**Amr Wahied**

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**Education**

* **M.Sc. Space Engineering,** [**University of Surrey**](https://www.surrey.ac.uk/postgraduate/space-engineering-msc-2019) **2017-2018**
* 1st on my class, average 82.5% **(**[**First-Class Honors**](https://drive.google.com/file/d/1gVrMKZEBUb5RTuAjci_zf1W0rrfIXnxN/view?usp=sharing)**).**

**With the following related modules**: Space Robotics and Autonomy - Advanced Guidance, Navigation and Control -Space Dynamics and mission - Space System Design - Space Environment and Protection - Launch Vehicles and Propulsion - Remote Sensing.

* **B.Sc. Aerospace Engineering,** [**Cairo University**](http://aer.eng.cu.edu.eg/en/)  **2012-2017**
* 2nd on my class, average 88.5% **(**[**First-Class Honors**](https://drive.google.com/file/d/13VscbLiI4hakgwzFkdu94IKqCSnLpSJ-/view?usp=sharing)**).**

**With the following related** [**modules**](https://drive.google.com/file/d/1v1F3_Rgrv_BFSiE1w-eAxjkSZ4Ghb6K5/view?usp=sharing): Classical Control - Modern Control - Digital Control - Non-Linear Control – Adaptive Control - Orbital Mechanics - Aerospace Guidance - Flight Mechanics - Partial Differential Equations - Fluid and Gas dynamics - Rocket Propulsion.

**Publications**

* [A. W. I. Mohamed, C. M. Saaj, A. Seddaoui and S. Eckersley, “Controlling a Non-Linear Space Robot using Linear Controllers,” 5th AIAA CEAS Conference on Guidance, Navigation and Control (EuroGNC), Milano, Italy, 3-5 April 2019](https://drive.google.com/file/d/1OGlT00DGQSk-2k6KOLUZqAOb3X0GQ7XE/view?usp=sharing).
* Asma Seddaoui\*, Chakravarthini Saaj\*, Amr Mohamed\* and Steve Eckersley\*, “Adaptive  Controller for Precise Maneuvering of Space Robots”, under review by IEEE Transactions on Aerospace and Electronic Systems.

**Work Experience**

* **Control System Design Engineer,** [**INOVO Robotics**](https://inovorobotics.com/)  **2018-Current**
* **Main Tasks:**
* Developing the Kinematics and Dynamics model of a reconfigurable multi DOF robotic arm.
* Design and Implementation of the Non-Linear Computed Torque controller for the feed-forward component.
* Developing of Path-Planning, Iterative Inverse Kinematics and Self-Collision algorithms.
* Developing Stiction and Viscous friction models based on real-life results of the robotic manipulator.
* Designing Field Oriented Control and Cascaded-PID controllers for the joint motors.
* Conducting software in the loop and hardware in the loop tests for the integrated system.
* Model verification and testing on UR10, Hans E5 and Alpha Robotics Manipulators.
* **Tools**: Rhinoceros, Grasshopper, Hal Robotics, MATLAB RST, ROS, Simulink, Eclipse IDE for C/C++.
* **M.Sc. Industrial Project at Surrey Satellite Technology Ltd. (**[**SSTL**](https://www.sstl.co.uk/)**) and Surrey Space Centre (**[**SSC**](https://www.surrey.ac.uk/surrey-space-centre)**) 2017-2018**
* Project Title**: Control System Design for a 12 DOF Robotic Spacecraft**
* **Main Tasks:**
* Developing the mathematical model for the Dynamics and Kinematics for the Free-Flying and Free-Floating Servicer Robotic Spacecraft based on the conservation of momentum and the Lagrange-Euler approach.
* Doing open-loop simulation for the dynamic model.
* Developing a 3-stage control algorithm with Feed-Forward compensation and Feed-Forward Linearization as initial stages, while PID and LQR controllers as final stages of control.
* Modelling the dynamic coupling between the manipulator and the base-spacecraft as well as the parametric uncertainties and external perturbations imposed by the space environment.
* Doing closed-loop simulation for the overall system.
* Conducting trade-off analysis between the proposed controllers and another in house developed modern non-linear controller in terms of precise desired trajectory tracking, power consumption and robustness.
* **Tools**: MATLAB, Simulink

For more information: [**SpaceRobot**](https://drive.google.com/file/d/1iFwZFH81lAnLOvK1ypRgV_WhFdYkM8G-/view?usp=sharing)

* **Attitude & Orbit Control Subsystem Engineer, National Authority for Remote Sensing and Space Sciences (**[**NARSS**](http://www.narss.sci.eg/)**) 2016-2017**
* **Main Tasks**:
* Developing the mathematical model for the Dynamics and Kinematics of the satellite based on Euler`s equations.
* Modelling the Gravitational field of earth using Spherical Harmonics and developing the Orbit-Propagator.
* Modelling the Geomagnetic field of earth using IGRF.
* Developing Extended-Kalman Filter (EKF) estimation algorithms to minimize statistical sensor and process noises.
* Developing B-dot, PD and Angular Velocity feedback control algorithms to control the satellite using magnetorquers in different modes of operation (De-Tumbling, Re-Orientation, Standby and Imaging).
* Integration and Implementation of the AOCS subsystem embedded software and verification of its functionality in different modes of operation using software in the loop test on MATLAB and hardware in the loop test on AVR microcontroller.
* **Tools**: MATLAB, Simulink, Eclipse IDE for C/C++.

