Electroplating 3D Printer Design Day

GNG5140

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Team:
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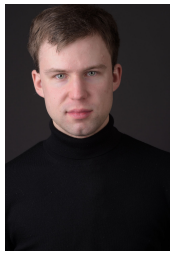
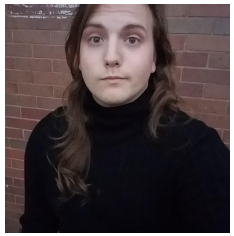


Jacob Jurkovich



Hayden Avery

Iragi Marara

Overview

- Background
- Problem Statement
  - Customer Requirements
- Design Requirements
  - Scope
    - How it changed
- UN Sustainability
- Prototyping
- Final Design

Background & Problem Statement

- This project comes from ECRIT, an initiative started in Vietnam by Dr. David Bruce who was studying hyper hydrophilic surfaces.

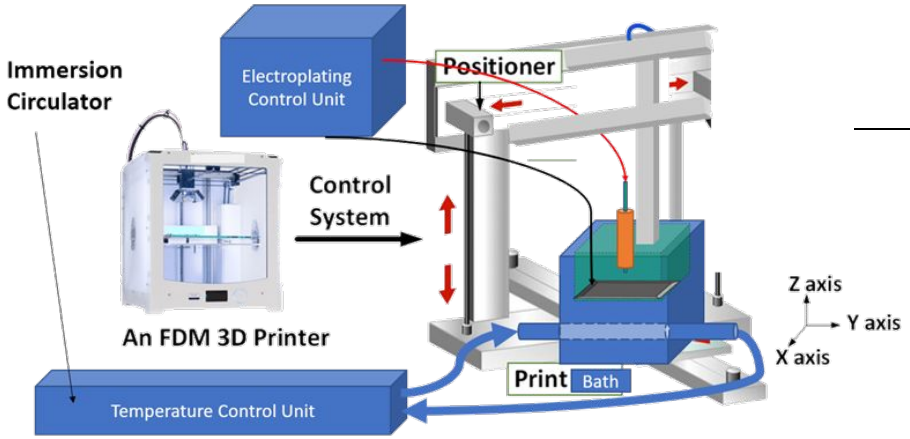


Figure 2: Customer Concept

Problem Statement:

To develop a 3D electroplating prototype that gives control over the plating area.

Requirements - Customer

Label	Customer Requirement	Priority
C1	Nickel Plating Capability	5
C2	Precise Movements	5
C3	Hydrogen Bubble Templating (HBT)	5
C4	Easy to maintain	4
C5	Open Source	3
C6	Easy to make/maintain	3
C7	Environmentally Friendly	2
C8	Swappable Components	1

Requirements - Design

Design Requirements	Relation	System	Rating
Utilize Existing 3D Printer	C2 C5 C4 C6	Movement	5
Accurate Current (2A/cm^2)	C1 C3	Plating	5
Contained solution	C6 C7	Pump	5
Precise plating current	C1 C3	Plating	4
Print Speed (X,Y)	C1 C2	Movement	4
Z- Precision	C1 C2	Movement	3
Thin anode and Feed stock precision	C1 C2 C3	Feeder	3
Bed temperature difference	C1 C3	Heating	3
Configurable voltage/current	C5 C8	Plating	2
Feed rate	C1 C4 C7 C8	Feeder	1
Pumping (Fluid out, clean solution, drain)	C4 C6	Pump	1
Bed temperature variance	C1 C3	heating	1

