Real time analysis of the filament for FDM 3D printers

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ABSTRACT

This project raises the need to develop a quality control system for manufacturing processes by melt deposition. The main problem with this technology is that, if the environmental parameters are not sufficiently controlled, inaccuracy is created between the mechanical and aesthetic properties of the product. This causes that the pieces do not meet the requirements for the market since they cannot guarantee a unified performance.

For this purpose, a proof of concept that implements the necessary sensors in a testing machine will be carried out. The sensors will collect the measurements by means of an Arduino microcontroller. The obtained information will be processed in order to make the reports that indicate if the manufacturing process meets the expected requirements.

With this system it is possible to improve the manufacturing results by melted deposition and to assure quality standards. In the future, the system could be improved according to the quality parameters required by the ISO standards for printing filaments and also used to certify them.

Considering all the aforementioned, this is undoubtedly a field of research that still has much to develop and it is expected that this work will be a contribution for future research.

CCS CONCEPTS

• Hardware → Bio-embedded electronics

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KEYWORDS

3D printing, melt deposition, quality control, printing filaments, Marlin, sensing.

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1 Introduction

It[1] is a fact that 3D printing is positioning itself as the process of manufacture of the 21st century. In particular, the manufacture by deposit of filament (FDM) has spread more than any other thanks to the large community of developers who have been interested in this. This has led to an increase in the supply available in the market, which once has brought as a drastic price and has expanded the variety of materials with which they can be manufactured; for example, conductors of electricity, biodegradable, resistant or biocompatible.

The increase in manufacturing at a particular and professional level requires an increase in print quality, a reduction in machine costs and an increase in the knowledge of the scientific community [1] [2] [3].

When making three-dimensional impressions by addition it is necessary to control several parameters to achieve an optimal final product. In many cases it is necessary to monitor the process in person when it is the first time you want to

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It is also showed some stress results that should be taken into account when positioning a new model to be produced using a FDM process. This also should be used to produce the parts using material in tis correct conditions of temperature, humidity or deposition speed, so that the mechanical characteristics are not decreased [16].

Possible improvements include the use of more precise sensors such as an encoder with sense detection, reverse information to the printer to control printing actively in real time, create alerts that notify when a parameter exceeds the limits and stop the process if necessary.

Another application for which this technology could be worth, is the validation of filaments by precision laser sensors, generating a report in which it can be seen if the filament has manufacturing defects or if the dimensional tolerances are met.

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