Daniel Tobon Collazos

Mechatronics Engineer
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SUMMARY

Mechatronics Engineer professionally since April 2019 with an emphasis on Application Development in Robotics Perception Systems, Computer Vision techniques (Object Detection and Recognition, Segmentation, Pattern Recognition, 3D graphics, 3D geometry, Camera Calibration), Image Processing, Depth Processing (LiDAR, Stereo Cameras, Structure From Motion), Robot Operating System (ROS) for path planning, CAD modelling, navigation stack, Point Cloud Library (PCL) and embedded systems. I have experience in software development, motion planning, and Intelligent systems. At the moment, I am working 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 Vehicles. In the future, I would like to work in 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

Bachelor's degree in Mechatronics Engineering
Member of the student research group in robotics SIR
July 2012 – April 2019
Colombia

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

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

Pipeline:
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)
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: Were accomplished measurements related to 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 – Present
Tralee, Ireland

My role involves prototyping of short-term projects 2-3 months, researching, coding embedded software, testing, and documentation.

Projects:

- 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
- 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 sensor using an ESP32 micro-controller and the ESP_IDF framework.

Achievements: Were accomplished a human-machine interface for a company integrating IoT tools with R&D open-source frameworks such as Plotly python, Dash and Git. This project produced a tool for graphical data analysis from multiple sensors that allowed to the company a better understanding of what is happening with their machine in the production line.

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
- 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, 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