3D PRINTERS ADDITIVE MANUFACTURING, MONOTORING AND FAULT DETECTION

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1.Introduction

3D printing is an additive manufacturing process used to create three-dimensional objects from a CAD or digital model. The method involves depositing material layer by layer until the final object is formed.

2.Problem

- Printing process takes many hours.
- It's impractical to constantly monitor printing.

- 3D Printers common errors are:
  - Filament Breakage
  - Nozzle Clogging
  - Under-extrusion
  - Prints stops prematurely
  - Overheating

3.Objective

Monitor the 3D printing process and detect potential issues caused by anomalies. This approach aims to save the user time, conserve material, and prevent damage to the commercial 3D printer.

4.Solution

Monitoring!

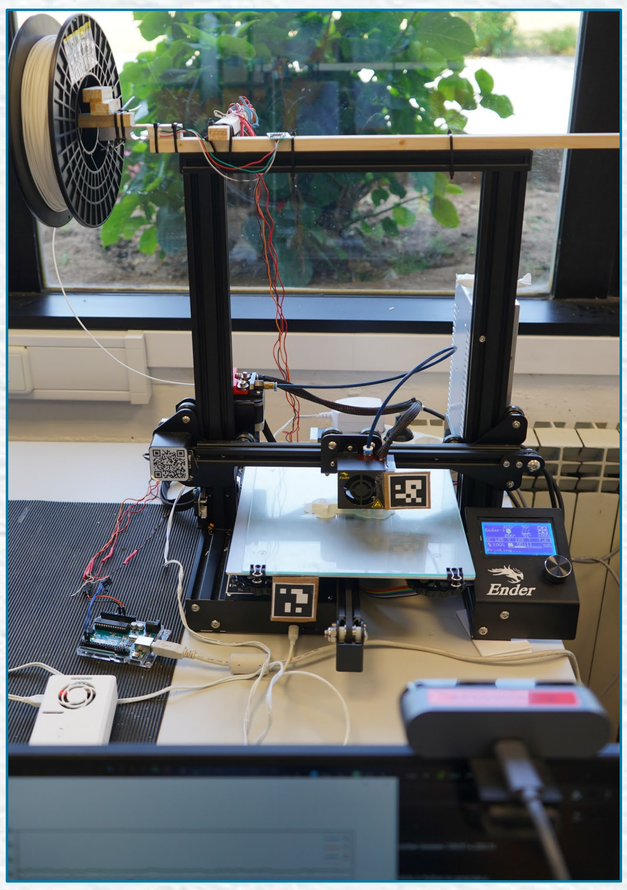
Notifications in real time to the user about:

- Available Filament Weight
- Printing State
- Printing Duration
- Nozzle and Bed Temperature

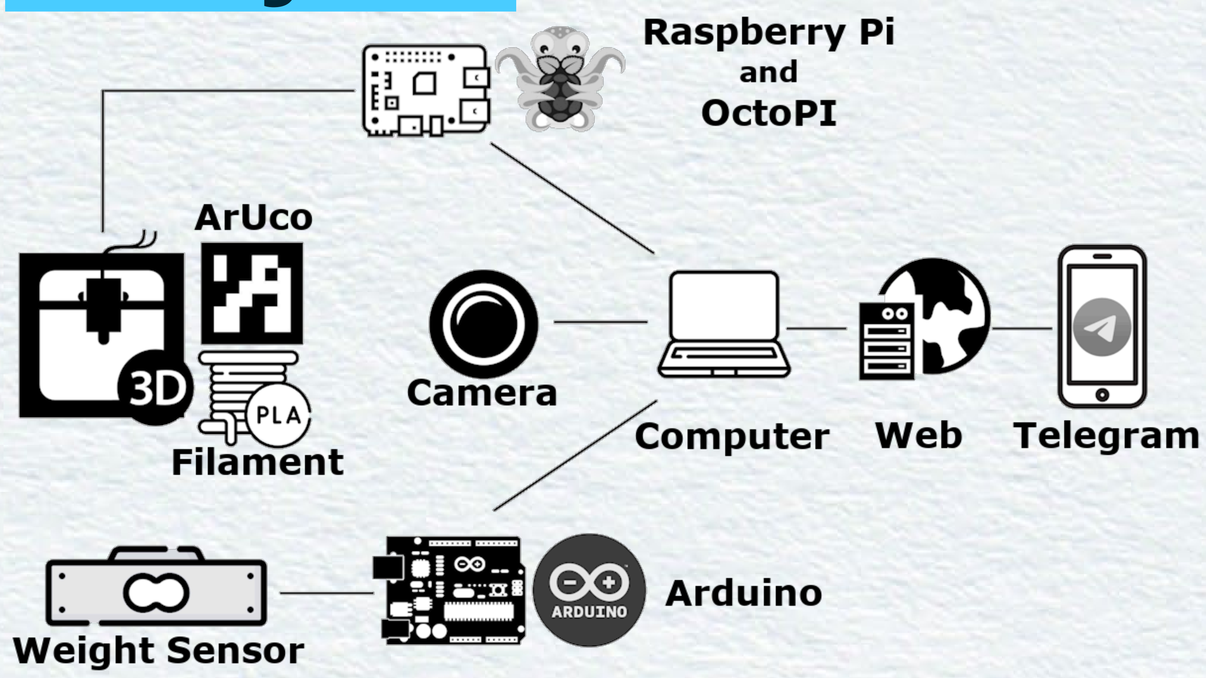
Detection!

