

This thesis presents the design, development, and implementation of a Multi-Material Unit (MMU) for enhancing multi-color 3D printing capabilities. We have designed a new MMU prototype, developing its firmware using C++ on a microcontroller platform. The architecture of firmware is modular, facilitating straightforward integration of additional features and functionalities. One of the central part was the development of a communication protocol for interfacing the MMU with a 3D printer, ensuring efficient command and control operations. The system utilizes multiple motors and sensors to manage filament changes. The practicality of the proposed design was validated through a functional proof-of-concept prototype, which demonstrated the MMU's capability to streamline the printing process and reduce system complexity.