UN Sustainability

Prototype Phase 1

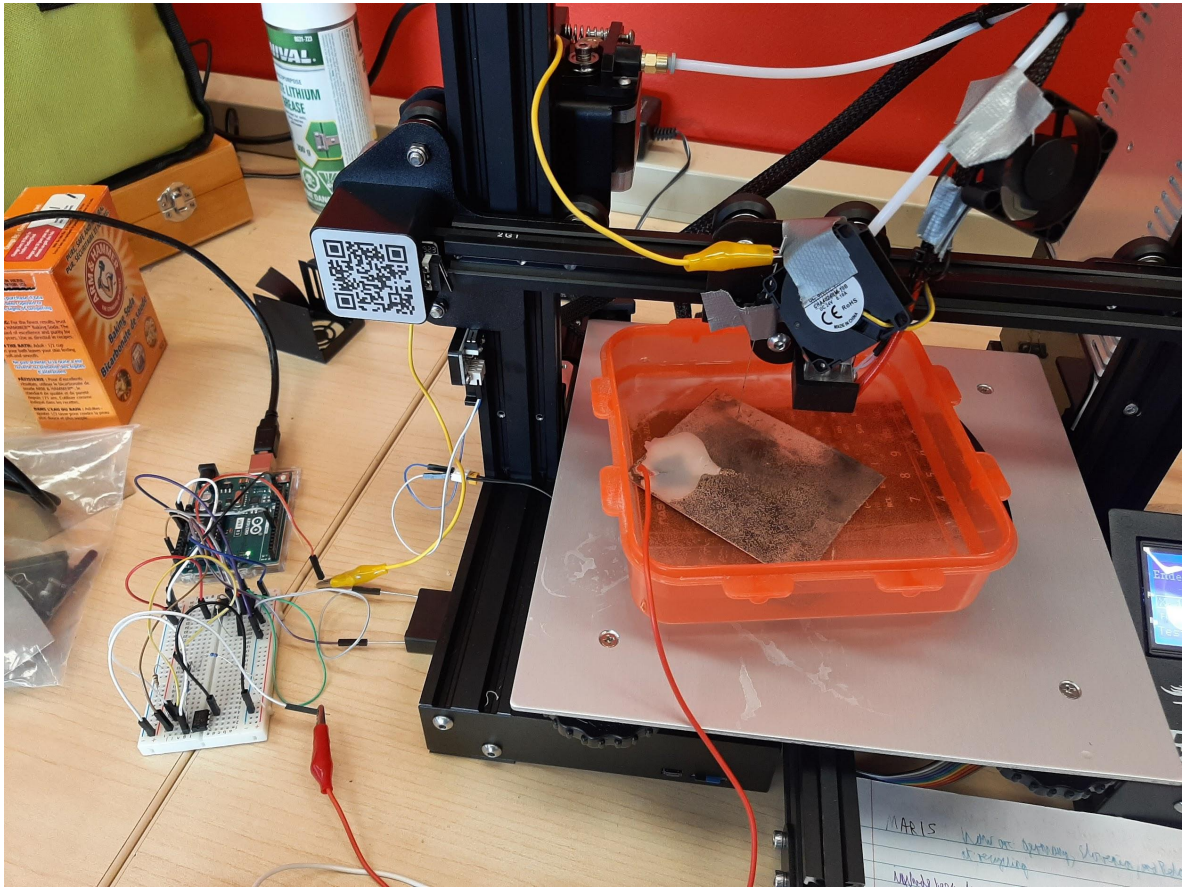


Figure 3: Electroplating printer Prototype #1

Prototype Phase 2

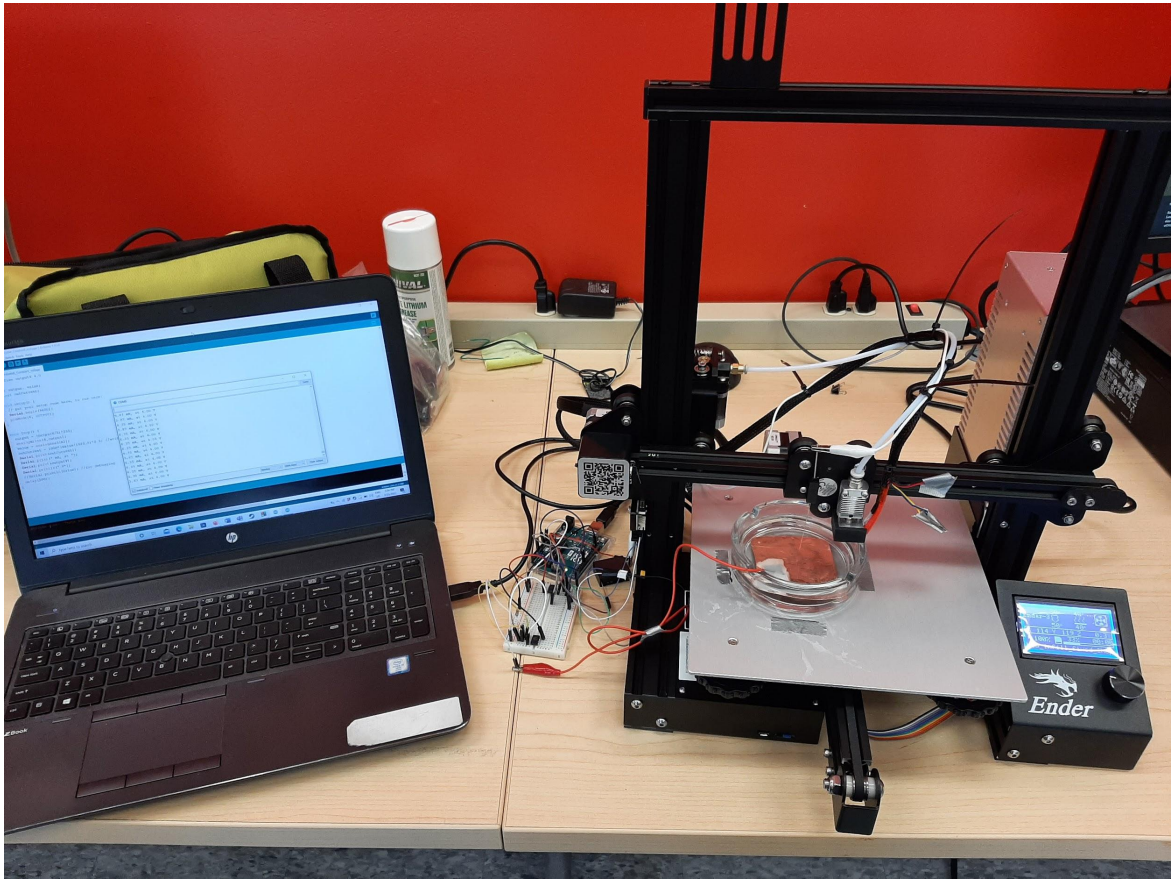


Figure 4: Electroplating Printer Final Prototype

Prototype Phase 2

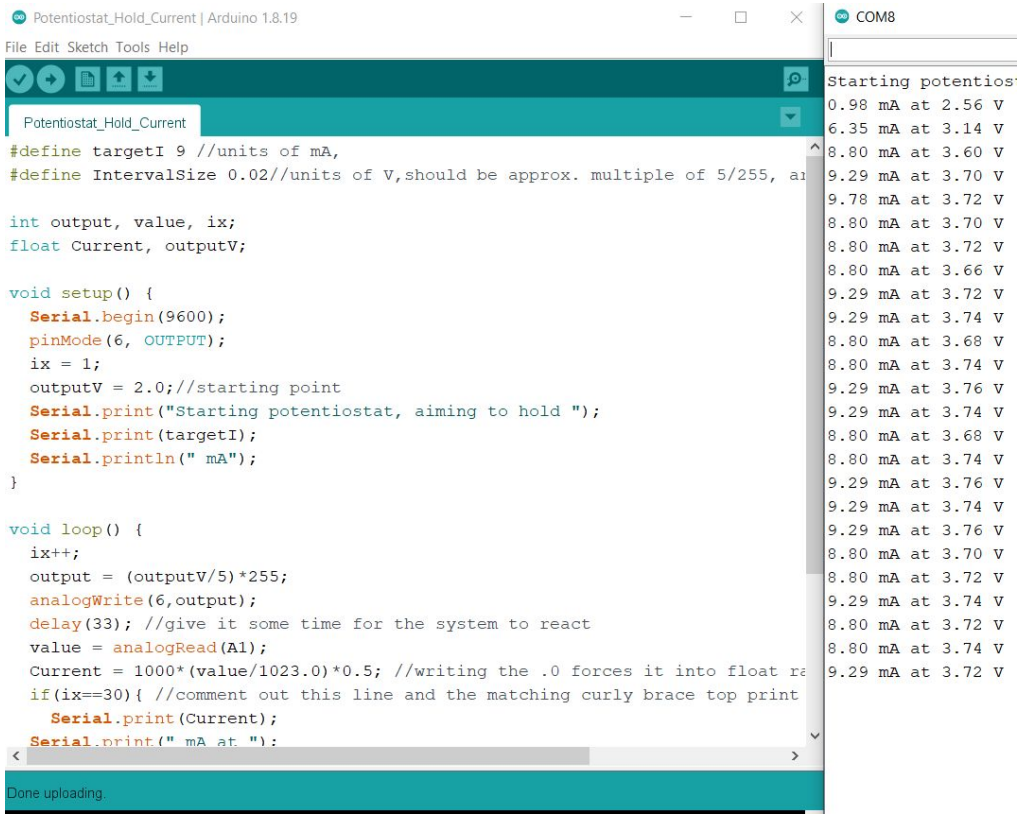
