



System integration / Image processing / Embedded system

DISSERTATION

- Development of an Optical Zoom Uncooled Thermal Imaging System for Environmental Observation Doctoral Dissertation
 - The integration is composed of hardware devices including industrial computers, thermal image sensors, zoom lenses, GPIO control modules, and power circuit boards.
 - By employing image processing techniques such as NUC (Non-Uniformity Correction), DPC (Defect Pixel Correction), and IE (Image Enhancement), the raw data is converted into visual images that can be observed.
 - The system is written in Python, with some of its content using OpenCV.
- Development of Compact Immunoassay System for Helicobacter Pylori Detection Master's Thesis
 - The integration is composed of hardware devices including Raspberry Pi, CMOS camera, LED light source-equipped circuit board, Liquid Crystal Display, Real-Time Clock, light diffuser plate, and an enclosed chamber equipped with a fixed light source for controlled illumination.
 - Using the Taguchi quality method to analyze and improve the accuracy of detection results.
 - The system is written in Python and primarily using OpenCV and SQL.

SIDE PROJECT

- Automatic urinalysis analyzer for urine strips 2022
 - Being able to rapidly and extensively measure URS test strips while reducing errors in color judgment caused by environmental factors and subjective visual assessment.
 - The integration is composed of hardware devices including a Raspberry Pi, CMOS camera, conveyor, Liquid Crystal Display, and an enclosed chamber equipped with a fixed light source for controlled illumination.
 - The system is written in Python, with some of its content using OpenCV and SQL.
- Testing platform for laser rangefinder 2021
 - Design a laser platform to test if there is any displacement in the laser emission position during laser excitation.
 - The platform was designed in SolidWorks and fabricated using a CNC machine, with certain components produced using a laser engraving machine.
 - The integration is composed of hardware devices including a Raspberry Pi, CMOS camera, manual slide table, Liquid Crystal Display, and platform into a single measurement device.
- Temperature testing chamber for cold finger 2020
 - Design a vacuum chamber environment with a temperature sensor for testing the cooling rate and ultimate temperature of a cold finger.
 - The vacuum chamber environment's hardware is designed using AutoCAD and then manufactured with a laser engraving machine.
 - The integration is composed of hardware devices including a Raspberry Pi, Liquid Crystal Display, and temperature sensors.
- Light intensity adjustment device 2019
 - Detect the illuminance of the LED light source-equipped circuit board using a digital light intensity sensor and adjust the PWM signal to achieve the desired intensity.
 - The integration is composed of hardware devices including a Raspberry Pi, Liquid Crystal Display, digital light intensity sensor, and an enclosed chamber equipped.
- Thermal analysis of disc brake by using ANSYS 2018
 - Designing a disc brake by using ANSYS.
 - Analyzing the heat distribution of disc brakes and changes in disc brakes when coming to a stop at different speeds in various environmental conditions.

INTERNATIONAL & EXHIBITION EXPERIENCE

- **Bio Asia Taiwan Exhibition – Exhibitor** 2020 Jul.
 - Showcasing the newly developed prototype of a rapid detection device for fluorescent immunoassay at the exhibition.
 - Participated as a startup company in this biotechnology exhibition.
- **MEDICAL FAIR THAILAND – Exhibitor** 2019 Sep.
 - Collaborated with two biotechnology companies in Taiwan to develop a new specialized detection equipment.
 - Participated in hardware and circuit design for the prototype, independently completed a portion of the machine's software development, and contributed to system integration.
- **Engineering Colleges Partnership Forum in Asia (ECPFA) – Engineering Student Representatives** 2019 Aug.
 - As a representative of the College of Engineering, engaged in discussions with top students from engineering colleges around the world at Surabaya Institute of Technology on the topic 'Clean Energy, Clean City'.
 - Received the 'Best Presentation Award' for this event.
- **Bio Asia Taiwan Exhibition – Exhibitor** 2019 Jul.
 - Showcasing the newly developed prototype of a simplified rapid detection device for immunoassay at the exhibition.
 - Collaborated with the Chinese manufacturer Genesis and the American manufacturer Vicam to develop new specialized detection equipment.
- **Bio Taiwan Exhibition – Exhibitor** 2018 Jul.
 - Displayed three developed prototype immunoassay interpretation devices designed for various functions at the exhibition.
 - Participated in hardware and circuit design for the prototype, independently completed a portion of the machine's software development, and contributed to system integration.
- **International conference "Transducers 2017" – Staff Member** 2017 Jun.
 - Assisting in the organization of meetings, venue setup, personnel guidance, issue resolution, communication support, behind-the-scenes tasks, and pre-event preparations.

