Kenneth Chow

Founder, Centre Of Robotics Excellence

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Academic History

Singapore University of Technology and Design (2017 – Present)
Bachelor of Engineering (Engineering Product Development)
Robotics Track
Co-curricular: Multirotor Society, Photographic Circle

Selected Projects:

Mobile Phone based Telematics Insurance System for WHYRE for 01.400/01.401 Capstone 1/2 2020
- Development of novel algorithmic pipeline to convert raw sensor data acquired by smartphones to insurance premium rebates, resulting in a system with no costs to motorists, instant feedback on rider behaviour changes, and net financial incentives to both insurers and motorists.
- Development of Computer Vision Pipeline, utilising classical and learnt algorithms such as Optical Flow and Semantic Segmentation to score scenes for safety based on available statistical data, resulting in a more accurate predictor of danger than current solutions, which are ego-motion based. [YouTube]

Running AI Development (RAID) Platform for 30.007 Engineering Design Innovation 2019
- Development of an independently suspended 4 Wheel Drive platform built on a riveted carbon fibre space frame utilising CNC milled, hand-machined, laser-cut (acrylic), and 3D-printed (ABS, TPU) hardware elements capable of travelling at high speeds (>20kmph) on uneven terrain and withstanding high impact collisions.
- Development of software stack (Arduino, C++, Python), with features including but not limited to a) learnt pose estimation (OpenPose) for running gait analysis and fall detection b) GPS waypoint following c) GPS route learning through Computer Vision based follow-me feature d) Bluetooth remote control through Android Application e) live status updates over cellular networks, visualised on an IoT dashboard f) parallel safety envelope system (software limits) based on Time of Flight sensors. [Github]

Autonomous Low-Cost, Sparse-sensing Quadrotor for the Singapore Amazing Flying Machine Competition 2019
- Development of a structural connector allowing for off-the-shelf hardpack LiPo batteries to be plugged directly into the chassis, eliminating the need to carefully route high current cabling which generate electromagnetic noise detrimental to sensitive flight-critical components on inherently unstable multirotor platforms.
- Development of sparse sensor stack (external to flight controller) including Time of Flight sensors and cameras for Optical Flow and general perception, resulting in a system costing less than half a Hokuyo LiDAR used by the competition.
- Development of a novel bounded-stochastic circumcentre algorithm able to robustly compute the positional setpoint of the drone in the presence of occlusions unlike traditional approaches such as the Hough Circle Transform.

Search and Rescue Tilt-rotor System for the Autonomous Aerial Vehicle Challenge 2018 [YouTube]
- Development of a crash-resistant, modular tiltrotor system built on a riveted carbon fibre space frame utilising CNC milled, hand-machined, laser-cut (plywood, acrylic), and 3D-printed (chopped carbon fibre, ABS) hardware elements capable of withstanding static loads of >100kg and drops of >20m into vegetation. Arms and externally mounted electronics can be packed within the space frame for transportation.
- Development of novel flow-informed statistical attention mechanism for Computer Vision applications to aid operators in spotting casualties in Search and Rescue scenarios.

Autonomous Mecanum Ground Vehicle for the National Instruments Autonomous Robotics Competition 2018 [Youtube]
- Development of full Robot Specification, including actuation, sensing and power subsystems.
- Development of sparse sensing algorithm for localisation and obstacle detection, resulting in computational speed ups allowing the robot to travel at over twice the speed of the competition.

Quadrotor with Novel Omniwheel Driven Gimbal for the Singapore Amazing Flying Machine Competition 2018 [YouTube]
Search and Rescue Mothership-Daughtership Multirotor System for the Autonomous Aerial Vehicle Challenge 2017 [YouTube]

Raffles Institution (2009 – 2014)
Integrated Program
A Levels: Physics, Chemistry, Mathematics, Economics, General Paper
O Levels: Higher Chinese
Co-curricular: Club Automatica (Chairperson), Infocomm Club (Robotics Section Chairperson), National Cadet Corp

Professional Experience

Centre Of Robotics Excellence (2014 – 2017, 2019 – Present) [Website]
Founder
- Consulted for companies and organisations in the Robotic Assistive Technologies, Kitchen and Education space.
- Development and implementation of competitive robotics curriculum and pedagogy at schools and with private clients, obtaining awards at various national and international competitions such as the International CoSpace Online Challenge.