For more information: [**Satellite AOCS/GNC**](https://drive.google.com/file/d/12pfkUO0LztlF8-4uBBwDQyfoEoW5nqxB/view?usp=sharing)

* **Embedded Control and Monitoring Engineer at NARSS 2015-2016**
* **Main Tasks**:
* Testing the external interface of the On-Board Computer (OBC) of the Egyptian Satellite with other subsystems using FPGA **cRIO 9023** via BST and SSP protocols and the following communication modules: **NI-9234, NI-9211, NI-9474, NI-9263**.
* Testing the internal interfaces and data acquisition functionality of the OBC.
* **Tools**: NI LabVIEW, NI MAX.

For more information: [**OBC Testing Project**](https://drive.google.com/file/d/1Winin3WtUt1Y2Ij7BmDMlMw3B5Gz1l9u/view?usp=sharing)

**Internships**

* **Exchange Student at CalPoly (California Polytechnic State University) 2016**
* Attended [**Automation**](https://drive.google.com/file/d/1S-jvBOkRxePwJyFj2NMd9K02pCrTxCuf/view?usp=sharing) and [**Robotics**](https://drive.google.com/file/d/1K0NEcUjE6JyHW3f-UU0uP3y0Cuh_wP99/view?usp=sharing) Workshops.
* Built an Autonomous path planning and collision avoidance robot given GPS waypoints based on planner and Potential Fields to control the robot.
* Attended an intensive training on PLC machines.
* Studied filtering algorithms such as the Kalman and Particle filters.
* [**National Instruments**](http://www.ni.com/en-gb.html) **– Internship for Entrepreneurship program 2016**
* [**Certified LabVIEW Associate Developer.**](https://drive.google.com/file/d/1HYuyg9kpsJOsE553SzDOeoVhuqt_Nk-P/view?usp=sharing)
* Worked as an Embedded Monitoring and Control Engineer on testing the On-Board computer`s functionality and interaction performance with other subsystems for the Egyptian satellite.

**Diplomas**

* **Embedded Systems at [AMIT](http://www.amit-learning.com/" \l "/ourDiplomas/embadded) 2015**
* **With the Following Courses**: Introduction to Embedded Systems, C Programming Language, Data Structure, Software Engineering, Micro controller and micro-processor Architecture (AVR), Micro controller Architecture (PIC & Assembly), Embedded C.
* Built the interfacing and device drivers for: **SPI, I2C, UART, PWM** and **GPIO** on AVR.
* Tools: Atmel Studio, Eclipse IDE for C/C++, Khazama AVR, Proteus.
* **Advanced Embedded Systems 2016**
* **With the Following Courses**: Base64 encryption and decryption, file management and object-oriented programming in C, Misra rules, introduction to Autosar architecture, introduction to ARM architecture, Arm device drivers and interfacing (Tiva-C microcontroller), introduction to artificial intelligence and Genetic algorithms.
* Built the interfacing and device drivers for: **I2C, UART, GPIO, Timers and µDMA** onTIVA-C.
* Tools: Code Composer, Eclipse IDE for C/C++.

**Extra-Curricular Activities**

* STP robotic arm competition.
* [**STP solar race competition**](http://stp-egypt.com/solar-race/evpage/).
* Cansat competition at SSTLab (2nd place).
* Line Tracking and Object Avoidance Robotics Competition (1st place).

**Programming Skills**

* Proficient with C, LabVIEW, C++, MATLAB and Mathematica.
* Familiar with assembly, Python, PHP and Java.

**Projects**

* **Computed Torque Controller (CTC) for the PUMA 560/600 6 DOF Robotic Arm: 2017**
* Developed the Forward and Inverse Kinematics for the arm using the Denavit–Hartenberg (DH) matrix.
* Developed the mathematical dynamic model for the robotic arm based on the Lagrangian approach.
* Developed a CTC controller to linearize the system and illuminating the centrifugal, Coriolis and gravitational non-linearities.
* Designed a Proportional-Integral-Differential (PID) controller for desired trajectory tracking of the arm after linearization.
* 3D simulation for the trajectory tracking for the End-Effector of the arm using MATLAB and Simulink.
* [**Aircraft Autopilot System**](https://drive.google.com/file/d/1YI5D1z5mIlDKlPplTPrZNu-ZIxPj2NWq/view?usp=sharing): **2017**
* Developed the mathematical model for the dynamics and kinematics by deriving the equations of motion of the aircraft.
* Designed control and coordination algorithms to be used in different flight phases (Cruise, Landing, Climb and Descent) using MATLAB and Simulink and Software in the loop tests.
* Integrated the control algorithms to obtain the Lateral and Longitudinal Autopilots to be Tested Hardware in the loop.
* **State feedback controller for an Inverted Pendulum on a moving cart: 2016**
* Developed the dynamic model for the system based on the Lagrangian approach.
* Developed a state feedback controller based on desired characteristic performance to stabilize the pendulum against any applied external or internal disturbances.
* Real-Time simulation for the system using virtual reality on Simulink.
* **Path Planning and Collision Avoidance Robot: 2016**
* Built two Autonomous robots equipped with obstacle avoidance and path tracking algorithms using Two Infrared Sensors and One Ultrasonic Sensor.
* Developing a Kalman filter and control algorithms to ensure smooth motion of the robot.
* [**Cansat**](https://drive.google.com/file/d/1Run7ggfGY8SJUEjyENOWwCbFl9pZaire/view?usp=sharing)**: 2015**
* Design and implementation of a Nano satellite used to inspect and collect date of the surrounding environment like pressure, humidity, temperature and to take infra-red pictures of a predetermined site using a camera.
* Development of a Ground Station software to communicate with the satellite and to send command signals of imaging.
* **Dynamic Module for Preliminary Orbit Design: 2014**
* Preliminary design of a satellite's orbit and ground track simulation.

**References**

Dr. Mini Saaj (M.Sc. Supervisor) Samah Chazbeck (NI Internship Supervisor)

Director of Post Graduate Research (PhD) Programme at Surrey Space Centre Applications & System Engineer at National Instruments

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