Errors that could damage the 3D printer or the printed object:

- Nozzle Stopped
- Nozzle Over/Underheated
- Filament Breaked
- Nozzle Clogged



5.Diagram



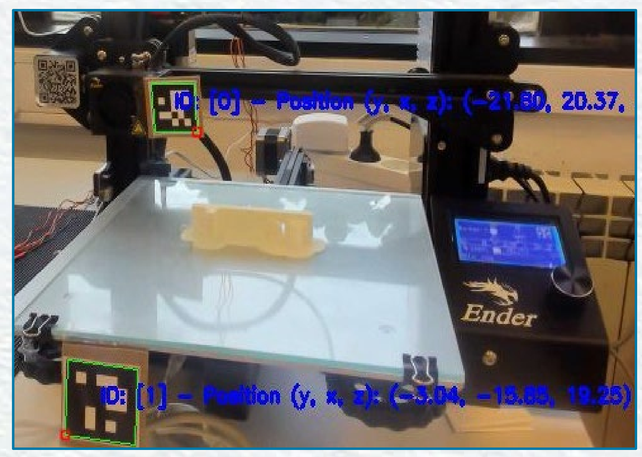
6.Users

- Air Force Academy Research Center (CIAFA)
- Portuguese Air Force Academy Students
- Commercial users of Ender 3 or similar printers

7.Results

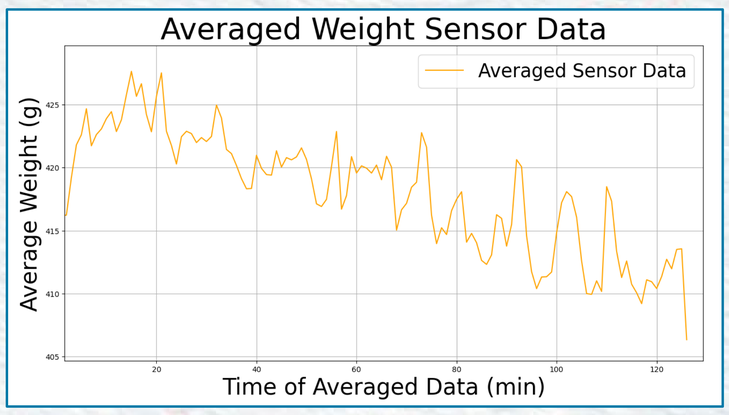
1 ArUcos

- ArUco detection and ID identification.
- Pose estimation and relative coordinates determination.



2 Weight Sensor

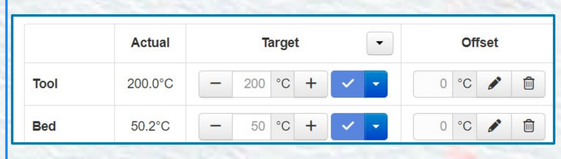
- Detection of the filament weight variation or stabilization.
- Detection when the filament was about to run out

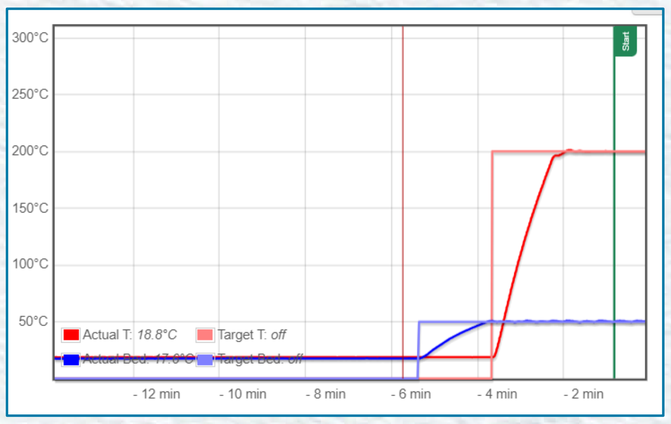


3 OctoPrint

Extract:

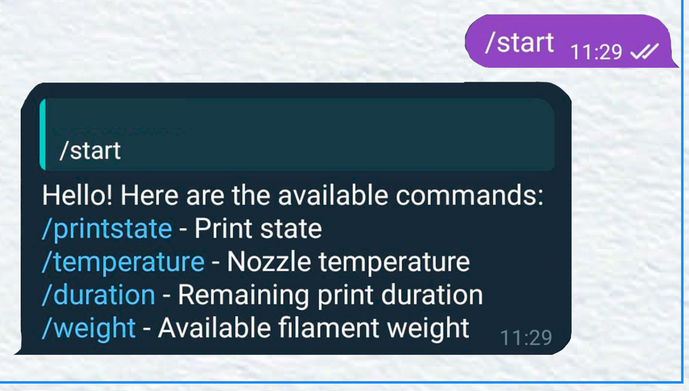
- Nozzle temperature
- Bed temperature





4 Real Time Notifications

- Bi-directional communication
- Automatic messages over time and in case of errors.



8.Benefits

- Improved time efficiency
- Enhanced human resource efficiency
- Increased printer safety
- Support for AFA students and CIAFA professionals

9.Similar Ideas

Obico is a solution for remote 3D printer monitoring and control with AI failure detection. Our solution differs by offering bidirectional communication, filament weight evaluation, no usage costs, and integration with Telegram, eliminating the need for a new app.