Jeremy Steward

Geomatics Engineer — Calibration and Multi-Sensor Integration

contact

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specializations

3D imaging & LiDAR
Spatial sensing
Sensor integration
Multi-sensor calibration
Real-time systems
Photogrammetry
Bundle adjustment
SLAM
Computer vision

programming

Rust, C++, C
Scheme, Lisp, Python
Docker, GitLab CI
LaTeX

experience

2020–now Tangram Vision Inc. Boulder, CO, USA

Senior Perception Architect

Performed in the role of technical leader and senior software architect developing a platform for multi-sensor integration and calibration. I have been in charge of developing Tangram Vision's SDK and integrating sensor drivers (RealSense, Velodyne) across C, C++, and Rust into robotic and autonomous platforms.

Achievements of note:

- Lead architecture and design reviews for the development of calibration & SLAM technologies. Code was written & architected in Rust, and shipped to cross-platform targets. Customers shipped to include those in mobile robotics, autonomous vehicles, and pick-and-place robotics.
- Helped shape and maintain continuous integration (CI) configurations for large Rust / C / C++ projects.
- Contributed to the Tangram Vision's marketing resources, including the development of text (blog) and video assets, as well as presenting technical information at conferences and trade-shows on behalf of the company.
- Mentored others in learning to program, test, document, and ship Rust code across multiple platforms and architectures.
- Contributed to the development of multiple patents and patent applications within the company.
- Assisted in defining compliance strategies for working with open-source code and ensuring that software built and shipped by Tangram (manually or through some autonomous CI process) complied fully with the open-source licenses of the projects we depended upon.

2019–2020 Occipital Inc. Boulder, CO, USA

Calibration & CV Technical Lead

Performed in the role of technical leader for a number of projects ranging across Calibration & Computer-Vision applications. As the Calibration & CV technical lead for Occipital, I have had a mixture of both technical leadership and project management experience combined with the day-to-day engineering tasks. This was done across a variety of products involving Occipital's sensor production line, calibration suite, and other related computer vision technologies (including SLAM).

Achievements of note:

- Remotely maintained, deployed, tested, and verified a 3D sensor production line system in Shenzhen.
- Managed several projects through the development, testing, and release cycle. Directed 2 other engineers and a handful of QA testers through the course of this project.
- Addressed longstanding technical debt within the company in a safe and controlled manner as we scaled the business.

| 2018–2019 | **Occipital Inc.** | Boulder, CO, USA |

Platform Software Engineer

Work on calibrating, integrating, and developing the architecture of computer vision and 3D vision systems on mobile, desktop, and integrated systems (e.g. HMDs, robotics, etc). This work was involved across many different platforms and operating systems.

Achievements of note:

- Worked on cutting-edge SLAM systems and architecture
- Tested and verified sensor data on a range of passive and active visual and visual-inertial systems
- Helped design and shape APIs across many platforms (e.g. iOS, Windows, Android)

| 2014–2017 | **Graduate Research** | Calgary, AB, Canada |

Masters Student

Developed a motion capture system that can detect, track, and model motion using multiple 3D Time-of-Flight (ToF) cameras.

Achievements of note:

- Implemented software registration of point clouds from scratch
- Extracted and modeled 3D time-series motion
- Synchronized motion capture across several 3D sensors
- Moved projects under version / revision control (Git)
- Added unit tests and documentation
- Learn and implement published solutions from original publications

education

| 2014–2017 | **Masters** of Science in Geomatics Engineering | University of Calgary |

3D Motion Capture and Modeling

My project focused on tracking, capturing, and modeling motion using 3D technology such as Time-of-Flight cameras. While my work has focused on tracking and capturing human motion, the work just as easily applies to tracking simpler objects moving through space.

As part of my project, I developed a system capable of capturing data from several synchronized 3D sensors, calibrating said sensors, and integrating them together to perform motion capture and analysis.

Some courses I have taken as part of my graduate program are:

- *ENGO 642:* Optical Imaging Metrology
- *ENGO 699:* Special Topics - Geospatial / Computer Vision
- *ENGO 629:* Advanced Robust Estimation Methods & Analaysis
- *ENGO 623:* Inertial Survyeing & INS / GPS Integration

| 2009–2014 | **Bachelors** of Science in Geomatics Engineering | University of Calgary |

Specialization in Biomedical Applications

interests

professional: programming & software design, 3D imaging technologies, LiDAR, SLAM, multi-sensor calibration, real-time systems

personal: Scheme (programming), free & open source software, judo, martial arts, logic puzzles, escape rooms, electronics

patents & publications

Patents

Two patents pending; Can provide more information upon request.

M.Sc. Thesis

Range Camera Motion Capture - Geometric Parameter Extraction from Human
Motion Data in Point Clouds
Jeremy Steward
(July 2017). University of Calgary

Peer-Reviewed Journal Articles

Measurement of Deflection in Concrete Beams During Fatigue Loading Test Us-
ing the Microsoft Kinect 2.0
Herve Lahamy, Derek D. Lichti, Jeremy Steward, Mamdouh El-Badry, Mohammad Moravvej
Journal of Applied Geodesy *10.1 (2016) p. 71. 2016*

Explanation for the seam line discontinuity in terrestrial laser scanner point clouds
Derek D. Lichti, Craig L. Glennie, Kaleel Al-Durgham, Adam Jahraus, Jeremy Steward
ISPRS Journal of Photogrammetry and Remote Sensing *154 (2019) pp. 59–69. 2019*

The Practical Application Of 3D Vision in the Field: Measuring Reindeer (Rangifer
Tarandus) Antler Growth Velocities
Derek D. Lichti, Jeremy Steward, Jacky C. K. Chow, John Matyas
The Photogrammetric Record *31.156 (2016) pp. 394–406. 2016*

Structural Dynamic Deflection Measurement With Range Cameras
Xiaojuan Qi, Derek D. Lichti, Mamdouh El-Badry, Ting On Chan, Sherif Ibrahim El-
Halawany, Hervé Lahamy, Jeremy Steward
The Photogrammetric Record *29.145 (2014) pp. 89–107. 2014*

Conference Proceedings

Monitoring Masonry Walls Subjected to Earthquake Loading with a Time-of-Flight
Range Camera
David Holdener, Derek Lichti, Jeremy Steward, Pedram Kaheh
FIG Working Week 2017, 2017, Helsinki, Finland

Evaluating the Capability of Time-of-Flight Cameras for Accurately Imaging a
Cyclically Loaded Beam
Hervé Lahamy, Derek D. Lichti, Mamdouh El-Badry, Xiaojuan Qi, Ivan Detchev, Jeremy
Steward, Mohammad Moravvej
SPIE Optical Metrology 2015, 2015

Developing a methodology to measure the regeneration of reindeer antlers
Jeremy Steward
Journal of Undergraduate Research in Alberta, 2012, 2012 CREATE Symposium at the University
of Calgary

Performance assessment and calibration of the Kinect 2.0 time-of-flight range
camera for use in motion capture applications
Jeremy Steward, Derek Lichti, Jacky Chow, Reed Ferber, Sean Osis
FIG Working Week 2015, 2015, Sofia, Bulgaria

Using a mobile range-camera motion capture system to evaluate the performance
of integration of multiple low-cost wearable sensors and gait kinematics for
pedestrian navigation in realistic environments
C. Tjhai, J. Steward, D. Lichti, K. O'Keefe
2018 IEEE/ION Position, Location and Navigation Symposium (PLANS), 2018