Tinkertanker (2017 – 2019) [Website]
Chief Robotics Officer
- Creation and development of drone capabilities, including: evaluation of platform suitability for local educational markets, sourcing and development of partnerships with local and international companies, procurement and pricing strategy for goods and services, development of curriculum for educational institutions and corporate courses, development of custom logistics solutions for events, instructor training, overseeing of courses for Statutory Boards such as Monetary Authority of Singapore, Organisations such as Citibank, and Schools such as Edgefield Secondary.
- Planning, development, and presentation of robotic exhibits for the following events: Tinkercademy Open House 2018, IMDA Tech Saturday 2018, GET UP! (North East CDC) 2018, Makerfaire 2018, National Robotics Competition 2018.
- Development and implementation of competitive robotics curriculum and pedagogy at schools and with private clients, obtaining awards at various national and international competitions such as the National Robotics Competition and Robocup.

Defence Science Organisation (2017)
Research Intern, Information Division
- Evaluated in-context, implemented, and presented on state-of-the-art computer vision pipelines for automatic camera-LiDAR calibration for Autonomous Vehicles, including techniques involving Mutual Information and Histogram of Oriented Gradients.
- Designed and implemented novel computer vision pipelines for the aforementioned problem, achieving increased precision and accuracy in single Degree of Freedom calibration problems in-context.
- Proposed novel Research and Development direction, considering deficiencies of state-of-the-art pipelines.

Singapore Armed Forces (2015 – 2017)
Corporal First Class, Operations, SAF Ammunition Command (Peirce Ammunition Depot)
- Designed a 2-part human-operable ground to Fully Integrated Transport Container pallet transfer system to remove forklifts as an operational requirement, drastically reducing fixed and variable costs.
- Designed software in Excel with Visual Basic to optimise high dimensional logistics plans for ammunition collection by units, reducing months-long manual planning processes to a day-long automatic process, saving time and labour costs.
- Designed software in Excel with Visual Basic to automate Floorplan updating processes, saving time and eliminating discrepancies between the ground, offline, and online records.
- Oversaw database system migration from the Integrated Ammunition Management System (proprietary) to the Enterprise System (SAP), including writing software for conversion between database formats and performing User Acceptance Tests.
- Awarded the Commanders Coin for completion of the abovementioned.

Defence Science Organisation (2015)
Research Intern, Guided Systems Division
- Designed, built, wrote software for, and integrated a payload for autonomous vision-based target localisation, tracking, and engagement on a manned hexrotor platform, performing a successful demonstration of abovementioned capabilities.

Defence Science Organisation (2012)
Research Intern, Information Division
- Evaluated Prefast, a Static Analysis Software in Microsoft Visual Studio for vulnerability detection.

Complementary Experience

Virtual Robocup Asia Pacific (Aichi, Japan) 2020: Member of Organising Committee (RCJ Soccer League)
National Robotics Competition 2019: Co-Assistant Chief Referee (WRO Category), Judging panellist
Robocup Singapore Open 2019: League Chair (RCJ Soccer League)
FIRST Lego League 2019: Co-Chief Referee (Robot Game), Judging panellist
Robocup (Montreal, Canada) 2018: Referee, Member of Organising Committee (Robocamp)
Robocup Singapore Open 2018: League Chair (RCJ Soccer League)
FIRST Lego League 2018: Co-Chief Referee (Robot Game)
Robocup Asia Pacific (Bangkok, Thailand) 2017: Interview panellist (RCJ Soccer League) at the inaugural RCAP
National Robotics Competition 2017: Chief Referee. Developed inaugural Robot Arm Challenge
Asia Pacific Youth Robotics Competition 2017: Co-organiser. Organised inaugural Arduino Challenge

Awards

Note: Lists are non-exhaustive. Regional/International awards have country of award bracketed.

