Department of Electronics and Telecommunications

University of Moratuwa

Individual Contribution Report: Soldering Station Project

EN2160

Engineering Design Realization

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This report highlights my individual contributions to the soldering station project. My involvement spanned various phases, including research, design, simulation, prototyping, component selection, schematic and PCB design, code finalization, and testing. The following sections detail each contribution.

Research and Circuit Design

I conducted extensive research in two main categories: product analysis and circuit design. First, I focused on industrial products and market-available products, examining their features and specifications to understand the current standards and innovations. This research provided valuable insights into what makes a successful soldering station. Secondly, I delved into circuit design, specifically for both AC and DC circuits. I explored various sub-circuits, learning about their functions and how to integrate them effectively. This foundational work on product features and circuit design was crucial in ensuring the project's success and informed the overall development of both the AC and DC PCB circuits.

Circuit Design

I was responsible for designing the circuits for two separate PCBs: the AC PCB and the DC PCB. This involved creating detailed schematics and layout designs, including essential circuits such as the current-controlling power supply, MCU, temperature sensing and amplifying, and the AC PCB with TRIAC trigger configuration. I used industry-standard design software to optimize these designs for performance and reliability. These designs were crucial for the efficient and reliable operation of the soldering station.

Schematic and PCB Design for AC and DC Circuits

I created detailed schematics and PCB layouts for both the AC and DC circuits. This work required precision and attention to detail to ensure that the circuits would function correctly and safely. The designs were thoroughly reviewed and optimized for manufacturing.

Simulation and Prototyping

To validate the circuit designs, I performed simulations using Multisim. These simulations helped identify potential issues and allowed for iterative improvements. Following successful simulations, I constructed a prototype using a dotboard to test the power supply circuit. This hands-on testing confirmed the circuit's functionality and performance under real-world conditions, ensuring its stability and reliability.

Component Selection

Another significant contribution was selecting the appropriate components for the project. This task required careful consideration of various factors such as compatibility, reliability, and cost. I

performed the relevant calculations to ensure optimal performance and selected high-quality components that would guarantee the soldering station's reliable and efficient operation.

Enclosure Design

I assisted in finalizing the design of the enclosure for the soldering station. This involved collaborating with the team to ensure the enclosure was both functional and aesthetically pleasing. The enclosure design needed to accommodate all components securely while allowing for adequate ventilation and ease of use.

Software Development

Another significant contribution was the software development for the project. I conducted thorough research to identify relevant techniques and features needed for the soldering station. Based on this research, I finalized the structure of the algorithm, ensuring it incorporated essential features such as PID control, pin change mode, sleep mode, and others. I played a crucial role in finalizing the main code, debugging, and refining it to ensure seamless integration with the hardware. This structured approach to coding was essential for the efficient and reliable operation of the soldering station, managing temperature control and other functionalities effectively.

Soldering and Testing

I participated in soldering the PCBs and testing the MCU (Microcontroller Unit) circuit and power supply circuit. These tests confirmed that the circuits worked as intended and that the soldering was done correctly. The successful testing phase was a critical step in moving the project toward completion.

Documentation Assistance

Technical Documentation: Assisting in the creation of comprehensive technical documents that detailed the circuit design, including schematics and PCB layout for various parts of the soldering station.

Design Methodology: Contributing to the development of the design methodology report, which was based on the Cambridge model, ensuring a structured and methodical approach to the design process.

This comprehensive research encompassed product analysis and circuit design, providing essential insights into industry standards and innovative practices. It was instrumental in shaping the development of both AC and DC PCB circuits for the soldering station, ensuring their effective integration and optimal performance.