Antonio CORATELLI

WORK EXPERIENCE

Software Engineer (External Contractor)

CARIAD (Subsidiary of Volkswagen Group)

MAR 2023 – ONGOING • Ingolstadt (DE) • 100% remote

Contributing to the development of map-based environment model software module on *E³ 1.2* solution train.

- Developed algorithms ensuring plausibility of sensor inputs (GNSS, dead reckoning, time zone data); refactored codebase unifying management of input sensor error states and sensor health checks; analyzed codebase ensuring compliance with automotive requirements in target binaries (absence of uses of RTTI and exceptions, no memory fragmentation in custom allocator).

Tech: C++14 (AUTOSAR, MISRA), CMake, Git, Python.

Software Engineer (External Contractor)

Kickmaker

JUL 2022 – JAN 2023 • 7 months • Lyon (FR) • 100% remote

Supported Kickmaker team in the efforts to improve the quality of an autonomous warehouse robot's software.

- Improved quality of simulation framework (ROS, Gazebo): investigated and fixed various bugs caused by incorrect modeling of inertial properties of the simulation models; reworked and modularized models, allowing reuse of components in order to support simulation of a new larger-sized warehouse robot.
- Improved quality of embedded software: reduced code duplication by refactoring and implementing internal utilities used to calculate relative link poses (emulating ROS TF tree); refactored codebase updating usage of deprecated legacy data structures.

Tech: C++14 (GoogleTest), CMake, Git, ROS, Gazebo, Linux (Ubuntu).

Software Engineer (External Contractor)

BladeInsight (Formerly Pro-Drone)

JUL 2021 – JUN 2022 • 1 year • Lisbon (PT) • 100% remote

Supported Robotics, Tablet-App, and Web teams in the development and integration efforts for the release of "*Drone 2.0*" and "*Rover*", autonomous robots for wind turbine inspections.

Tech: C++17 (GoogleTest, Boost, Abseil), CMake, Git, ROS, Python, Docker, Linux (Ubuntu), Jenkins.

- Defined architecture for inter-platform RPC communication; designed and implemented the Robots' REST APIs powering Robot/Tablet interaction (HTTP Server based on C++ Boost Asio and Beast libraries); implemented an internal utility library for cross-platform serialization of volatile and persistent data (JSON, Cereal library); defined data formats for inter-platform exchange of inspection data (pictures, platform logs, rosbags), ensuring data integrity and confidentiality, using asymmetric public-key cryptography schemes (encryption and digital signature implemented with C++ Botan library); supported development of an internal library for telemetry data (based on Mavlink, UDP) with bug fixes, reliability improvements, unit tests and integration tests;
- Contributed to the development of the Drone simulator (dynamic FOV camera Gazebo plugin) and build system (improved internal and external CMake libraries management, integrated an AWS S3-based APT repository).

Software Engineer (External Contractor)

Leica Geosystems, part of Hexagon (via Consulteer A.G.)

JAN 2020 – MAR 2021 • 1 year and 3 months • Zurich (CH) • 80% remote

Supported *"Design and Disruptive Technology"* team in the development of *BLK2FLY*, a fully integrated autonomous LiDAR UAV.

Tech: C++17 (CTest, Boost, gRPC, Protobuf, Eigen), CMake, Git, Python, Linux (Ubuntu), Jenkins.

- Supported development of the simulation framework (ROS, Gazebo): integrated proprietary UAV flight controller in simulation; developed custom plugins for simulating moving objects, UAV battery, and LiDAR noise.
- Supported system integration efforts at various levels: internal data flow across various software modules (gRPC, shared memory); integration of hardware peripherals (EEPROM over I2C, FPGA JPEG Encoder); code profiling and optimization; software modules boot sequence management; bug fixes, unit tests, and enhancements in the build system and CI.

Navigation Engineer
Hease Robotics
NOV 2017 – NOV 2019 • 2 years • Lyon (FR)

Designed and developed from scratch, with minimal external dependencies, the navigation control algorithms for *Heasy*, an autonomous indoor differential-drive mobile social robot.

