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Hossam Adel

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Profile

Bachelor's degree holder in Computer and Systems Engineering from Ain Shams University, with a strong academic background and hands-on experience in C++ development, embedded systems, and autonomous vehicle applications. Passionate about software development, real-time systems, and optimizing high-performance applications. Strong problem-solving, teamwork, and communication skills with a continuous drive for learning and innovation.

Education

- **B.Sc. Computer and Systems Engineering** – Ain Shams University *(2019–2024)*
- Grade: **Very Good (GPA: 3.05/4.0)**
- **Military Service:** Exempted

Projects **(All project exists at GitHub)**

Digital Twin for Matgr DB4 Autonomous Golf Car (Graduation Project) Github: Supervision by Cytwinlabs

- Developed communication between the autonomous vehicle and host machine using **CAN, Wi-Fi, and Ethernet**.
- Implemented **CAN bus communication** between **TMS320F28379D MCU** and **ESP32 gateway** which receives the control actions from the computer and sends it to the car and vice versa.
- Established the communication where the car receives the set points for steering angle and speed and continuously sends back the current metrics.
- **Worked** on the Model-based design (using Simulink) of the golf car which manages the control actions (steering angle and speed) that are received from the host machine.
- Integrated the internal **CAN bus** with the external system for autonomous operations.

Embedded Software Development Projects

- **Microwave Oven Controller**:
  - Developed firmware in **C** using **finite state machines (FSM)**, interfacing with LCD, keypad, and switches on **TIVA C: EK-TM4C123GXL**.
  - Implemented multiple operational states (idle, cooking, paused, completed) with responsive user interaction.
  - Designed and integrated **timer-controlled heating elements**, ensuring proper microwave functionality.
  - Conducted rigorous **unit testing** to validate FSM behavior and hardware integration.
- **High-Pressure Detector**:
  - Implemented a **real-time safety system** using **STM32F103C6** to monitor pressure levels.
  - Designed an **interrupt-driven alert mechanism** that triggers an alarm when pressure exceeds a defined threshold.
  - Applied **real-time constraints** to ensure system responsiveness and reliability.
- **APB Bus, GPIO Controller, and UART in Verilog**:
  - Designed an **Advanced Peripheral Bus** from scratch for seamless communication between peripherals.
  - Developed a **General-Purpose I/O (GPIO) Controller** to manage pin configurations dynamically.
  - Implemented a **UART module** for serial communication, ensuring robust data transmission.
  - Conducted **extensive testbench simulations** to verify proper signal handling and data integrity.

Network Traffic Analysis Automation [Github]:

- Automated **network traffic analysis** using **Wireshark**, **tshark**, and **Bash scripting**.
- Generated reports summarizing **protocol breakdown, packet counts, and top IP sources/destinations**.

Software Testing Project:

- Developed a **student GPA calculator** with testing principles: **unit testing, white-box testing, black-box testing, integration testing, and data flow analysis**.

XML-tool Project:

- Using C++ and QT, it is a project based on data structures where the xml file is processed and several operations are done on it like prettifying, compressing and validation.

Process scheduler using JavaFX to create and visualize (live and static) several process scheduling techniques showing info like waiting time and turnaround time:

- Created a **scheduler simulator** visualizing CPU scheduling techniques: **FCFS, SJF, Round Robin, Priority Scheduling**.

Space Gobblers game:
Using sockets to send and receive moves between the server and the client. Note that the client and the server are virtually peers in our implementation, this means that there is 1 server and 1 client only.

Skills

- **Programming Languages:** C++ , Python, MIPS Assembly, Java
- **Embedded Systems:** STM32, TivaC, Atmega32, ESP32
- **Operating Systems:** Embedded Linux, Ubuntu
- **Software Development:** Data structures, algorithms, multi-threaded programming, real-time systems
- **Communication Protocols:** CAN, UART, SPI, I2C
- **Development Tools:** GDB Debugger, Wireshark, tshark, Git, make
- **Software Testing:** G-test, unit testing, integration testing
- **Soft Skills:** Strong problem-solving, teamwork, adaptability, excellent verbal and written English communication

Awards and activities

- **Shell AI Team – Ain Shams Racing Team**
    - Worked on **autonomous vehicle simulation** using **CARLA and ROS2**.
    - Developed **LQR controller** for speed control ensuring safe distance maintenance.
    - Implemented **PID controller** for throttle control.
    - Used **Pure Pursuit and Stanley** for steering control.
- **Egyptian Collegiate Programming Contest (ECPC) for** competitive programming**– 10th Place**
- **Computer Vision Project (2nd Place in Competition)**
    - Developed a rover capable of detecting and mapping terrain and picks rocks up with **95% accuracy**.
- **Embedded Linux – Ongoing Learning**
    - Studying Linux kernel architecture, kernel space, and user space.
    - Working with embedded Linux elements, including toolchain, bootloader, kernel, and root filesystem.
    - Gaining experience with Yocto Project, covering pre-development, development, and post-development stages.
    - Learning device driver development, including writing character, SPI, and block device drivers.
    - Advancing C++ skills, including STL, design patterns, system programming, concurrency, and Google Testing Framework**.**
    - Embedded Linux applications and utilizing CMake for build automation.
- **Orange Embedded Systems Scholarship** *(2 weeks intensive training)*