Zolzaya Khurelbaatar

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INTRODUCTION

I was born in Mongolia and came to Korea in 2017. I completed my master's degree in Electronics Engineering at Kyungpook National University in 2019. Since then, I have been working as a Chief Researcher in the Robot Development Team at HADA Co., Ltd. I currently hold an F5 Permanent Residency Visa and live happily with my wife and two children. I excel in embedded systems development and deep learning, with strong expertise in autonomous mobile robot control, sensor fusion technology, and AI-based image processing. I have successfully completed various projects, focusing on electronic system design, algorithm development, and HMI programming, all while solving real-world challenges through innovative solutions. My technical skill set includes Python, C, C++, and Codesys, with proficiency in CAN communication, BLDC motor control, and real-time debugging on Linux systems. I am experienced in integrating various sensors to optimize robot performance and developing systems tailored for practical applications in the field. Over the years, I have led major projects in smart farming robots, multi-sensor systems, and pest control and harvesting robots for agricultural automation, achieving significant real-world results. Moving forward, I aim to leverage my expertise to develop innovative solutions and contribute to advancements in technology and society.

EDUCATION

Kyungpook National University, Graduate School of Electronics Engineering ***2017 - 2019***
Master of Science in ML (Electrical Engineering and Computer Science) **Daegu, Korea**

Mongolian University of Science and Technology, School of Information and Communications Technology ***2011-2015***
Bachelor degree in Electronic Engineering **Ulaanbaatar, Mongolia**

SUMMARY

Professional Skills:

Data Science | Machine Learning | Image processing | Deep Learning |Autonomous mobile robot control| Sensor fusion | HMI programming |

Domain Knowledge:

AI based image processing| Cloud system IoT | Data analysis | Autonomous mobile robot | Electronic circuit design

IT Skills:

Python | C | C++ |Codesys PLC programming| CAN | Embedded system programming | Linux | Real time debugging

LANGUAGE

- English (C1 Advanced)
- Korean (TOPIK level 4)
- Mongolian (native)

CONSULTING AND AWARDS

ABU Robocon Mongolia (Grand Prix, Best Automatic Robot Award) ***Apr. 2014***

ABU Robocon International (Quarter-final, Mabuchi Motor Award, India) ***Aug. 2014***

WORK EXPERIENCES

HADA Co., Ltd ***Sep. 2019 – Present***
Chief Researcher (*Robot development team)* ***Jeonju, Korea***

- **Electrical System Design & Testing**: Designed and implemented electrical systems for various autonomous robotic projects. Conducted hardware assembly, integration, and rigorous testing to ensure robust performance and reliability.
- **Algorithm Development**: Developed advanced automatic control algorithms for autonomous mobile robots, focusing on navigation, obstacle avoidance, and real-time decision-making.
- **Embedded System Programming**: Programmed and optimized ECU control systems using **Codesys** and **C**, ensuring seamless integration of sensors, actuators, and real-time controllers.
- **Sensor Fusion & Control**: Utilized IMU and multiple optical sensors for robust sensor fusion, enhancing robot localization and path accuracy. Expertise in **CAN control** and **BLDC motor control**, enabling efficient motor coordination and communication.
- **HMI Development**: Programmed Human-Machine Interfaces (HMI) using **JavaScript**, delivering intuitive user experiences for robot operation and monitoring.
- **AI-Powered Solutions**: Developed AI-based systems, such as a worker detection system, leveraging advanced machine learning models for real-time worker safety and productivity analysis.
- **Robust Testing**: Built comprehensive test environments and created test cases for electrical systems, ensuring reliability and identifying root causes of issues through detailed analysis.

Kyungpook National University ***Feb. 2017 – Aug. 2019***
Researcher (*Data mining and Bio Information laboratory****)*** ***Daegu, Korea***

- Developed expertise in **machine learning** using libraries like **scikit-learn, pandas,** and the **Anaconda platform**.
- Applied **Python** for data analysis and implemented advanced **image processing** techniques using **OpenCV**.
- Designed and trained **CNN** and **LSTM** models for image-based and sequential data tasks.
- Conducted thesis research on **video-based driver drowsiness detection** using deep learning, achieving real-time monitoring capabilities.

Ametros Solutions Co., Ltd ***Jul. 2015 – Jul. 2016***
Embedded software developer ***Ulaanbaatar, Mongolia***

- Designed and implemented embedded software solutions for diverse applications, ensuring optimal performance and reliability.
- Debugged and optimized code for efficiency, improving system responsiveness and resource utilization.
- Collaborated closely with hardware teams to integrate software with electronic components, achieving seamless system functionality.
- Developing a **tablet-based smart home control system**, enabling intuitive management of smart devices.

PROJECTS

운반로봇 보급사업 (Transport robot distribution project) ***Jan. 2024~ Dec. 2024***

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Designed the **electronic system architecture** and developed an **autonomous driving algorithm** using AGV sensors and an **AI-based worker detection system**.
- Conducted extensive field testing to collect real-world data, iteratively improve the algorithm's accuracy, and optimize sensor performance
- Integrated feedback from farmers to design a user-friendly **HMI interface**, ensuring seamless interaction with the system.
- Successfully deployed the robot to farmers, achieving real-world implementation and solving practical challenges for agricultural operations.

수경재배 스마트 온실 무인 방제 기반 기술 개발

(Development of unmanned pest control methods in hydroponic smart greenhouse) ***Apr. 2021~ Dec. 2024***

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Developed the electrical system and control algorithms for an autonomous pest control robot.
- Performed extensive field testing to collect operational data and optimize the robot's performance in smart greenhouse environments.

- Enhanced algorithm accuracy through iterative testing and data analysis

수경재배 과채류 재배 모니터링, 적과 및 수확 로봇 기술 개발

(Development of Monitoring, fruit thinning and harvesting robot for Hydroponic) ***Apr. 2021~ Dec. 2024***

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Designed the electrical system and developed autonomous control algorithms for robotic fruit thinning and harvesting.
- Conducted on-site testing to gather data, refine object detection models, and improve task-specific robot behaviors.

스마트 온실용 저전력, 경량 다중 센서 시스템 개발 및 실증 ***Apr. 2021~ Dec. 2024***

(Development and Demonstration of Low Power and Lightweight Multiple Sensor System for Smart Greenhouse)

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Built the electronic system for a multi-sensor platform to monitor greenhouse conditions.
- Led field deployment and data collection to validate sensor fusion techniques.
- Iteratively improved autonomous decision-making algorithms based on collected insights.

다수 로봇 협업 기반 원예작물 수확용 로봇 개발 ***Apr. 2021~Dec. 2022***

(Development of robot for harvesting horticultural crops based on multi-robot collaboration)

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Designed the robot's electronic system and developed multi-robot collaboration algorithms for harvesting.
- Conducted field testing to evaluate and refine collaborative navigation and task-sharing algorithms.

스마트팜 농작업자 추종형 이송 로봇 사업화 (Smart farm agricultural worker tracking robot) ***Jul. 2020 ~ Jul. 2021***

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Designed the electrical system and tracking algorithms for a robot that follows agricultural workers.
- Collected field data to analyze tracking performance and iteratively improve the robot's autonomous behavior.

스마트팜 시설원에 적용형 방제로봇 고도화 개발

(Advanced development of spraying robot for smart farm horticultural) ***Aug. 2019~Aug. 2020***

Provider: 농촌진흥청장, 농림축산식품부, 과학기술정보통신부

Role as lead researcher:

- Developed the robot’s electronic system for spraying applications.
- Performed field testing to collect environmental data and optimize the spraying robot's navigation and pest control algorithms.