

Bassem DAHROUG

PhD, Mechatronics Engineer

Toulouse, France

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📄 bdahroug.github.io/

Experienced robotics and mechatronics engineer with a PhD in Engineering Sciences and over seven 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

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|------------------------|-----------|--|-----------|
| Robotics | ● ● ● ● ● | Robotic experimentation | ● ● ● ● ● |
| Mechatronic design | ● ● ● ● ● | Organization, rigor and autonomy | ● ● ● ● ● |
| Automatic control | ● ● ● ● ○ | Analysis, synthesis and solving problems | ● ● ● ● ○ |
| Scientific programming | ● ● ● ● ○ | Oral and writing communication | ● ● ● ● ○ |
| Mechanics | ● ● ● ● ○ | Project Collaboration | ● ● ● ● ○ |
| Electronics | ● ● ● ● ○ | | |

Education

- 11/2014 – **Doctor of philosophy in Engineering Sciences**, **UBFC**¹, Besançon, France.
02/2018 **Dissertation**: Minimally Invasive Surgery in the Middle Ear: a guided micro-robotic system to efficiently remove cholesteatoma.
- 09/2012 – **Masters degree in Mechatronics and Micro-Mechatronics Systems**, joint masters degree from
09/2014 **ENSMM**², Besançon, France and **EPI**³, Gijón, Spain.
Master thesis: Design, modelling and control of a contactless modular conveyor.
- 09/2006 – **Bachelor degree in Mechanical Engineering**, **AAST**⁴, *College of Engineering Studies and Technology, Department of Mechatronics*, Alexandrie, Egypt.
09/2011 **Graduation project titre**: Mobile robot control for parking manoeuvre.

Professional and Academic Experiences

- 03/2023 – **Robotics Engineer - Control & Mechatronics**, **ROVIAL Space**⁵, Toulouse, France.
06/2025 ○ 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 is available on the website⁶.

¹UBFC: <https://www.ubfc.fr/>

²ENSMM: <https://www.ens2m.fr/>

³EPI: <http://www.epigijon.uniovi.es/>

⁴AAST: <http://www.aast.edu/en/index.php>

- 09/2021 – **Temporary teaching, ENSMM**, Besançon, France.
- 01/2022 ○ 20 hours of practical work of JAVA programming for students in the 1st year of bachelor.
- 06/2021 – **Mechatronics engineer, AMAROB Technologies**⁷, Besançon, France.
- 11/2022 ○ 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 – **Temporary teaching, UFC**⁸, Besançon, France.
- 01/2020 ○ 28 hours of practical work of robotics for the ISIFC⁹ students in the 3rd year of bachelor;
- 12 hours of practical work of 3D computer vision for the students in the 2nd year of master;
- 9 hours of practical work of automatic control of continuous system for the students in the 3rd year of bachelor.
- 09/2018 – **Researcher, Post-doctoral, Institute FEMTO-ST**¹⁰, Department AS2M (*Automatique et Systèmes Micro-Mécatroniques*), Besançon, France.
- 12/2020 ○ 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 is available on the website¹¹;
- valorization of the dissertation work.
- 09/2015 – **Temporary teaching, ENSMM**, Besançon, France.
- 01/2016 ○ 64 hours of practical work of automatic control and programming for students in the 1st year of bachelor.
- 11/2014 – **Research assistant, PhD student, Institute FEMTO-ST**, Department AS2M, Besançon, France.
- 02/2018 ○ early research stage of the project "μRMES" (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 Center¹², 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 is available on the website¹³.
- 02/2014 – **Master graduation project, Institute FEMTO-ST**, Department AS2M, Besançon, France
- 08/2014 ○ 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;

⁵ROVIAL: <https://rovial.eu/>

⁶space robot: <https://bdahroug.github.io/2023/01/01/rovial.html>

⁷AMAROB: <https://amarob.com/>

⁸UFC: <http://www.univ-fcomte.fr/>

⁹ISIFC: <http://isifc.univ-fcomte.fr/pages/en/index.html>

¹⁰FEMTO-ST: <http://www.femto-st.fr/en/>

¹¹ROBOT: <https://bdahroug.github.io/2020/01/01/robot.html>

¹²ARTOG: http://www.artorg.unibe.ch/research/igt/index_eng.html

¹³μRMES: <https://bdahroug.github.io/2018/01/01/uRMES.html>

- numerical and experimental validation of the proposed controller;
- more information about my contribution to this project is available on the website ¹⁴.

02/2012 – **Temporary teaching, AAST, Department of Mechanics**, Alexandria, Egypt.

- 07/2012 ○ practical work of robotics and CAD (Computer Aided Design);
- tutor of a university team participating in the 11th MATE (Marine Advanced Technology Education Centre) International ROV Competition.

02/2011 – **Bachelor graduation project, AAST, Department of Mechanics**, Alexandria, Egypt.

- 07/2011 ○ 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 ¹⁵, **ICRA'2015** (IEEE International Conference on Robotics and Automation)

2012 European Scholarship, Master **EU4M** ¹⁶ (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, Eagle, 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: L^AT_EX, MS-office, Sozi

Linguistics

English

French

Arabic

Spanish

¹⁴ Smart Block: <https://bdahroug.github.io/2014/01/01/smartBlocks.html>

¹⁵ ICRA'2015: <https://www.ieee-ras.org/about-ras/latest-news/635-icra-2015-award-recipients-announced>

¹⁶ EU4M: <http://www.eu4m.eu/>