EMON HASAN SAUMIK

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CAREER OBJECTIVES

With a background in embedded systems, control algorithm, sensor fusion, and robotics, I wish to become a robotics scientist. I love creating things that can move or fly. Also, decoding the science behind every new technology always attracts me.

EDUCATION

B.Sc. in Electrical & Electronic Engineering
Khulna University of Engineering & Technology (KUET) 2019 - 2024
CGPA: 3.11/4.00

Higher Secondary Certificate, Govt. Hazi Mohammad Mohsin College, Chittagong. 2016 - 2018
GPA: 4.75/5.00

Secondary School Certificate, Govt. Muslim High School, Chittagong. 2014 - 2016
GPA: 5.00/5.00

WORK EXPERIENCE

Embedded Systems Engineer Intern June 2025 - Present
CyberneticsBD Hi-Tech Solution, Dhaka, Bangladesh

Autonomous Ground Vehicle (AGV) Development

- Developing AGV systems for garments factories using ArUco markers and wheel encoders with Extended Kalman Filter (EKF) for precise pose estimation
- Implementing PID control algorithms for accurate path following and navigation in factory environments
- Integrating LiDAR sensors with A* algorithm for real-time obstacle avoidance and optimal path planning
- Working on multi-AGV synchronization and fleet management for coordinated material handling operations

4G-Enabled Drone Systems

- Developing 4G-enabled drone systems for industrial surveillance and monitoring applications
- Implementing long-range communication systems for real-time data transmission and remote control
- Working on autonomous flight control systems and mission planning for various industrial use cases
- Integrating sensors and cameras for aerial data collection and analysis

THESIS WORK

Synchronized Cooperative Control of Two Autonomous Quadcopters The two primary goals of this thesis were to build two autonomous quadcopters from scratch and create a cooperative communication strategy between them. To achieve this, I used an STM32F103C8 microcontroller as the brain of the quadcopters. Simple complementary filters were implemented to reduce sensor noise. Moreover, separate PID algorithms were used to add features such as GPS hold, altitude hold, heading lock, rate mode, and automatic return to home. Additionally, a desktop application was developed using C# in VS Code to send the desired coordinates for the quadcopters to follow and to display various data. However, due to lack of time, I was unable to develop the cooperative communication algorithm between the two quadcopters.

MAJOR PROJECTS

Design and Construction of a Mini Drone This project is an initiative to build a low-cost drone for research purposes. I have chosen the ESP32 S3 microcontroller for the flight controller and the MPU9250 for precise orientation. The ESP32, with its 240MHz dual-core processor, built-in WiFi and Bluetooth, and large RAM and ROM, is well-suited for testing various control algorithms, including swarm control. The motor driver PCB uses SMD MOSFETs and resistors to keep the drone lightweight. Moreover, an Android app for controlling the drone was designed using MIT App Inventor. Overall cost was below $16.

Comparative Study of Kalman Filters for 3D Rotation: LKF, QEKF, and QUKF To obtain the precise orientation of the quadcopter, three variants of the Kalman filter—Linear Kalman Filter (LKF), Quaternion-based Extended Kalman Filter (QEKF), and Quaternion-based Unscented Kalman Filter (QUKF)—were tested and compared. We fused data from the MPU6050's gyroscope and accelerometer, along with the HMC5883l's compass data, to derive the state and measurement equations for the filters. The state for LKF used Euler angles to avoid nonlinearity, while quaternions were used for the other two variants. QEKF and QUKF outperformed LKF as they were faster, more accurate, and avoided gimbal lock. QUKF and QEKF performed similarly, but QUKF showed slightly better accuracy.

Constructing an Inexpensive Remote-Controlled Car The goal of this project was to design and construct a very inexpensive remote-controlled car. By pressing different combinations of buttons, the encoder generates signals, which the transmitter sends to the receiver. The decoder then decodes the signals to set the direction of the motor rotation through the motor driver, allowing the car to move in any direction. Since no microcontroller or programming was needed, the total cost of the car was less than $4.

TECHNICAL SKILLS

Microcontrollers:	STM32F103C8T6, ESP32 S3 WROOM, Atmega328p
Sensors:	MS5611 Barometer, GPS M8N, HMC5883L Compass, MPU9250 etc.
PCB Tools:	EasyEDA, Tinkercad
Algorithm :	PID, Adaptive Control, Backstepping Control, Kalman Filter
Programming Languages:	C, C++, C#, Arduino, Python, HTML
Software:	Arduino IDE, VS Code, MATLAB, MIT App Inventor

EXTRACURRICULAR ACTIVITIES

- Conducted a 4-day workshop titled "How to Make Your Own Drone Using Arduino", arranged by EEE Makershub, KUET
- Served as the Assistant General Secretary of OKS (Organization of KUET Sports)

REFERENCES

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