projectpam.github.io

* Welcome to Project PAM

We are a team of undergraduate engineering students working on a Senior Design Project at Southern Illinois University Carbondale. We have great passion for advancing the open source and 3D printing community.

Team Photo

PAM stands for **P**hotoresin **A**dditive **M**anufacturing. This type of 3D printing gets away from the extruded plastic spaghetti machines that we're all familiar with and instead uses light-curing resins to build your models. This means higher resolutions, fewer moving parts, and faster build times and the only jam to worry about is the kind you eat with peanut butter.

Project PAM is seeking to take DLP 3D printing in a new direction of higher build volumes and lower costs without sacrificing resolution. The goal for this project is to produce a high resolution DLP printer that is fully open sourced using off-the-shelf hardware and that is well documented. All design material can be found on GitHub in either the Hardware Repo or the Software Repo.

* Crowdsourcing

As mentioned, Project PAM is a Senior Design Project. To this point all funding has been provided by the Electrical and Computer Engineering Department and the Mechanical Engineering Department. However, they are not capable of providing enough funds to allow us to build a working prototype. Because of this we have decided to crowdsource Project PAM to raise the remaining funds needed to successfully build a working prototype.

If you would like to donate to Project PAM visit our Indiegogo campaign. Any and all donations would be greatly appreciated.

* Why Open Source?

Our first priority when starting out was to keep everything open-source; this includes both hardware and software. To ensure this, we have followed the Open Source Hardware (OSHW) Definition set by the Open Source Hardware Association (OSHA).

Open Source Hardware (OSHW) Statement of Principles 1.0:

Open source hardware is hardware whose design is made publicly available so that anyone can study, modify, distribute, make, and sell the design or hardware based on that design. The hardware’s source, the design from which it is made, is available in the preferred format for making modifications to it. Ideally, open source hardware uses readily-available components and materials, standard processes, open infrastructure, unrestricted content, and open-source design tools to maximize the ability of individuals to make and use hardware. Open source hardware gives people the freedom to control their technology while sharing knowledge and encouraging commerce through the open exchange of designs.

The licenses Project PAM use are:

1. Hardware: CERN OHL v1.2
2. Software: GNU GPL 3.0
3. Documentation: CC BY-SA 4.0

Many DLP 3D printers claim to be open source, yet have patents associated to the design, non-commercial licensing, or do not properly host and share their designs.

* Tired of Those Stupid Spaghetti Machines?

Photoresin additive manufacturing printers have many advantages over fused deposition manufacturing (FDM) printers. There are fewer moving parts, faster build times, and no jams. Currently there are DLP 3D printers on the market; however, most have either high cost or small build volumes. Our design is low cost ($1000) and also features a build volume comparable to leading FDM printers.

Market Gap

* How is our design more flexible?

Project PAM has a build volume of just under 9 liters. We are able to accomplish this by supporting dual 1080p projectors; however, the system is designed to be compatible with projectors of any resolution and also a single projector.

We have designed Project PAM to use mostly off-the-shelf parts that can be bought through Adafruit, Amazon, and industrial supply warehouses. An advantage to using off-the-shelf parts is that the design can be easily modified to suit any needs. We have also used the off-the-self mentality when it comes to the resins we use through the use of Maker Juice G+ resin. For more information regarding the hardware design go to the Hardware Page.

The software Project PAM will be using is based off of the software for the B9 Creator. The software will be modified to be compatible with all projectors and resins. Project PAM will be using Grbl firmware, which unlike the software does not need to be modified to increase compatibility. For more information regarding the software please go to the Software Page.

* Releases

First release coming soon!

* Contact Us.

For general correspondence please Email us at

Questions and comments can be posted on our mailing list or you can email them to

Please report all bugs and feature requests through GitHub issues either on the Software Repo or the Hardware Repo respectably.

Follow us on GitHub, Twitter, Facebook, Google+, and YouTube.

projectpam.github.io/Software

* Introduction

The control software for Project PAM will be forked from the B9Creator control software. It will be written using C++ and Qt to ensure the application is cross-platform. The software will be licensed under the GNU GPLv3.

Project PAM will be using an Arduino running Grbl to implement motion control.

* Changes That Will Be Made

Currently there some limitations associated with the B9Creator control software. The following list details the limitations and the proposed changes that will be made.

1. Currently the software is using a custom slicing engine that produces SLC files, which are CAD slice files. The slicing engine will be changed to Slic3r. Slic3r outputs layers as SVG files.
2. The only model file format that is supported is STL. The intent is to add support for OBJ, 3DS, STEP, and AMF file formats as well.
3. The user interface will be changed to a tabbed interface from that of separate windows.
4. Projects are saved in a proprietary binary file format. This will changed to XML files.

* Releases

First release coming soon!

* Contributing

Here’s how we suggest you go about proposing a change to this project:

1. [Fork this project][fork] to your account.
2. [Create a branch][branch] for the change you intend to make.
3. Make your changes to your fork.
4. [Send a pull request][pr] from your fork’s branch to our `master` branch.

Using the web-based interface to make changes is fine too, and will help you by automatically forking the project and prompting to send a pull request too.

* Contact Us.

Email List

GitHub Issues

GitHub, Twitter, Facebook, Google+, YouTube

projectpam.github.io/Hardware

* Introduction
  + Project PAM’s design is completely original.
  + Open-Source
* Specs
  + The build volume is intended to be very flexible. The printer can accept two 1080p projectors for a large build area of 21.6 cm by 19.8 cm. With a Z axis travel of 21.6 cm the build volume can be as large as 9 L. Different sizes of build vats can be used to reduce the amount of resin necessary for building smaller parts.
  + Maximum build dimensions:
    - X: 21.6 cm
    - Y: 19.8 cm
    - Z: 21.6 cm
    - Volume: 9 L
* Off the shelf parts
  + Electronics:

Arduino Uno R3

Adafruit Motor Shield v2.3

* 1. V 300 mA NEMA 17 Stepper Motors

1. V 1000mA DC Power Supply
   * The prototype will use G+ resin from MakerJuice Labs

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