Bassem DAHROUG

PhD, Mechatronics Engineer

Toulouse, France
bdahroug@gmx.com
bdahroug.github.io/

Experienced robotics and mechatronics engineer with a PhD in Engineering Sciences and with ten years of hands-on experience in space robotics, surgical robotics, and advanced control systems. Passionate about developing autonomous systems and digital twins for challenging environments.

Field of Interest

Mechatronics Design - Robotics - Automatic control - Visual servoing - Programming - Mechanics - Fluid mechanics - (micro)Manufacturing - Materials - Electronics

Skills and Know-how

Robotics ●●●●●
Mechatronic design ●●●●●
Automatic control ●●●●◐
Scientific programming ●●●●◐
Mechanics ●●●●○
Electronics ●●●●○

Robotic experimentation ●●●●●
Organization, rigor and autonomy ●●●●●
Analysis, synthesis and solving problems ●●●●◐
Oral and writing communication ●●●●○
Project Collaboration ●●●●○

Education

11/2014 – 02/2018 **Doctor of philosophy in Engineering Sciences**, ***UBFC***, Besançon, France.
Dissertation: Minimally Invasive Surgery in the Middle Ear: a guided micro-robotic system to efficiently remove cholesteatoma.

09/2012 – 09/2014 **Masters degree in Mechatronics and Micro-Mechatronics Systems**, joint masters degree from **ENSMM**, Besançon, France and **EPI**, Gíjon, Spain.
Master thesis: Design, modelling and control of a contactless modular conveyor.

09/2006 – 09/2011 **Bachelor degree in Mechanical Engineering**, ***AAST***, *College of Engineering Studies and Technology, Department of Mechatronics*, Alexandrie, Egypt.
Graduation project titre: Mobile robot control for parking manoeuvre.

Professional and Academic Experiences

03/2023 – 06/2025 **Robotics Engineer - Control & Mechatronics**, ***ROVIAL Space***, Toulouse, France.

- participate in the research and development of robotic systems for on-orbit servicing applications
  - design and develop mechatronic systems by using different robotic structures (e.g., manipulator arm, legged robot) for performing assembly and repair tasks;
  - develop a low-level controller for actuating the robotic system;
  - develop a high-level controller for computing forward and inverse kinematics controllers, as well as dynamics ones;
  - develop a perception controller to guide the robotic system throughout its various tasks;
  - develop a scientific simulation for robotic systems and their digital twin;
  - create experimental proof-of-concept to validate the developed robotic system;
  - integrate and test the various components of the developed robotics system;
- collaborates with other departments, such as Structure and Space, to gather requirements and specifications;
- review the robotics part of the projects that have been proposed for public funds;
- co-supervision of one master trainee;
- more information about my contribution to this project, as well as demonstration video, is available on the website [1].

09/2021 – 01/2022 **Temporary teaching**, ***ENSMM***, Besançon, France.

- 20 hours of practical work of JAVA programming for students in the 1^{st} year of bachelor.

[1] *space robot*: https://bdahroug.github.io/2023/01/01/rovial.html

06/2021 – 11/2022 **Mechatronics engineer**, ***AMAROB Technologies***, Besançon, France.
- participate in the research and development of the main product of the company which is a micro-robotic systems dedicated to intracorporeal laser surgery;
  - design of a mechatronics device to actuate a blendable micro-robot;
  - manufacturing some parts of the micro-robot;
- take part in the company activities with its collaborators and client;
  - design and fabricate a medical prototype for detecting the breast cancer;
  - manufacturing using milling and electrical discharge machines.
- co-supervision of one undergraduate trainee.

09/2019 – 01/2020 **Temporary teaching**, ***UFC***, Besançon, France.
- 28 hours of practical work of robotics for the **ISIFC** students in the 3^{rd} year of bachelor;
- 12 hours of practical work of 3D computer vision for the students in the 2^{nd} year of master;
- 9 hours of practical work of automatic control of continuous system for the students in the 3^{rd} year of bachelor.

