in French and realize a document in French which explain how the experiments should be done.

Tools: electrical generators, coils, multi-meters.
Skill expected: basics in physics, very good level in French, being meticulous and keen reasoning.
Referent: **Mihaela GIRTAN**, ***mihaela.girtan@univ-angers.fr***
Laboratory: **LPHIA**, Photonics Laboratory (***http://sites.google.com/site/mihaelagirtan/***)

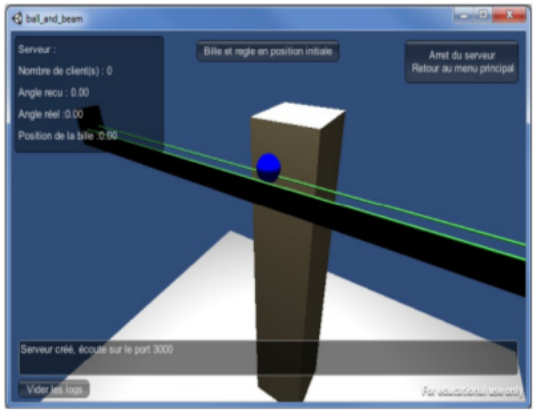
Internships at ISTIA, 2017
School of Engineering, University of Angers

I - Creativity Application Development on Surfaces SUR40.

The goal is to design one to several application of collective creativity on creativity room equipment.
The specifications will be to finalize from an existing basis and the objective is to develop an I.H.M application allowing brainstorming sessions.
The creativity production and capitalization aspects will be approached.
Keywords: creativity, Tactile table multitouch, SDK development
Supervisor: Anthony Delamarre, associate professor, anthony.delamarre@univ-angers.fr

II - Virtual Control Lab

Virtual System (simulate the physics)



Controller (e.g. PID)

Subject : the objective of this internship is to design and to program a virtual lab (a software tool) to apply the theory of automatic control. The virtual lab has to simulate a mechanical system that will be controlled by exchanging data/signals with a remote controller application, for instance a PID controller.
Several mechanical systems have to be virtualized: for instance
– a ball and beam system (see the picture)
– a ball on plate (the extension of the previous system)
– a classical pendulum or an inverted pendulum
The goal of the project is to develop software tools to virtualize some physical systems and to facilitate the application of the theory of control into that virtual environment.

Tools: Unity 3D software (with C# scripts) on a Windows environment, shared memory (between Unity3D and the controller), Windows C# application for the controller .
Expected skills: software programming
Supervisor: Bertrand Cottenceau, associate professor,
bertrand.cottenceau@univ-angers.fr

III- Virtual Rehabilitation Project

Context: This project falls within the context of the project ENJEU[X], funded by the University of Angers and the Region Pays de la Loire. The objective of this project is the development of serious games and virtual environments for the assessment and rehabilitation of movement disorders, cognitive and emotional in children. Virtual Island is an innovative system to rehabilitate children affected by motor and cognitive disorders (cerebral palsy). The system works with a kinect 2, which measures the child's movements in 3D space. The game principle is to animate the avatar to make him catch moving objects arriving around the avatar. A virtual coach is provided (currently a seahorse) to inform and encourage the child.

Goal: The project objective is to contribute to the development of the system by integrating different types of objects, background, and interaction tools. In this context, and in order that the system could be used by elderly people (balance training, etc.), you will have to integrate the corresponding objects for this population. Finally, you can consider validate your choices via experimentation.
Tools: Unity3D, Kinect 2, Myo.
Keywords: Human-computer interaction, virtual reality, assessment, rehabilitation, cerebral palsy
Supervisor: Paul Richard, associate professor, Paul.Richard@univ-angers.fr

IV- Production of defective mutants of Scedosporium apiospermum, a filamentous fungus associated with cystic fibrosis, to identify new therapeutic targets

Subject:
Scedosporium apiospermum colonizes chronically the airways of patients with cystic fibrosis. Establishment and development of a fungal colonization depends on its capacity to evade killing by the host immune system. Phagocytes release reactive oxygen species (ROS) generating oxidative burst, in response, there is an induction in pathogens of various genes encoding enzymes capable to degrade the high amounts of ROS.
We already identify in *Scedosporium apiospermum* genes highly overexpressed in response to oxidative stress.

The aim of this internship is to produce defective mutants of *Scedosporium apiospermum* for these genes involved in the oxidative stress responses. Then, these mutants will be analysed for their capacity to survive in oxidative stress condition.
This work will allow us to establish the role of these genes as virulence factors and to identify new therapeutic targets.

Methods: fungal culture, protoplast production, primer design, PCR, cloning, DNA preparation, restriction enzyme digestion, DNA agarose gel, DNA transfection, mutants selection on selective culture media, mutants analysis by PCR and southern blot.
Supervisor: Maxime Fleury, associate professor, maxime.fleury@univ-angers.fr

V-Virtual Building Information

Context: Almost three decades before Building Information Modeling (BIM) would go mainstream, the term “Virtual Building” was used in the earliest implementation of BIM through Graphisoft’s ArchiCAD (1987). Since then, the concept hasn’t changed, but interactive visualization technology has advanced to the point where designers, engineers and building owners can become so immersed in the virtual building model that they feel as if they’re actually there. Technologies like the Unity3D game engine and the Oculus Rift VR headset are making it possible at a very low cost. Thus, Virtual reality is the next natural step for BIM and building bridges between VR and CAD / BIM software has become of primary importance.

Goal. The project aims to contribute to the development of virtual reality techniques in the context of Building Information Modeling. Your will have to integrate a 3D model of a building in a virtual environment under the Unity3D game engine. Then, you will have to develop intuitive and immersive interaction and navigation techniques allowing exploring the building and visualizing situated information.
Tools: Unity3D 5.1, Kinect 2, Oculus rift V2.
Keywords: virtual reality, Interaction techniques, information system, building, modeling
Supervisors: Paul Richard, associate professor in VR, Paul.Richard@univ-angers.fr
David Bigaud, full Professor in BIM, David.Bigaud@univ-angers.fr