



Mission Statement

'To develop a printer that secures seeds in a user-defined pattern on biodegradable, plant-able paper for analysis of interactions among different species of flora'

Motivation

Purdue Forestry Professor, Dr. Keith Woeste's research involves planting of inter-species seed patterns.

Current Method takes up to 5 days to complete!

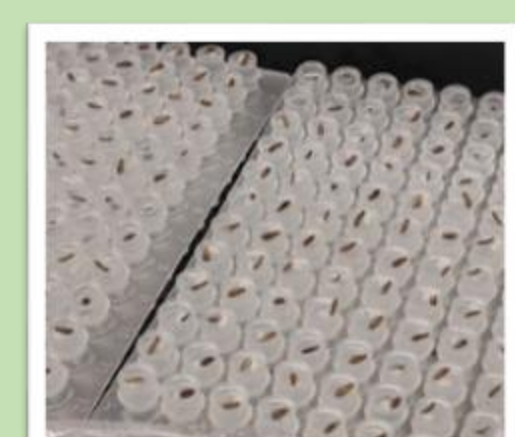


Fig. 1. Seeds are individually selected and placed in separate vials.



Fig. 2. Vials are arranged in plastic pattern. Glue is dispensed below, and seeds are released.

Requirements

Customer:

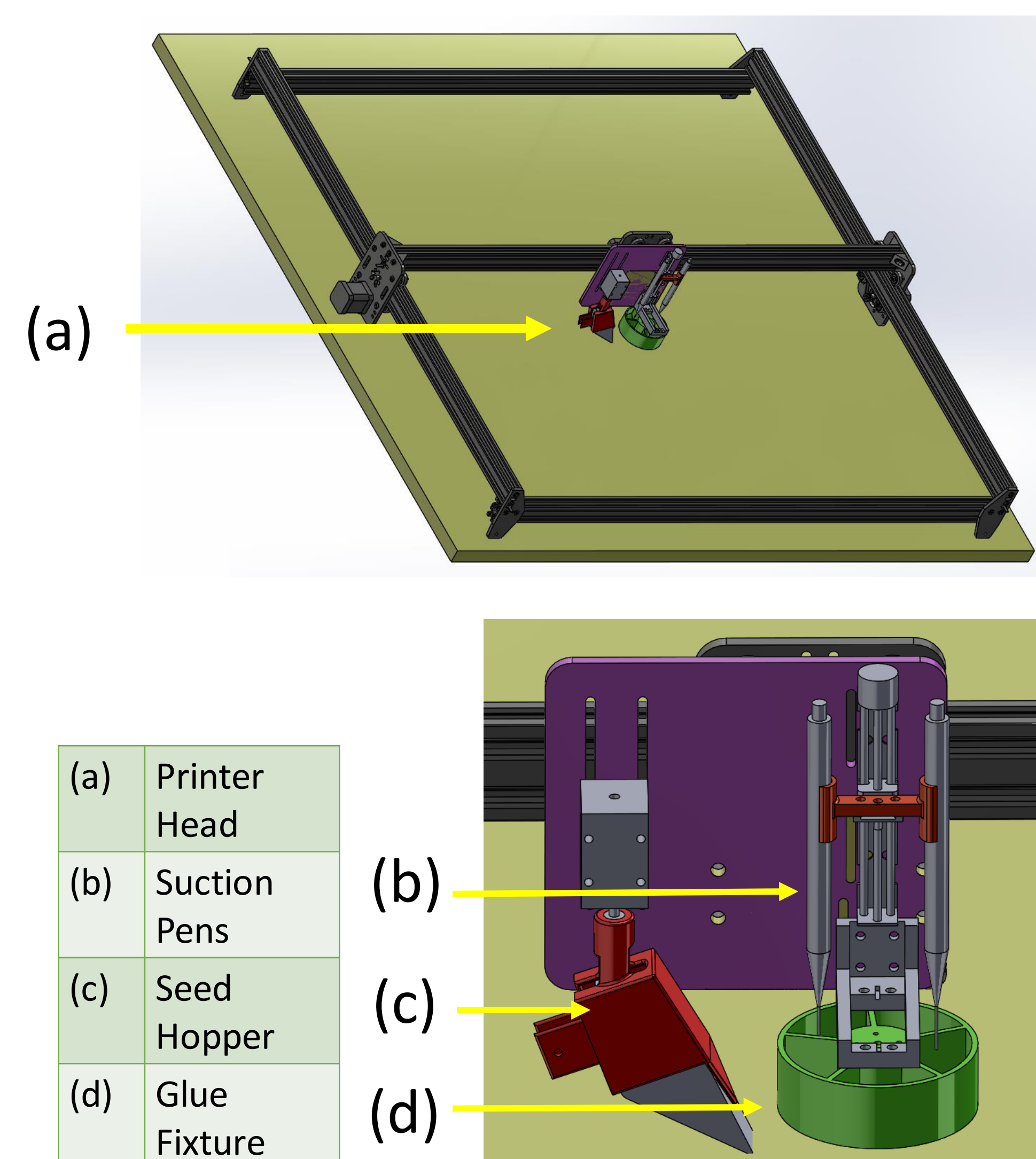
- Ability to automatically secure seeds in desired pattern (Fig. 6)
- Ability to individually plant 4 types of seeds of varying sizes and shapes