09/2018 – 12/2020 **Researcher, Post-doctoral**, *Institute* ***FEMTO-ST***, *Department AS2M (Automatique et Systèmes Micro-Mécatroniques)*, Besançon, France.
- participate to the INSERM project "*ROBOT*" (Robotics and Optical coherence tomography for optical BiOpsy in the digestive Tract) [2017 – 2021] which proposes an innovative approach to detect the cancer cells at the digestive tract;
- implement a visual servoing scheme based on the 3D imaging (C-scan) obtained from the OCT (Optical Coherence Tomography) for guiding a robot during the intra-operative phase in order to perform a repeatable optical biopsy;
- design and development of a prototype in order to validate and integrate the distinct technological and methodological approaches proposed by the different projects teams;
- supervision of two undergraduate trainees;
- more information about my contribution to this project, as well as demonstration video, is available on the website [2];
- valorization of the dissertation work.

09/2015 – 01/2016 **Temporary teaching**, ***ENSMM***, Besançon, France.
- 64 hours of practical work of automatic control and programming for students in the 1^{st} year of bachelor.

11/2014 – 02/2018 **Research assistant,PhD student**, *Institute* ***FEMTO-ST***, *Department AS2M*, Besançon, France.
- early research stage of the project "μ*RMES*" (Micro-Robot for Middle Ear Surgery)
  - analysis of the clinical need for middle ear surgery to treat the disease known as cholesteatoma;
  - development of an image-guided micro-robotic system to perform this procedure.
- collaboration with **ARTOG** Center, Bern, Switzerland, by conducting experimental tests to evaluate the proposed controller in a clinical environment;
- supervision of six undergraduate trainees;
- more information about my contribution to this project, as well as demonstration video, is available on the website [3].

02/2014 – 08/2014 **Master graduation project**, *Institute* ***FEMTO-ST***, *Department AS2M*, Besançon, France
- participate to the project "*Smart Block*" [2011 – 2015] which innovates the transportation of fragile objects by designing a modular and reconfigurable conveyor;
  - propose new designs for a modular block which builds an aerodynamic conveyor for transporting photovoltaic cells;
  - model the air jets below an object;
  - propose control law to control the opening of the ports of each block independently so that the object can maintain a fixed position or follow a desired trajectory;
  - numerical and experimental validation of the proposed controller;
  - more information about my contribution to this project, as well as demonstration video, is available on the website [4].

[2] *ROBOT*: https://bdahroug.github.io/2020/01/01/robot.html
[3] μ*RMES*: https://bdahroug.github.io/2018/01/01/uRMES.html
[4] *Smart Block*: https://bdahroug.github.io/2014/01/01/smartBlocks.html

02/2012 – 07/2012 **Temporary teaching**, ***AAST***, *Department of Mechanics*, Alexandria, Egypt.
- practical work of robotics and CAD (Computer Aided Design);
- tutor of a university team participating in the 11^{th} MATE (Marine Advanced Technology Education Centre) International ROV Competition.

02/2011 – 07/2011 **Bachelor graduation project**, ***AAST***, *Department of Mechanics*, Alexandria, Egypt.
- model and control of a mobile robot (car-like vehicle) for performing an automated parking maneuver.

Scholarship and Awards

2016 International mobility grant for doctoral students, funded by **UBFC**

2015 Best Automation Paper Award, **ICRA**'2015 (IEEE Internaltional Conference on Robotics and Automation)

2012 European Scholarship, Master **EU4M** (Mechatronics and Micro-Mechatronics Systems) funded by the Erasmus Mundus programme

2008 Participation in competition **Robocon** (Egypt) with AAST team, 4th place in Egypt

Computer skills

Computer Aided Design (CAD): FreeCAD, Solidworks, CATIA, 3DExperience, Creo
Computer Aided Manufacturing (CAM): G-Code, FreeCAD-Path, Vericut, GO2Cam
Electronic Design Automation (EAD): KiCAD, Egale, Proteus, Quartus
Mathematics: Matlab/Simulink, Octave
Numerical Modeling: COMSOL Multiphysics
Programming: C/C++, CMake,
Python, Java, JS, HTML, CSS,
micro-controller, Ladder,
TCP/IP, I2C,
Android
Vision & Perception: ViSP, OpenCV, PCL
Robotics libraries: Webots, RBDyn, DART, Bullet
3D computer graphics: Magnum, VTK, Blender
Version Control: GIT, SVN
Operating Systems: Linux, RTEMS, Windows
Planning: Gantt
Office Tools: LaTeX, MS-office, Sozi

Linguistics

English French Arabic Spanish