LE-3DPM (2 in 1)

Team Members:

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Problem Statement: Laser cutter/engraving machine and 3D printers are becoming more and more popular because a user can efficiently create objects of interest that can provide necessity. Some appropriate uses that these devices have displayed over the years include Architectural models, labs and educational settings, and displays and gadgets. However, one of the issues with the existing machines is the complex nature of operating the machine which limits the number of users as a result. Another problem that laser cutter/engraving machine and 3D printers are sold separately which creates additional discomfort for users.

Our Solution: To provide a low cost 2 in 1 system that includes both CNC laser cutter/engraver and 3D printer and utilize a user-friendly operating system.

Product Description:

Figure 1: shows a picture of our prototype product

- Camera is used to capture an image of the object to be cut/engrave in the working space. Image processing algorithm is applied to determine the dimension and location of the object with reference to the laser starting point.
- CNC software translates the design into G-code which then executes and controls the motion of the motors accordingly.
- Laser intensity is also determined within the CNC software.
- The final product is the design cut/engrave on the object
- (Add on) Laser head can be swapped with that of the 3D printer.
- 3D printing process works in a similar way to the Laser cutting /engraving process with additional z-axis.

Key Functions of our proposed product:

- A Computer program known as CNC used to drives the position of both the x, y, and z axes allowing finer cutting and engraving process. It is also used to adjust the intensity of the laser beam to enhance the engraving or cutting of the material.
- Camera system used as a sensor to aide in the design process. The camera determines the dimension of the object as well as the position of the object relatively to the workspace by applying computer vision and image processing algorithm.
- The types of material that the machine can cut/engrave also includes: Paper, wood, cardboard, and craft foam.
- 3D printing capability
- A phone app that allows interfacing with the machine
- The machine can connect to a wireless system which allows user to utilize the machine as long as the machine is setup.
- Table 1 below summarizes the main key functions and compares our product with top competitors:

Table 1: Comparison in features and price between our product and competitor's product

Features	Our product	Trinus DELUXE	da Vinci Jr. 1.0 3-in-1	Glowforge Basic
Adjustable working space	✓	x	x	x
Wi-Fi Connectivity	✓	x	✓	✓
Phone App	✓	x	x	x
Camera System	✓	x	x	✓
2 in 1 System	✓	✓	✓	x
Touch screen	✓	✓	x	x
Price	$950 (Prototype cost)	$649 (Selling Price)	$899.95 (Selling Price)	$2,995 (Selling Price)

Value propositions to customers/investors:
- The machine is built with inexpensive and 3D printed parts.
- The operation does not require high-proficient skills from the operator.
- The camera system allows the user to determine dimensions during cutting or engraving without having the user to do it manually.
- A phone app provides an easy interface.
- Wireless connectivity which allows easier access to the machine from anywhere.
All these features integrated into one machine at a low price gives us a unique product compared to our competitors. These features will make our product valuable to both customers and investors.

Business model:
Our business model would be selling our machine through an online website. This way it saves us some of the operational costs.

Market size and availability:
According to Forbes, 3D printing industry is expected to grow from $3.07B revenue in 2013 to $12.3B revenue by 2018. The industrial laser processing market size was estimated to be over $7B in 2015. There are quite a few companies out there in the market. However, we saw a great opportunity entering this market by offering a cheaper, 2 in 1 system (3D printing/ Laser engraving), and user-friendly machine as compared to our competitors.

Key technology:
- 2 in 1 system that includes both CNC laser cutter/engraver and 3D printer;
- Adjustable size
- Camera system integration
- Wi-Fi connectivity
- Phone app.

Patentable:
One possible feature that makes this machine patentable is the difference user interface between this and other machine. For example, this machine is capable of interfacing by using a simple handheld device such as a phone. This first example shows how this machine can innovate the world. We'll begin with the phone as an easy user interface, upon further enhancements might be moved towards other handhelds devices: tablets, PDA (Personal Digital Assistant), and finally portable devices (game devices and so on).

Some critical factors of our proposed product:
It is easy to use, to sell, and to create. It might help us override our opponents on the market, but we will need financial support to start the production.