Personal

Singapore Amazing Flying Machine Competition 2019: Judge's Commendation Award
Autonomous Aerial Vehicle Challenge (Chiang Mai, Thailand) 2018: Best Design Award
National Instruments Autonomous Robotics Competition (Sydney, Australia) 2018: 4th
Autonomous Aerial Vehicle Challenge (Korat, Thailand) 2017: Best Design Award
Robocup Singapore Open 2016: Achievement Award (Entrepreneurship Category)
SiTF Awards 2014: Gold, Best Speaker Award
Robocup Singapore Open 2014: Category B Open 1st, Best Institution Award
National Junior Robotics Competition 2013: Best Presentation Award 2nd
Robomaker Challenge 2013: Robosoccer Champions, Best Performance Award, Best Presentation Award
Robocup Singapore Open 2012: Category B Open 1st, Best Institution Award
FIRST Tech Challenge 2012: Connect Award
National Junior Robotics Competition 2011: Best Research Award 2nd
Robocup (Istanbul, Turkey) 2011: Category A Lightweight 2nd, Category A Lightweight (Superteam) 2nd
strITwise 2011: strITbiz 1st, Overall 2nd
FIRST Lego League 2011: Gracious Professionalism Award
Raffles Institution Research Education Congress: High Distinction, Gold
Robocup (Singapore) 2010: Category A Lightweight (Superteam) 4th
National Infocomm Competition 2010: 2nd, **Solarprix 2010:** 1st
National Software Challenge 2010: LEGO Challenge 2nd, Overall 2nd
Robocup Singapore Open 2009: Category A Lightweight 2nd

Coached

International Cospace Online Challenge 2020: Cospace Rescue (CSR) FS U19 Best Presentation Award 1st, 2nd, 3rd, 3rd, Most Creative Presentation Award, Best Strategy Award, Cospace Grand Prix U19 Best Presentation Award 1st, 2nd, 3rd, CSR FS U12 Best Presentation Award 1st, Influencer Award (Community Awareness) Session 4 1st, S1 3rd, (Most Educational Value) S4 1st, S2 1st, (Most Popular Video) S2 1st, (People's Choice) S3 1st
FIRST LEGO League 2020: Robot Design Award (Mechanical Design Awards) 1st
National Robotics Competition 2019: Best Presentation Award 2nd, 3rd, Best Programming Award 3rd
Robocup (Sydney, Australia) 2019: Lightweight (Superteam) 1st
IDE 2019: (Maker) 3rd
Robocup Singapore Open 2019: Rescue Line 1st, 3rd, Soccer Lightweight 1st, Soccer Open 2nd
National Robotics Competition 2018: Best Content Award 1st, Best Presentation Award 3rd
IDE 2018: (Maker) 1st
Robocup Singapore Open 2018: Dance 1st, Dance (Superteam) 1st
National Robotics Competition 2017: Robot Arm Challenge 1st, Best Programming Award 2nd
Robocup Singapore Open 2017: Dance 1st
Robocup (Leipzig, Germany) 2016: Rescue Line (Superteam) 3rd
Robocup Singapore Open 2016: Soccer Open 1st, 2nd, Rescue Line 1st, Dance 2nd, Dance (Superteam) 1st
National Junior Robotics Competition 2015: Overall (Tertiary) 1st, Best Programming Award 1st, Best Research Award 1st, Best Presentation Award 2nd, Best Journal Award 2nd
Robocup Singapore Open: Soccer Open 2nd

Certifications and Skills

Certifications: Ministry of Education Registered Trainer (2015 – Present)
Programming Languages: C, C++, MicroPython, Python
Libraries: Arduino, Dronekit, NumPy, OpenCV
Robotics Software: Mission Planner, QGroundControl
Robotics Systems: Arduino, Ardupilot, LattePanda, LEGO Mindstorms, Odroid, OpenMV, Pixhawk, Raspberry Pi
Design Software: AutoCAD (2D), Photoshop, Premiere Pro, Sketchup, VRay (Sketchup)
OS: Raspbian, Ubuntu, Windows
Skills: Robotic System Design and Specification, Computer Vision, Curriculum Development, Teaching, Competition Development