Tech: C++14 (GoogleTest, Abseil, Lapack), CMake, Git, Python, Linux (Debian), Docker.

- Designed and developed algorithms for global planning (A*), local planning (dynamic window approach MPC), and obstacle avoidance (occupancy-grid mapping based); designed and developed a pure-localization solution, handling multiple combinations of sensors (odometry, LiDAR, bluetooth beacons, magnetometer) using particle filters, Kalman filters, and histogram filters; developed a lightweight 2D kinematics and sensors simulator and its GUI (OpenGL); wrote unit tests and end-to-end tests for the entire navigation stack (GoogleTest).
- Set up continuous integration (GitHub, CircleCI) for C++ repositories; refactored an internal C++ library for interprocess messaging; defined versioning and release procedures for all software modules on the robot.

R&D Software Engineer
Pro-Drone (Currently BladeInsight)
NOV 2016 – OCT 2017 • 1 year • Lisbon (PT)

Contributed to the development of an autonomous drone for wind turbine inspections.

Tech: C++11 (GoogleTest, Eigen, Boost), Git, CMake, Python, Linux (Ubuntu), Docker.

- Supported development of the high level flight controller logic, increasing the level of autonomy, safety and performance of the device: developed an abstraction layer to handle connection to PX4 and DJI flight controllers; designed and implemented a LiDAR-based anti-collision strategy; reduced inspection time by 10% by developing an adaptive vertical speed controller; validated changes through Software-in-the-Loop and Hardware-in-the-Loop simulations (ROS, Gazebo).
- Implemented communication layer between UAV, ground operator PC, and Web Platform: developed a communication interface between UAV and ground operator PC (ROS Bridge C++ client); developed a GUI application (QT) for users to collect inspection data from the UAV and upload it to S3 buckets (AWS C++ SDK); developed interfaces to encrypt and sign data with an asymmetric cryptography scheme (Botan library); set-up cloud workers to pre-process uploaded data (OpenCV); supported development of the UAV software updater.

Internship and Master Thesis Development
C.N.R. (National Research Council of Italy) I.S.S.I.A. (Institute for Intelligent Systems for Automation)
MAR 2016 – OCT 2016 • 7 months • Bari (IT)

Designed and implemented a cooperative algorithm for 3D map exchange and mutual localization in a heterogeneous network of robots. Experimentally validated the algorithm, setting up a network composed of two ground robots (skid steering + differential-drive) carrying Microsoft Kinect RGBD cameras, and one UAV equipped with a stereo-camera.

Tech: C++ (STL, PCL Library), ROS, Git, CMake, Python, C, Linux (Ubuntu).

EDUCATION

Master's Degree in Automation Engineering (Grade: 110/110 with honors)
Politecnico di Bari
SEP 2013 – OCT 2016 • Bari (IT)

Linear and nonlinear control theory; kinematics, dynamics, and control of robotic systems; electric drives; system identification. Thesis: Distributed algorithms for 3D mapping and localization in robot networks.

Bachelor's Degree in Automation and Software Engineering (Grade: 106/110)
Politecnico di Bari
SEP 2009 – APR 2013 • Bari (IT)

Thesis: Quantized consensus algorithms for capacity-constrained networks.

PUBLICATIONS

A Distributed Map Building Approach for Mobile Robotic Networks

Published in: 2018 IEEE 14th International Conference on Automation Science and Engineering (CASE)

Authors: Antonio Petitti; Donato Di Paola; Roberto Colella; Annalisa Milella; Ettore Stella; Antonio Coratelli; David Naso.

DOI: 10.1109/COASE.2018.8560499

LANGUAGES

Italian	Native speaker
English	C1 – Cambridge Certificate in Advanced English – Grade B (2015.07.06).
French	C1

OTHER

Iscritto all'Ordine degli Ingegneri