Will Davis

Automation, Controls and Hardware Engineer
Huddersfield, UK | 07792 199271 | william.davis@live.co.uk
willdavis.uk | linkedin.com/in/willdavis576 | github.com/willdavis576

PROFILE

Controls, automation and hardware engineer with hands-on Beckhoff TwinCAT experience across industrial robotics, entertainment automation and my own machine builds. Currently a Hardware Engineer at Rivelin Robotics, where I am **lead engineer on TwinSAFE projects**, responsible for the safety library behind three robotic machine lines, and part of a team that cut commissioning from 80 hours to 8. Previously I commissioned SIL 3 servo winch and hoist systems to IEC 61508 at TAIT. Outside work I design and build Beckhoff-controlled special purpose machines end to end – most recently a **3-axis CNC router** and a **custom EtherCAT slave device on STM32 with its own ESI description**. First Class BEng in Mechatronics, Robotics & Automation, MSc by Research in Digital Twins, and WorldSkills UK Gold Medallist in Mechatronics. I want to bring a systematic, scientific approach to building scalable, reusable, object-oriented automation software for Power Unit assembly systems.

TECHNICAL SKILLS

PLC & Controls: Beckhoff TwinCAT 3 (PLC, Motion, TwinSAFE, I/O configuration), IEC 61131-3 Structured Text, object-oriented programming (OOP), reusable function blocks, HMI development, CODESYS, Siemens TIA Portal / STEP 7, Siemens Simotion

Motion & Drives: EtherCAT servo and stepper axes, Siemens S120, Nidec, Kinesys, SEW and Control Techniques motors, ODrive; servo winch and hoist commissioning

Functional Safety: Beckhoff TwinSAFE (project lead engineer), Pilz, DOLD; IEC 61508 (SIL 3), ISO 13849 (PL d / PL e), EN 17206; risk assessment; UL508A, NFPA 79; FAT and SAT

Fieldbus & Integration: EtherCAT (including custom slave firmware and ESI files), CAN bus, TCP/IP, SPI, QSPI, serial; integration of sensors, drives and third-party devices

Software & Version Control: Git / GitHub, CI/CD, versioned libraries, automated testing, C, C++, C#, Python, Node-RED, Unity, LabVIEW, Linux

Robotics & Simulation: ABB RobotStudio, ROS, Festo Robotino, Siemens Plant Simulation, digital twins of PLC-controlled production lines

Hardware & CAD: Control panel design and wiring, electrical schematics, SolidWorks, Siemens NX, Autodesk Fusion (Design & Electronics), KiCad, STM32

PROFESSIONAL EXPERIENCE

Rivelin Robotics — **Sheffield, UK**
Hardware Engineer — June 2025 – Present

- Led **version 2 of the Netshape TwinSAFE safety library** used across the R400, R700 and R1000 robotic machines (PL d / PL e). It added automated tests for TwinSAFE functions, hot-swappable libraries, a safety interface layer for non-safe comms, and modular safe groups that turned adding an M1000 module to an existing machine from days of setup into near plug-and-play
- Now leading **version 3 to IEC 61508**, tracing every safety function back to its signed-off risk assessment
- Part of a 5-person multi-disciplinary hardware team that cut R1000 install time from **160 hours to 18 (89%)**. My part: worked with panel suppliers on custom plug-and-play looms (field wiring **120 hours to 16**) and redesigned the Assa Abloy high-speed roller door (**40 hours to 2**)
- Cut integration and commissioning from **80 hours to 8 (90%)** as a team; I led 40% of that saving by restructuring the TwinSAFE and TwinCAT 3 PLC code
- Introduced **CI/CD and versioned PLC libraries** with a colleague, sharply reducing a rate where 1 in 2 PLC updates caused a major fault on another machine
- Led the rev 2 electrical design for the R1000; achieved **UL508A and NFPA 79** field certification for the machine
- Redesigned the HSK tool holders for a higher cycle count and made them serviceable instead of disposable; moved machined parts to cheaper, faster suppliers, ahead of the enclosure maker's later 100%+ price rise

TAIT — **Wakefield, UK**
Controls Engineer — January 2023 – June 2025

- Wrote, tested and debugged machine code across **Beckhoff TwinCAT**, Siemens Simotion / S120, Brilliant, Kinesys and Nidec platforms for performer-flying servo winches and hoists
- Commissioned safety-critical motion systems, typically **SIL 3**, including **FAT and SAT**, to EN 17206 and IEC 61508
- Wrote risk assessments to EN 17206 and traced each safety function in the safety project back to the signed-off assessment
- Integrated Pilz and DOLD safety controllers with SEW and Control Techniques motors, tuning equipment to perform at its best before shipping to site
- Managed a controls apprentice and a controls technician to improve production throughput
- Created and redlined wiring diagrams

SELECTED PROJECTS

Beckhoff-Controlled CNC Router (personal project) — **Ongoing**
Technologies: *Beckhoff TwinCAT 3, EtherCAT, SolidWorks, panel design*
Designed and built a 3-axis CNC router, from initial sketches through to prototyping and soon on to integrating.

