Daniel Tobon Collazos

Mechatronics Engineer
Address: Hacienda el Castillo pradera 2 casa 43, Jamundi, Col
Nationality: Colombia, Non-EU National
Email: daniel.tobon@uao.edu.co
Phone: +573166250165
LinkedIn: https://www.linkedin.com/in/danieltobonco43/
GitHub: https://github.com/danielTobon43
Portfolio: https://danieltobon43.github.io/

SUMMARY

Mechatronics Engineer professionally since April 2019 with an emphasis on Application Development in Robotics perception Systems, Computer Vision techniques (Object Detection, pattern recognition, Segmentation, linear algebra, 3D graphics, 3D geometry, cameras Calibration), Image Processing, Depth Processing (LIDAR, Stereo Cameras, Structure From Motion), Robot Operating System (ROS) for path planning, CAD modelling, navigation stack, design of very large adaptive data structures, and embedded systems. I have skills in Software development with robust, safety-critical, efficient code, motion planning, and in systems architectures with data structures and advanced algorithms. I took part as a Researcher in Electronics at IMaR Technology Gateway: The Intelligent Mechatronics and RFID Research Centre based at IT Tralee in Kerry, Ireland. I am passionate about Computer Vision and Intelligent robotics perception systems, Mobile robotics, multi-robot cooperative systems, and autonomous systems. In the future, I would like to work in (localization and mapping) SLAM projects, machine learning Algorithms applied to environment understanding and for decision-making, and classification. I am a person with a specific interest in a role of Robotics Engineer, Computer Vision Engineer, and Research Engineer.

EDUCATION:

Universidad Autonoma de Occidente

BS degree in Mechatronics Engineering
Member of the student research group in robotics SIR
July 2012 – April 2019
Cali, Colombia

Development of a robotic perception system for geometric feature estimation of an individual tree

This is an intelligent farm open source project about a real-scaled pointcloud representation of an individual tree built from an RGB monocular camera using computer vision techniques such as structure from motion and pointcloud processing.

pipelines:

1. Keypoints/descriptors detection
2. Tree trunk and tree crown pointcloud model from PCL segmentation algorithms (plane model segmentation)
3. 3D points clustering method with a Machine Learning algorithm (DBScan ML)

4. ICP for pointcloud alignment. (Tree trunk alignment)
5. For filtering and refining outliers (RANSAC)
6. Conversion from pointcloud to mesh representation
7. Measurements of each feature using each cluster

Achievements: Measurement error reduced by 2 cm against conventional measurement techniques tested in the tree trunk diameter, tree trunk height, total tree height, crown volume, and percentage of canopy missing in 5 trees.

WORK EXPERIENCE:

IMaR Technology Gateway

Research engineer embedded systems/electronics/hardware design
September 2019 – December 2020
Tralee, Ireland

I play a key role in the prototyping laboratory with short-term projects 2-3 months, building, deploying, researching, coding that runs on embedded systems, Design, testing, and documentation.

Projects:

- Vision system for quality inspection using OpenCV
- Interface framework for a ZR300 Intel Realsense camera in PCL and ROS
- Data analytics and Industrial Internet of Things project for a human-machine interface to automate a task in biomedical industry
- RFID project to read an animal tag using the RFIDRW-E-TTL with a nRF5 SDK 16.0
- CMake project for the nRF52 SDK to program an nRF52832 using JLink
- IoT application for getting the strain deformation data of a strain gauges sensors using an ESP32 micro-controller and the ESP_IDF framework.

Achievements: Graphic analysis system evaluated the operation of the machine by integrating a human-machine interface for the client while integrating IoT tools with R&D open-source frameworks such as Plotly python, Dash and Git

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PAST PROJECTS:

- URDF/Xacro model and Gazebo simulation of a 7DOF robot arm using ROS
- Robotic arm design with 5 degrees of freedom using stress theory and deformation due to mechanical failure (finite element analysis)
- Embedded control for a chocolate injection line with a microcontroller board based on the ATmega2560
- optimized Dbscan implementation in PCL
- A simple structure from motion pipeline for 3D incremental reconstruction
- Upsampling method for an input cloud using mls method of PCL 1.9.1
- C++ application to align a pointcloud to the global reference frame in PCL
- Path planning of a robot arm in Gazebo and Moveit with ROS

SOFTWARE TOOLS:

- **programming languages**

  C/C++, Python, Git

- **Libraries**

  Matlab, ROS, Gazebo, Moveit, OpenCV, OpenMVG, PCL, CMake, Eigen, Linux Ubuntu

- **Electronics circuit design**

  Proteus, Eagle

- **Mechanics design**

  SolidWorks

PUBLICATIONS:

Conference Paper

1. D. Tobon, V. Romero, J. Perafan y W. Mayor (2018). A photogrammetric system for dendrometric feature estimation of individual trees. On: IEEE Colombian Conference on Robotics and Automation (CCRA). DOI: 10.1109/CCRA.2018.8588151