

Assignment 3: Engineering Standards

ECDME305 Project Standards

Project Title: Robotic Arm for NES Power Glove

Team Members:

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Introduction

Adhering to established engineering standards is essential in ensuring engineering project's quality, safety, and effectiveness. Our project, the Robotic Arm for NES Power Glove, involves both software and hardware components that must comply with industry standards to ensure reliability and functionality. Following these standards enhances human interactivensess, Serviceability, and the safety of the user.

Software Engineering Standards

- **ISO/IEC 12207 – Software Life Cycle Processes**
Our software development adhered to ISO/IEC 12207, ensuring a systematic approach to software design, coding, testing, and maintenance. This facilitated structured development, control, testing, and verification of control algorithms for servo motors and motion control.
- **IEEE 830 – Software Requirements Specification (SRS)**
All software requirements were documented following IEEE 830, ensuring that functional and non-functional requirements were well-defined, testable, and verifiable.
- **C++ Standards (ISO/IEC 14882)**
The embedded software was written in C++, adhering to ISO/IEC 14882 to ensure code readability, maintainability, and portability across different platforms.

Hardware Engineering Standards

- **ISO/IEC/IEEE 29148 – Requirements Engineering**
The hardware design followed ISO/IEC/IEEE 29148, ensuring all functional and performance specifications of the robotic arm were documented and validated for reliability.
- **IPC-2221 – Generic Standard on Printed Board Design**
For designing and fabricating custom PCBs used in the robotic arm's control system, we followed IPC-2221, ensuring proper electrical performance and manufacturability.
- **W-Model Design Process**
We followed the W-Model methodology, which emphasizes verification and validation at each stage of hardware development to meet design specifications.

Programming Language Standards

- ISO/IEC 14882 – C++ Standards

The firmware development ensures robust and efficient embedded programming practices, including type safety, memory management, and object-oriented design principles crucial for real-time control applications.

Communication Protocol Standards

- SPI (Serial Peripheral Interface)

The SPI protocol was used for fast and reliable communication between the ESP32 microcontroller and peripheral devices.

- USB (Universal Serial Bus)

USB was utilized for debugging and data transfer during the development and testing phases.

- Bluetooth (IEEE 802.15.1): used for short-range Wireless communication between the Robotic arm and the glove.

References:

ISO/IEC/IEEE 29148 – Requirements Engineering

<https://www.iso.org/standard/72089.html>

IPC-2221 – Generic Standard on Printed Board Design

<https://www.ipc.org/TOC/IPC-2221A.pdf>