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Ph.D., Engineering Science, National Cheng Kung University 2019 - 2023
M.S., Engineering Science, National Cheng Kung University 2017 - 2019

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 test platform for testing the laser optical path when the laser is excited, allowing for adjustments to the optical path.
  - 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, beam splitter, 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 Ture 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

- 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

- 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

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