Engineering:

- Accepts any input pattern in .xlsx form
- Places seed accurately to 1/16 "
- Applies non-toxic, non-volatile adhesive at seed location

Final Design



Figs. 3 and 4: Final Prototype and Printer Head

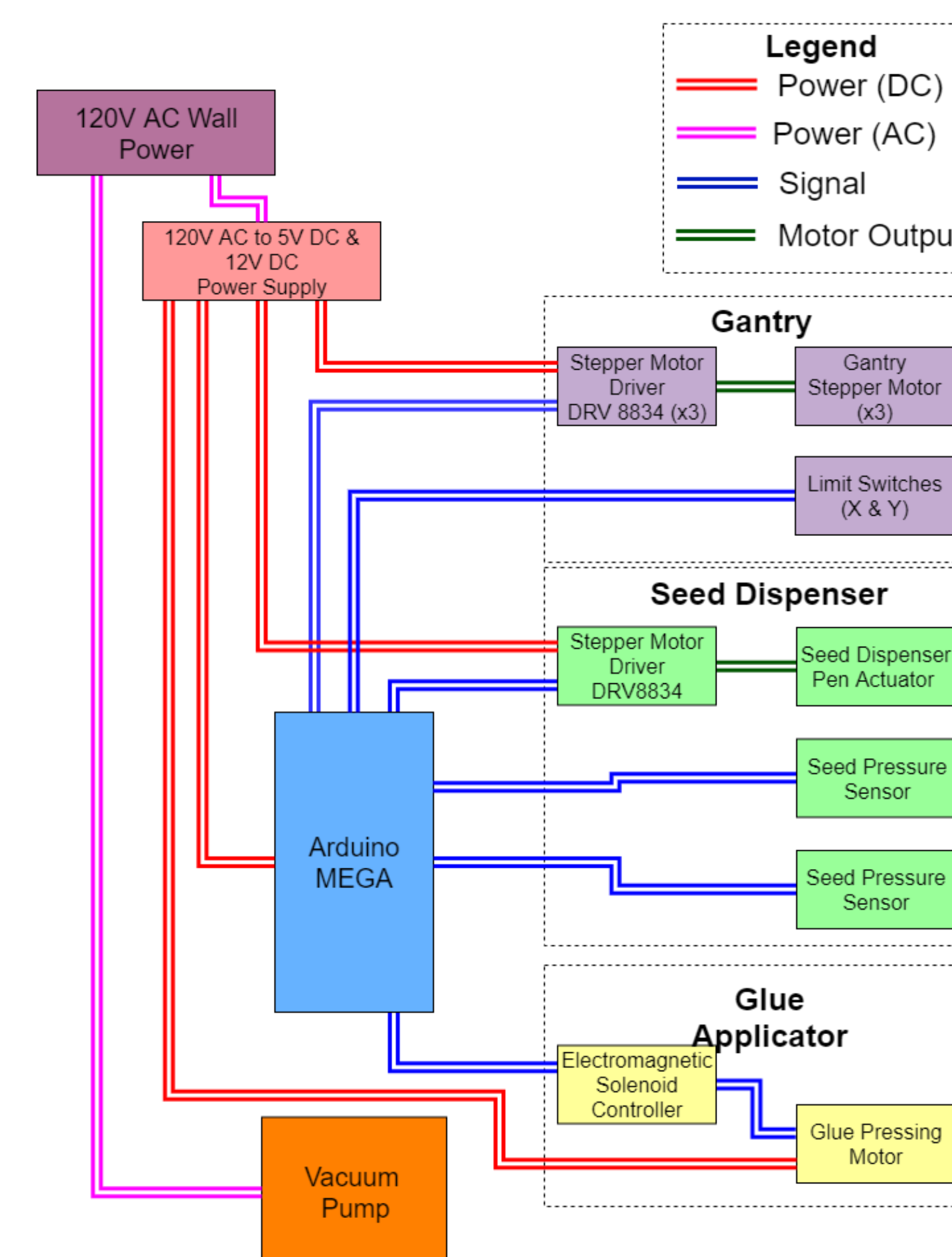


Fig. 5: Electrical Design by subsystem

Our design takes inspiration from the movement of a standard 3D-printer and incorporates it with an **innovative seed hopper** and dispenser design. The design is broken into 4 main mechanisms: **file input**, **glue**, **location**, and **seed dispensing**. The Excel file is parsed using **Python** and transferred via **SD card**. The **gantry** will move the end effector to the desired location to apply a 1 cm strip of glue and **pick up one seed, using suction**, and drop at the desired location.

