

Keynetics Assembler

Austin Kugler, Taylor Martin, John Myers, & Zach Preston

Faculty Advisor: John Shovic
Sponsor: Schweitzer Engineering Lab



OBJECTIVE

Prevent incorrect combination of electrical plugs using a six-axis robot.

BACKGROUND

Existing method:

- Employee picks up key hexagon
- Employee inserts key into plug slot
- Employee twists the hexagon, breaking off the key and filling the slot

Drawbacks:

- Slow, taking employee time away from other tasks
- Straining on employee hands
- Introduces human error

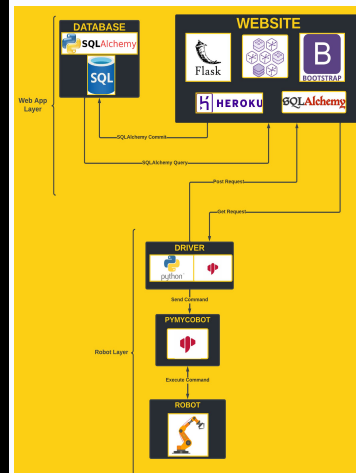
REQUIREMENTS

1. Remove need for molded keys
2. Minimize human interference
3. Use 6-axis robot, like used by SEL
4. Maintain or improve existing:
 - a. Speed
 - b. Accuracy
 - c. Strength
 - d. Cost
5. Provide web app for robot control
6. Deliver record of notes and design choices

VALUE PROP

- Automation of a boring and repetitive task
- Removes need for molded keys
- Decreases production time
- Removes human error
- Prevents strain on employee hands

FINAL DESIGN



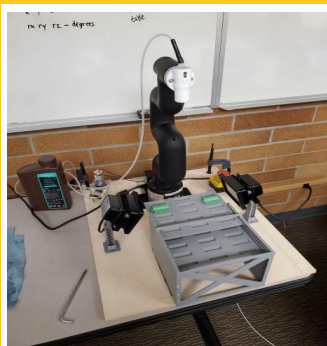
MANUFACTURING

Pallet, Rack, & Mounting Accessories:

- Additive Manufacturing (3D Printed)
- Chosen material is PETG
- Production time of ~15 hours
- Offers ease of prototyping with good accuracy

Base Plate Aligner:

- Uses subtractive manufacturing
- Chosen material is plywood
- Production time around ~3 hours
- Easy to manufacture and inexpensive



VALIDATION

- Mean automated job time vs. existing method
- Cost of UV resin system vs. molded key system
- Strength of cured resin vs. plastic keys
- Accuracy of resin curing vs. employee key insertion
- Job success rate vs. failure rate
- Comparison of safety concerns between new and existing processes

OUTCOMES

- Designed, built, and implemented the Keynetics Assembler
- Created a web app for non-technical stakeholders
- Provided plug configs, jobs, and user account manager
- Designed and built manufacturing station to house robot, UV flood lights, and plug oven
- Dispensed and cured UV resin in key slots, automating the existing process

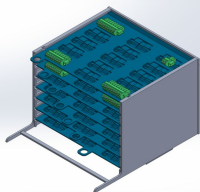
FUTURE WORK

Error Handling:

- Handle incorrect placement of tray and plugs
- Alert employee of UV resin depletion
- Handle trays with missing plugs

Increase Scale:

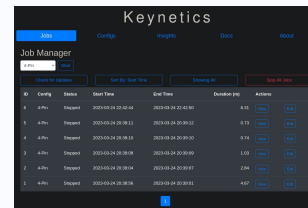
- Increase plug capacity by introducing additional robots, plug ovens, and/or UV flood lights



TECH STACK



LIVE DEMO



<https://www.keynetics-web.com/>