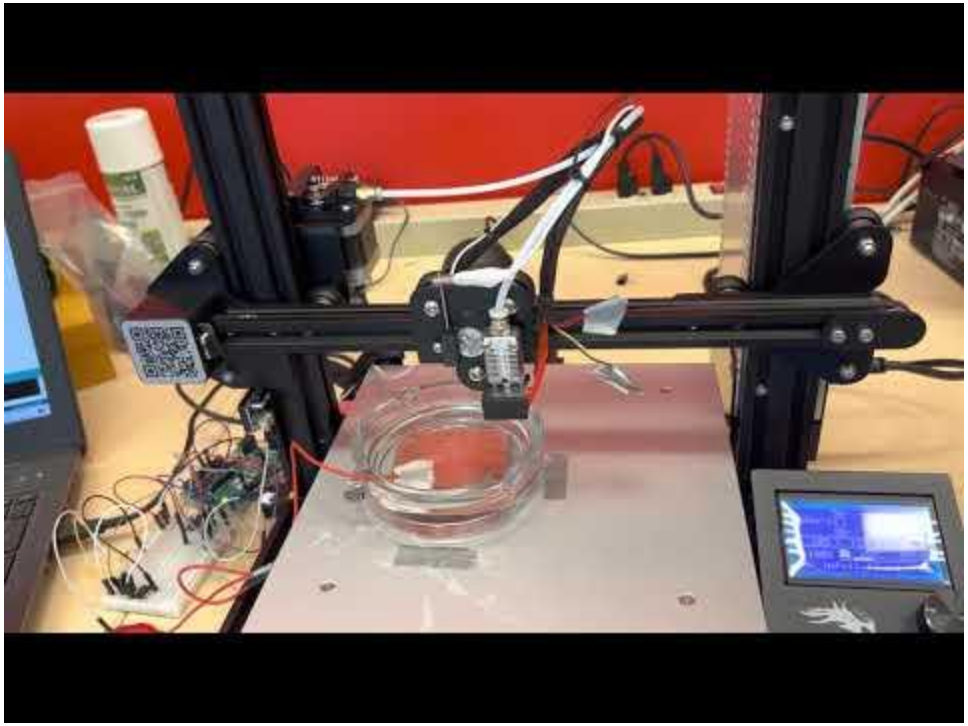


Figure 5: Potentiostat UI

Prototype Phase 2



Conclusion and Future Remarks

- We did achieve the expected goal, a successful hydrolysis reaction using a 3D printer has been performed
- There are problems in repeatability and precision, especially with distance of anode/cathode
- We believe this creates ample opportunity for further projects to open up to improve upon:
  - Pumping & heating systems
  - More thorough testing
  - Precision improvements
  - Firmware upgrades

Questions?

Thank you for Attending