3D printer for Henna application

# Scope:

3D printing technology is at the forefront of scientific development integrating cutting edge technology into mass market appeal items. Henna application is a time consuming process requiring hands on trained labor and the quality outcome of application depends upon the expertise of the applicator. Existing 3D printer hardware can be modified to be the frame work of an automated Henna application solution

# Specifics:

The design will have an extruder mount system that will move in the X, Y, and Z axis. This will be controlled by an embedded system that will communicate with a computer to receive files for input to work.

The extruder will have a holding tank containing slurry of the printing media. This tank will be topped up manually prior to commencement of printing. The slurry will be extruded in a controlled way using a motor to drive its mechanism. The nozzle will be designed to ensure laminar flow and smooth deposition of slurry.

A on the go sensing system will be designed to measure topology of print surface directly ahead of the extruder. This will use either a tactile or digital sensing system that will constantly take measurements which will in turn be used to vary the extruder height along the Z-Axis.

To support the hand for the 3D print, a human friendly hand mount will be designed and fabricated which will comfortably conform to the shape of the subjects hand via manual adjustments.

The software side of this project will control the design of extrusion, sensing, axis control, and giving commands from a 2D image all the way up to a 3D printed design on hand.

# Benefits:

This project will explore new frontiers in the field of 3D printing and additive manufacturing, mainly focusing on single slice slurry deposition on uneven surfaces that are being remotely sensed. The body of work generated by this project will be replicable to the following fields:

* Ceramic 3D printing
* Biomaterial and living material extrusion
* 3D printed foods
* Henna application
* Tattoo application
* Clay extrusion
* Etchant deposition
* High precision masking
* Precise powder coating for electrostatic surface protection
* High precision adhesive deposition

# Technology deliverables to be developed:

* Slurry extruder
* Slurry extruder controller
* Hand securing jig
* Depth sensing and feedback system
* 3 axis mount for jig
* Software