

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: JAPE143

Project Title: Recycler le Riciclatore

Project Type: Invention

To our best knowledge and after thorough literature research, as at 30/06/2022 , there are / ~~are no~~ similar works. If there are, the reference links are as below:

<https://www.filastruder.com/products/filastruder-kit?variant=323882043>

The enhancement our project has made for the existing related products or research is summarized as below:

- Lower price (about 80% decrease)
- Lighter (about 80% decrease)
- Integrated spooling function added
- Integrated auto correction added
- Has an easy to use app

***Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.**

I. Background

Pollution is a major crisis that humanity has to face, and plastic pollution is certainly no exception. Plastic pollution affects not only nature but also us humans. Plastic pollution takes millennia to decompose, and will only get worse as plastic becomes ever more popular. In the past decades of the rapid growth of the demand for plastic, alongside it, breakthrough technology has emerged, which is the technology of 3D Printing. 3D Printing involves melting plastic from a spool and extruding said material through a small computer-controlled nozzle. One of the main reasons for the popularity of 3D printing is that it is fast when compared to traditional methods like injection moulding which requires the production of a mould. In this day and age where efficiency is of utmost importance, 3D printing has become immensely popular among tinkerers and prototypers, and alongside it, the large amount of plastic waste. 3D printing is most commonly used for prototyping, and with prototyping, there will be many failed attempts. Apart from that, drafts and support pieces required do not have a purpose after printing. Apart from that, 3D printing filament is also expensive. A “normal” roll of PLA filament is \$150HKD per kilogram. This is usually already the cheapest option, with other types of filaments costing even more. Although it may not be a problem for established organisations, it is extremely expensive for startups or simply hobbyists at home. Paraphrasing a quote from famous entrepreneur Elon Musk, not reusing is like throwing away a plane every time it completes a flight. Not only are the materials going to become waste, but it is also highly costly for the company and flyers. Hence, 3D printing waste is a big problem from an environmental and financial standpoint. Although products such as the aforementioned Filabot do exist to solve this issue, we aim to decrease costs, weight and size, while increasing functions like spooling, auto correction, and having an easy to use app.

II. Objectives

Be able to recycle 3D printing filament
Have an easy-to-use interface
Have an auto-correction function to produce optimal filament

III. Methodology

The only available methodology is by melting the plastic waste then heating it
There are no other methods

IV. Design of Invention

The user of the machine will input the material that they want to recycle. After they initialise the process on the phone app, the Arduino microcontroller will turn on the fans, the heating elements, as well as the motor attached to the spool. The inputted material will melt, and then it will be sent to a pipe where it will be extruded through a nozzle. The output from the nozzle is checked, and then it is sent to the spool to cool. Once all material is processed, the Arduino microcontroller will switch off the power for the fans, the motors and the heating elements.

V. Application / Market Need

Applications

- Recycling shops/services
- Hobbyists
- Prototyping/Engineering
- Collaboration spaces (i.e. schools, maker spaces, workshops)

Market need

- Great interest - 43 million results on Google
- Market worth over 100 billion HKD (2021)
- Projected 21 million 3D printer users by 2030

Limitations

- Interface is not user-friendly and hard to understand
- Heating elements are not efficient due to power limitations
- Some solutions include shredder, shredder not included in our product

VI. Conclusion

The project has passed all internal tests
The project achieved its goals being able to recycle 3D prints and has an easy to use interface and auto correction function

Our project is developed based on our school's previous project and the enhancement is as below:

Last year our school joined the HKSSPC 2020 (Team No. JAPE26) in the invention proposal category. The team members are different.