Recycling Household Plastics for Use in 3D Printing Applications

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Single use plastics are increasingly common in society, with waste from bottles, packaging, and containers filling up landfills and damaging ecosystems worldwide. At the same time, 3D printing is more accessible than ever before. To help make plastic recycling more commonplace, I designed and fabricated a device to allow hobbyists to process their waste plastics into filament, thus keeping them out of the environment. To do so, research was first done into industrial plastics extrusion and the different polymers found in household waste to direct the design process. Then iterative design was used to quickly prototype and test new designs, with data and observations from previous iterations used to guide development. Currently, this device is capable of reliably and smoothly extruding filament ~2.00mm in diameter, which is significantly higher than the standard 1.75mm filament used in most consumer machines. However, with further testing of different factors, this diameter can be brought down to 1.75mm. Testing has proven the viability of this design, but more testing and iteration will be required to refine it into a consumer-friendly platform. With the addition of electronic control, better control past the nozzle, and more testing and data collection, accurate and precise extrusion will be achievable. Once that is done, a next step will be to create CAD designs and mock-ups for a consumer variant, incorporating all prior research and testing into a simple, inexpensive, and compact machine, accessible to any 3D printing hobbyist.

Awards Won:
Fourth Award of $500