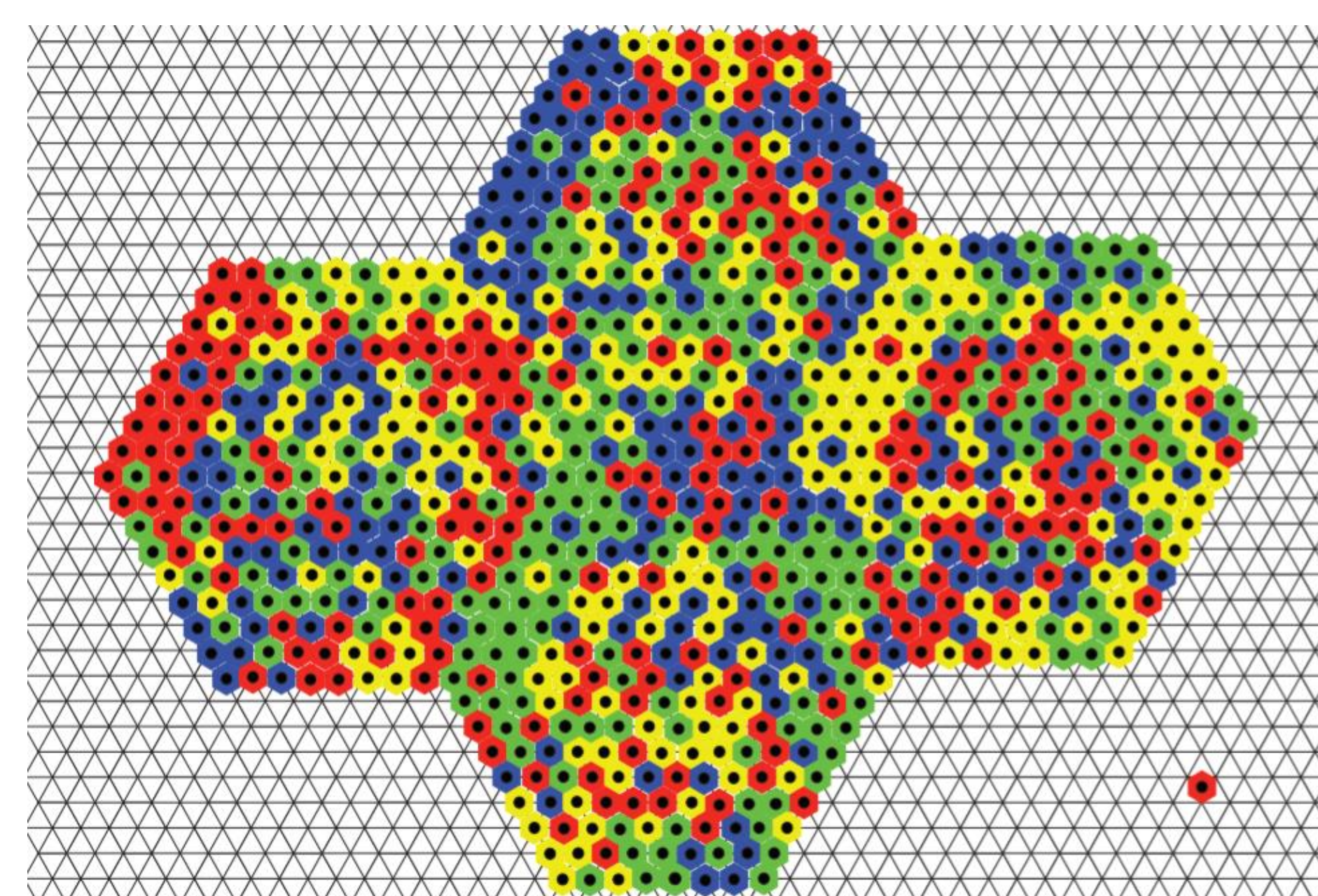


Fig. 6: Input Pattern (Courtesy Dr. Keith Woeste)

Validation Results

- Positioning Accuracy

X	Y
<0.5mm	<1mm

- Seed Pickup Efficiency

1st Try	2nd Try	3rd Try
72%	92%	100%

- Glue Length Accuracy: <3mm

Future Improvements

- Improve suction pen tip to adapt to greater diversity of seeds
- Increase efficiency of seed and glue placement by combining movements

Next Steps

- Design will be scaled-up for agriculture and forestry applications
- Potential commercial application for "Green Gifts" and garden planning (see below)



Benchmarks



- Expensive (\$1,500 - \$3,000)
- Permanent fixture – 1/bed
- Higher complexity
- Large footprint - 1.2m x 0.5m