AWARD & PROGRAM EXPERIENCE

- **11th Instrument Technology Innovation Competition – Competition Team** 2019 Oct.
 - Selected as a finalist for the 'Smart Mobile Device with Cloud Integration for Home Health Check System'.
 - Key member of the project software development team.
- **Ministry of Economic Affairs – Technology Development Program for Academia. – Participating Team** 2018 Dec.
 - Participated in the hardware exterior design and circuit design of two prototype models, and independently completed software development as well as hardware-software integration.
 - Filed four patent applications for detection equipment technology.
- **National Cheng Kung University Technology Licensing and Incubation Center** 2018 Nov.
– **National Cheng Kung University Innovation and Entrepreneurship Startup Festival Annual Achievement Presentation – Publication Team**
 - Completed the development of the project prototype and showcased it at the presentation.
 - Participated in hardware exterior design and circuit design for the prototype, and independently carried out software development and hardware-software integration.
- **National Cheng Kung University Technology Licensing and Incubation Center** 2018 Jun.
– **NCKU Dreams Come True Program "Dreams Come True • Prototype" – Participating Team**
 - Participated in project design and secured funding through a startup initiative.
- **9th Instrument Technology Innovation Competition – Competition Team** 2017 Oct.
 - Achieved an honorable mention for "Smart mobile device rapid detection equipment."
 - Participated in hardware and circuit design for the prototype and served as one of the primary software developers.

REFEREED JOURNAL PAPER

1. Lin, K.-W., & Chang, Y.-C. (2021). Embedded immunodetection system for fecal occult blood. *Biosensors*, 11(4), 106.
2. Lin, K.-W., Wang, T.-Y., & Chang, Y.-C. (2021). Impact of top electrodes on the nonvolatile resistive switching properties of citrus thin films. *Polymers*, 13(5), 710.
3. Lin, K.-W., & Chang, Y.-C. (2021). Use of the taguchi method to optimize an immunodetection system for quantitative analysis of a rapid test. *Diagnostics*, 11(7), 1179.

REFEREED CONFERENCE PAPER

1. Lin, K.-W. & Hou, T.-W. (2016, August). With a controllable mobile apparatus rapid test detection system (in Chinese). In *Proceedings of the 20st Nano Engineering and Microsystem Technology Conference*, Hsinchu, Taiwan.
2. Lin, K.-W., Weng, W.-C. & Lai, C.-F. (2019, June). Development of Immunoassay System for Helicobacter Pylori Detection (in Chinese). In *Proceedings of the International Conference on Smart Sensors 2019*, Hsinchu, Taiwan.
3. Lin, K.-W. & Chang, Y.-C. (2020, October). Immunodetection System for Fecal Occult Blood Rapid Test. In *Proceedings of the IEEE 6th International Conference on Applied System Innovation 2020*, Taitung, Taiwan.
4. Lin, K.-W. & Chang, Y.-C. (2021, September). Using the Taguchi Method to Optimize Immunodetection System for Quantitative Analysis of Rapid Test. In *Proceedings of the IEEE 7th International Conference on Applied System Innovation 2021*, Chiayi, Taiwan.
5. Lin, K.-W. & Chang, Y.-C. (2023, April). Development of An Optical Zoom Uncooled Thermal Imaging System for Environmental Observation. In *Proceedings of the IEEE 9th International Conference on Applied System Innovation 2023*, Chiba, Japan.

PATENT

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| • I752684 | INTEGRATED CARRIER FOR RAPID TEST KITS | 2020 Oct. |
| • M610229 | DEVICE FOR READING RAPID TEST | 2020 Oct. |
| • M606957 | DEVICE FOR READING RAPID TEST | 2020 Oct. |
| • I734413 | STRIP DETECTING APPARATUS | 2020 Mar. |

SCHOLARSHIP

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| • Ministry of Economic Affairs, Industrial Development Bureau 5G+ Industry Rising Stars Sailing Program | 2022 |
| • National Cheng Kung University Department of Engineering Science Graduate Institute Scholarships | 2021 - 2022 |
| • Ministry of Science and Technology Encourages Enterprises to Participate in the Pilot Program for Cultivating Doctoral Students | 2019 - 2022 |

SKILLS

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|----------|-------------------|--------------|---------|
| • Python | • Linux | • SolidWorks | • Ansys |
| • MATLAB | • Taguchi Methods | • AutoCAD | • SPSS |