- Mechanical design in SolidWorks, then fabrication and assembly of the frame and axes
- Designed and wired the control panel around Beckhoff hardware, with EtherCAT I/O and stepper drives
- Programmed the machine safety in TwinCAT 3 TwinSafe

Custom EtherCAT Slave on STM32 (personal project) **2026**

Technologies: *STM32, C, EtherCAT, ESI (XML), TwinCAT 3*

Wrote custom EtherCAT slave firmware for my STM32 board and authored its ESI (EtherCAT Slave Information) file, so TwinCAT scans, configures and maps the board's process data like any commercial terminal. This gave me a detailed understanding of EtherCAT from the device side, which helps when integrating third-party hardware.

Digital Twin Framework for Industry 4.0 – Middlesex University (Publication 1) **3 years**

Technologies: *Siemens TIA Portal, CODESYS, Python, C#, Unity, Node-RED, JS, TCP/IP*

Designed and built a software-agnostic Unity digital twin of an Industry 4.0 production line (Siemens PLCs, Festo hardware). It reads multi-PLC data at varying rates over TCP/IP for real-time part position tracking.

- Trend prediction for fault detection: air flow vs regulated pressure (leak detection) and per-station power draw (bearing and motor strain)
- Production analytics: historical time-series validation of production efficiency, plus obstruction detection from the position-tracking algorithm

Modular Smart Gauge (personal project) **Ongoing**

Technologies: *STM32, CAN bus, QSPI, Autodesk Fusion Design & Electronics, JLCPCB / JLCCNC*

A modular automotive gauge that reads sensors directly and pulls live vehicle data from CAN bus, with configuration depending on the application. The revision 2 PCB is in prototyping; electronics and enclosure are developed together in a single Fusion project.

Sim Racing Formula Wheel and Force-Feedback Rig (personal project) **18 months**

Technologies: *C, C++, Python (PyQt5), Teensy, ODrive, CAN bus, SolidWorks, CNC, 3D printing, welding*

Designed and built a carbon-fibre, formula-style wheel for under half the cost of a commercial one. I reverse-engineered a Thrustmaster T150 for PlayStation 5 compatibility, built a HUD showing live game telemetry, and made the rig's force feedback using a Control Techniques servo driven by an ODrive over CAN bus, with custom electronics to convert the differential encoder signals.

EDUCATION & AWARDS

Middlesex University **London, UK**
Master of Science by Research 2020 – 2024

Research: Digital Twin Technology with the Application of Industry 4.0 Manufacturing

Middlesex University **London, UK**
BEng Mechatronics, Robotics and Automation (First Class Honours) 2016 – 2019

Major Project: Applying Blockchain Product Tracing to an Industry 4.0 Production Line

Key Courses: Computer science (Programming, Formal Systems); PLC Programming, Control Systems (Applied and Theory), Electronics, FPGA, Mobile Robotics and Manipulators, Mechatronics, Electro-pneumatics

Sheffield University Technical College **Sheffield, UK**
Level 3 Engineering Diploma; A Levels in Maths, Further Maths and Physics 2014 – 2016

WorldSkills UK – Gold Medal, Higher Mechatronics (recruited into Squad UK) **2018**

PAPERS AND PUBLICATIONS

1. M. Raza, P. M. Kumar, D. V. Hung, W. Davis, H. Nguyen and R. Trestian, "A Digital Twin Framework for Industry 4.0 Enabling Next-Gen Manufacturing", 9th International Conference on Industrial Technology and Management (ICITM), Oxford, UK, 2020
2. S. V. Mihai, D. V. Hung, H. Nguyen, R. Trestian, W. Davis, "A Digital Twin Framework for Predictive Maintenance in Industry 4.0", International Conference on High Performance Computing & Simulation (HPCS), Barcelona, Spain (virtual), 2020
3. W. Davis, M. Yaqoob, L. Bennett, S. Mihai, D. V. Hung, R. Trestian, M. Karamanoglu, B. Barn and H. X. Nguyen, "An Innovative Blockchain-Based Traceability Framework for Industry 4.0 Cyber-Physical Factory", 11th ICITM, Oxford, UK, 2022
4. D. V. Hung, S. V. Mihai, H. Nguyen, R. Trestian, W. Davis, M. Yaqoob, "Digital Twins: A Survey on Enabling Technologies, Challenges and Future Prospects", IEEE submission, September 2022

INTERESTS

Motorsport & cars: Sim racing (own-build rig and wheel), full restoration of a 1996 Toyota MR2 including self-taught welding (new floor, rear arches, boot, suspension and custom exhaust), Mazda RX8 CAN bus telemetry display

Other: Cycling and bike technology, 3D printing (including parts for London bike companies), home automation, guitar and drums

Language: English (native)