Kyle Chisholm

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PROFILE

I'm a roboticist and engineer who loves to build solutions for applications that are human-centered. My work is focused on surgical, rehabilitation, live camera motion, and collaborative robots.

TOOLS AND SKILLS

PROGRAMMING
C/C++ • Python
POSIX/Linux • CMake • Bash
MATLAB • Simulink • Scipy
OpenCV • ROS • PCL

PRODUCTIVITY
Jira • VS Code • CLion
Codebeamer • Conan • Jenkins
LaTeX • Doxygen • Sonarqube

PROTOTYPING
3D Printing • Laser Cutting
Amtel AVR • QNX Neutrino
FreeRTOS • PCB • Machining

WEB APPS
Node.js • Redis • React.js
HTML • CSS • Typescript

CAD
SolidWorks • Autodesk Inventor
KiCAD • Blender • FEMM

EDUCATION

CARLETON UNIVERSITY
Doctoral Student - Research in Rehabilitation Robotics
Sept 2011 - August 2017 | Ottawa, ON
- 2012-2015 NSERC Post Graduate Scholarship - Doctoral

MASc Mechanical Engineering
2010 | Ottawa, ON
CGPA 11.67/12
- 2010 University Senate Medal nomination for outstanding research
- 2009-2010 NSERC CGS

BEng Mechanical Engineering
2008 | Ottawa, ON
CGPA 10.68/12

EXPERIENCE

KINOVA ROBOTICS Senior Robotic Control Developer
April 2021 - present | Montreal, QC
- Update kinematic calibration procedures of a robot manipulator used in bronchoscopy surgical robots (MONARCH™).
- Preliminary design for 7DoF surgical robots with workspace analysis, redundancy resolution, and optimizing robot geometry.
- Actuator controller design, modeling, and tuning for high-performance torque, velocity and position control.
- Created robot calibration and ISO 9283 performance testing procedures with motion capture and laser tracker systems.
- Implemented features for next-generation light industrial cobot (Link 6) such as collision detection, energy limitation, and hand-guiding.

ROSS VIDEO INC. Robotics R&D Software Developer
December 2017 - April 2021 | Ottawa, ON
- Software developer and architect for next-generation Ross Video camera motion systems mobile robot and manipulator.
- Built custom trajectory planning, kinematics, and real-time control software for differential drive robot with a multi-axis camera column.
- Incorporated 3D sensor package (Realsense) with point cloud processing (PCL) and image processing (OpenCV) for collision avoidance.

ADVANCED BIOMECHATRONICS AND LOCOMOTION LABORATORY (ABL) Research Engineer
Sept 2011 - 2017 | Ottawa, ON
- Designed, built and tested a novel prototype gait rehabilitation robot for stroke patients capable of delivering haptic feedback from virtual environments, full gait trajectories, and monitoring patient effort.
- Acquired a broad practical skill set through the full development cycle including conceptual design, requirements analysis, detailed mechanical design, procurement, controller design, integration and implementation.
- Implemented advanced controls and sensing techniques such as admittance force control, feedback linearization, 6DoF proxy haptic rendering, redundancy resolution, and unscented kalman filters.

ABL - SAFE HUMAN-ROBOT INTERACTION
Doctoral Candidate
Sept 2014 - August 2017 | Ottawa, ON
- Real-time user monitoring techniques for safe integrated human-machine interfaces by fusion of redundant and/or wearable biomechanical sensor data (EMG, inertial measurements, forces, joint angles).
- Novel approach included continuous monitoring of human biomechanics, lower extremity muscle activation, and joint torque estimations.

GESTURELOGIC Lead Researcher
August 2015 - April 2016 | Ottawa, ON

- Implemented sensor fusion and on-line parameter learning algorithms measuring power output of cyclists from wearable sensing technology.
- Validation with electromyography, inertial measurements, and power data from multiple test subjects.

STANDARD INNOVATION CORPORATION Researcher
May 2016 - December 2016 | Ottawa, ON

- Simulated, designed and prototyped electromagnetic components for mini hydraulic soft actuators.
- Built bench testing apparatus with 3D printed multi-material parts, sensors, and low-cost acquisition electronics.

ABL - COMPLIANT LIMB SENSOR Research Engineer
August 2014 - December 2014 | Ottawa, ON

- Development of a compliant shell sensor for robot manipulators, rendering them safe for human-machine interaction.
- Contributions involved development of a real-time shell pose estimation algorithm that incorporated a nonlinear optimization routine and an embedded infrared sensor array.

ALLEN VANGUARD Robotics Research Engineer
May 2012 - September 2012 | Ottawa, ON

- Kinematic modeling, simulation and visualization of a new reconfigurable mobile robot concept with mixed passive and active joint actuation.
- Mobile robot controls and inverse kinematics algorithms implemented for remote operation.

IEASTE WORK EXPERIENCE PROGRAM Research Assistant
Sept 2010 - December 2010 | Tarbiat Modares University, Tehran, Iran

- Improved depth profile calculation technique of a mobile sewage pipe inspection robot with mobile robot modeling and sensor processing.
- Researched, calibrated and tested a 3D profile reconstruction sensor using a single camera and line laser for a sewage pipe inspection robot.

RESEARCH ENGINEER - COMPUTER VISION SENSOR FUSION
August 2009 - August 2010 | Ottawa, ON

- Implemented a computer vision sensor for orientation feedback and control of a spherical motion platform.
- Applied image processing, sensor modeling and kinematics to combine inertial measurements with structured marker-based visual sensing.

EXPERIMENTAL STRESS ANALYSIS FACILITY NRC-IAR
Engineering Research Assistant
Sept 2006 - August 2007 | Ottawa, ON

- Developed a prototype solution for automating the detection of rotor blade damage using stereo vision surface profilometry and 3-axis robotic stage
- Applied experimental digital image correlation and infrared cameras to crack propagation and full-field stress-strain analysis.

SELECT PUBLICATIONS

"A limb compliant sensing strategy for robot collision reaction," *IEEE/ASME Transactions on Mechatronics*, 2016

"A task oriented haptic gait rehabilitation robot," *Mechatronics*, 2014

"Orientation control of Atlas: A novel motion simulation platform," *Mechatronics*, 2012

"Design and control for a gait rehabilitation robot," *Master's Thesis*, 2010

COMMUNITY

Open Source Hardware Summit Volunteer
2024 | Montreal, QC

- https://2024.oshwa.org/

FIRST Robotics Mentor
2018-2019 | Toronto, ON

- Mentored high school students participating in FIRST Robotics.

Let's Talk Science
2013-2015 | Ottawa, ON

- Lead interactive science workshops for high school students.

Science Travels
2014 | Ottawa, ON

- Traveled to rural first nations communities and facilitated science-based activities.

IEEE EMBS International Student Conference Technical Chair
2015-2016 | Ottawa, ON

Graduate Student Association Councilor
2009-2010 | Carleton University

Engineers Without Borders Volunteer (VP outreach)
2004-2010 | Carleton University

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