**3D PrintBot**

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**[IMAGE OF PROTOTYPE]**

**Technical Field**

This project involves the technical fields of 3D Printing Automation, Robotics, and Artificial Intelligence, specifically focusing on the integration of AI-driven robotics with 3D printing software to enhance efficiency and reduce manual intervention.

**Background Information**

The inspiration for this project came from personal experience and feedback within the 3D printing community, where users frequently expressed frustration with the repetitive manual tasks required during the printing process, such as clearing the print bed and managing print jobs. As a 3D printing enthusiast, I often found myself tied to the printer, needing to intervene after each print, which disrupted workflow and reduced productivity. Recognizing a gap in the market for solutions that fully automate these processes without modifying the printer itself, I was inspired to create a seamless integration of a robotic system with popular 3D printing software to address these inefficiencies.

**Prior Art**

This project builds on prior art, including existing 3D printing management software and robotic automation solutions:

1. OctoPrint: An open-source software for remote monitoring and controlling 3D printers. It provides print management but requires manual intervention for tasks like bed clearing.

Retrieved from <https://octoprint.org/>

2. AstroPrint: A cloud-based platform for managing 3D prints remotely, allowing some automation but lacking direct robotic integration.

Retrieved from <https://www.astroprint.com/>

3. PrusaSlicer: A slicing software that helps optimize print settings but does not incorporate automated print bed clearing or job management through robotics.

Retrieved from <https://www.prusa3d.com/page/prusaslicer_424/>

4. MatterControl: A 3D printing software that assists with print preparation and monitoring but does not fully automate the clearing and queuing process with robotic assistance.

Retrieved from <https://www.matterhackers.com/store/l/mattercontrol/sk/MKZGTDW6>

**Project Description**

This project aims to develop a Cura-integrated robotic system that automates 3D printing tasks such as bed clearing and print job management. The solution combines a robotic arm programmed to remove completed prints and reset the bed for the next job in the queue, all managed through a custom Cura plugin. The intended application supports home users and small-scale professionals seeking to enhance their 3D printing workflow by reducing manual intervention and maximizing printer uptime. The system is designed to cater to tech-savvy individuals who value automation, efficiency, and innovative solutions to streamline their 3D printing process.

**Innovation Claim**

This project is innovative because it integrates AI-driven robotics with 3D printing software, providing a fully automated solution for print bed clearing and job management, tasks that are currently not addressed by existing 3D printing products.

**Usage Scenario**

Describe a scenario involving a typical use of your system/design OTHER than the use you will be demonstrating in your project. You are trying to sell the reader on the idea behind your application and what its intended use is, so be clear. How could this innovation be used beyond the product you are demonstrating? Remember to avoid 1st person, and to avoid a “story-telling” style of writing. And, if all else fails and you are having difficulty describing a “Usage Scenario,” you can focus on describing the Demographic for your project/product.

**Evaluation Criteria**

Start this section with a statement like: “The following questions will identify the successful completion of the project.” Then, in the form of **“Yes/No”** questions, list the criteria you/your team will use to determine the success/completion of your project in terms of usability or usefulness of the product you will eventually prototype. Provide as many criteria as required to assure the quality of the project; each one needs to be expressed in such a way that it is measurable or observable, and should be in the form of a **yes or no** question. Also, do NOT answer the questions. This is simply a list of what the criteria are.

**Objectives and Tasks Associated with the Project**

List and describe the High-Level objectives of this project. These should include the targeted areas of completion that will guarantee the success of your project. (Each objective will eventually have several tasks associated with it.)

After giving the objectives, list and describe all tasks that will allow you to complete each objective. Tasks are the specific actions required to achieve the objectives. The Evaluation Criteria mentioned above will ensure that the quality is ultimately measurable or observable. Each task shall be described in detail and include transparency on the decision-making process. Use headings for each task to maintain clarity in the documentation. Use dates (if known) to specify when the tasks will be completed and implemented.

***Note: This section must be revised prior to SIP408 to describe tasks as they actually occurred.***

**Description of Design Prototype**

Describe the **design prototype** implementation. You should describe the platform on which the system will be built and provide directions on how to run the prototype (if necessary). Elaborate on the functionality of the parts that define your project. Effective descriptions will give the reader an understanding of what the design prototype will be, and how it relates to the final project.

***Note: This section will be revised prior to SIP408 to describe the design prototype in its final form.***

**Evaluation Plan**

Provide a complete, paragraph style description of the plan that is to be used to evaluate your project. This section should be a **description of the full plan** for how the team will go about answering the “Evaluation Criteria” questions. Do not simply repeat the questions!

***Note: This section must be revised prior to SIP408 to describe the full evaluation plan as it was actually implemented.***

**Project Completion Assessment**

***Note: This section must be completed prior to SIP408***

Provide an in-depth description of the completion assessment of your project. Describe how well the completed components function and highlight the innovative facets of your design. This is sometimes known as a “Post-Mortem” or “Lessons-Learned Report”. A good approach for this section is to answer the following 4 questions: “What went right? What went wrong? What was learned throughout the process? What would be done differently if you had to do it again?

**Appendices**

***Note: This section must be completed prior to SIP408.***

Include as appendices any supporting material for this project, including charts, graphs, and other data; images associated with the project; or other documentation (e.g., a game design document or read-me file). Include any prior art that was used such as U.S. Patent Documents, Foreign Patent Documents, or other sources. Remember that this section should only be a list of additional files, not the actual data of the files!

Use the following format:

Appendix letter: description of item – file name

Example…

Appendix A: Game design document – myGameDoc.docx

Appendix B: 3D render of primary character – mainCharacter.jpg