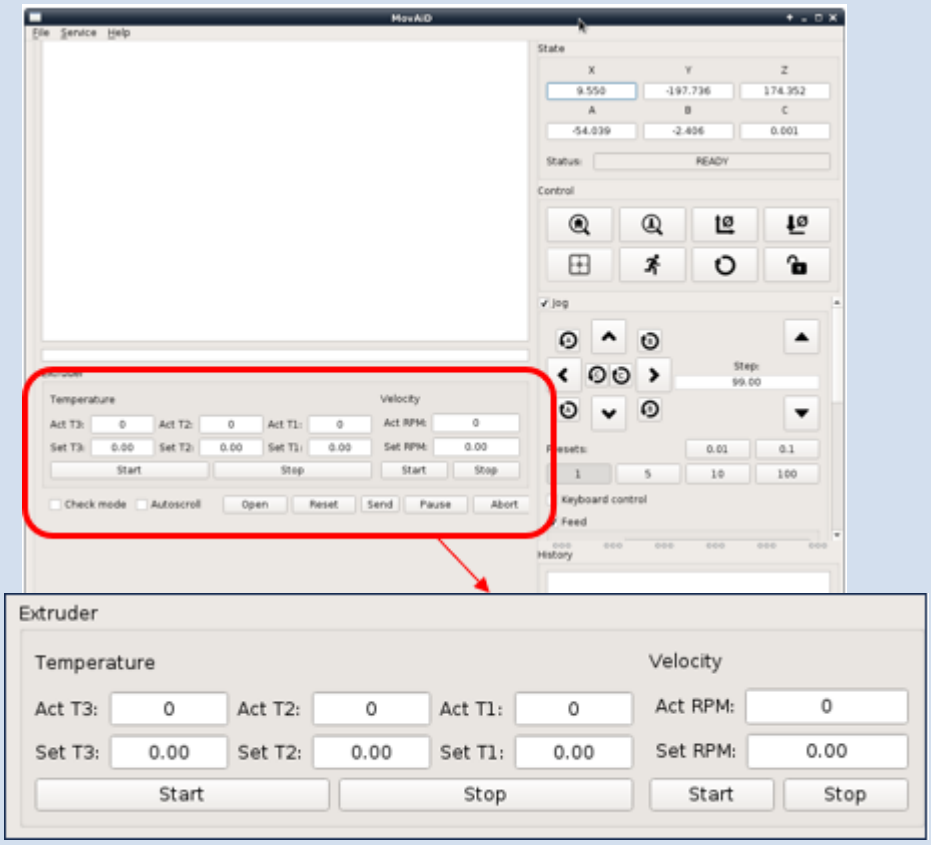
Result name	Mini Pellet Extruder for Desktop 3D printer - control software
Brief description	**Main objective** The result is a software product designed for controlling a small-scale pellet extruder. The extruder consists of a barrel heated by two resistors, which are feedback-controlled through temperature sensors, and a screw driven by a brushless motor. **Short Description** The system has been designed following criteria suitable for rapid commercial production. To meet these requirements, a pellet extruder was miniaturized to allow integration into common desktop 3D printers. The control software operates on a PC-based architecture interfacing with the hardware via a microcontroller (Arduino). Through a graphical interface developed using Qt libraries, the user can input the desired heating resistor temperature values and monitor real-time temperatures at specific points. Additionally, the user can control the extrusion speed via a dedicated command and visualize the instantaneous speed. The software communicates with the Arduino through a serial (USB) connection, sending setpoints for both temperature and extrusion speed. Simultaneously, it receives and displays feedback from various sensors. The software can be integrated with the machine's motion control system to synchronize extrusion with printing movements. This functionality has been implemented on a real-time system based on LinuxRTAI, specifically configured for interfacing with various hardware devices. **Innovation** Traditionally, commercial 3D printers rely on Fused Deposition Modeling (FDM) technology, which uses pre-manufactured plastic filament. Large-scale pellet extruders are typically employed to produce these filaments. The innovation presented here lies in the miniaturization of pellet extruder technology, enabling direct implementation within 3D printers and thereby eliminating the intermediate filament production process. Another significant innovation is providing end-users with the ability to create customized material blends for printing. This not only allows users to modify the color of the final printed object by adding color additives but also enables adjustments to the physical properties of the printed product. Lastly, the use of pellets offers cost savings and supports sustainability efforts by allowing material from failed prints to be reused, thereby reducing waste through the re-melting of used material.

Picture/screenshot	
Activities/ Research lines/ Project	INTERNAL PROJECT TITLE: Mini Pellet Extruder DURATION: STARTING DATE: STRATEGIC OBJECTIVE: Materials and new Production Technologies
Author(s)	Guido Chizzoli, Mario Pelle, Fabrizio Silva, Claudia Pagano Name: STIIMA-CNR Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato – Consiglio Nazionale delle Ricerche Via Corti 12, 20133, Milano – Italy Phone: +39 02-23699914 Website: http://www.stiima.cnr.it GitHub: https://guichiz.github.io/MiniPelletExtruder_ControlSoftware/
References/ Related documents	Papers: Reports: [ID:] Guido Chizzoli, Mario Pelle, Fabrizio Silva, Claudia Pagano (2024) Development of a High-Throughput Mini Pellet Extruder for 5-Axis Desktop 3D Printer with Rapid Metal 3D Printed Screw Prototyping - Mini Pellet Extruder for 5Axis Desktop érinter system – control software (Specification of)