Encoder Automation Table

Showcasing the power of encoders.

360 Designs

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What's an encoder?



Encoders very accurately measure angles which can easily translate to distance, velocity, and acceleration.

Project Description

→ Design and create an automated, interactive modular display that highlights EPC's encoders for a variety of purposes.

Value Proposition

- → The Encoder Automation Table will:
 - showcase EPC products at trade shows
 - provide an attractive display to encourage individuals to inquire more about EPC products
 - aid in the training of new employees at EPC

Design for Module 1 (Programmable Encoder)

- → Minigame
 - User will attempt to guess length of a given point on the linear actuator
 - The linear encoder will provide feedback to determine the actual distance travelled
 - Accuracy will determine <u>success</u> or <u>failure</u>
 - Success will only be achievable by programming the encoder to modify the resolution . . .

Design for Module 1 (cont.)

- → Resolution
 - The Model 25 SP can be programmed to have a specific resolution
 - Resolution is the number of ticks/points that the encoder counts per resolution
 - Capable of the range of 1 and 65,536

Model 58TP Programmable Encoder



Lower Resolution (8)

Higher Resolution (128)

Project Learning

- → Synthesizing budgets and purchasing
- → Organizing multi-disciplinary tasks to provide synergy
- → 3D modeling, rendering, and animation to effectively communicate design plans
- → Learning a new language to program the Unitronics display
- → Working with the client as demands and ideas morph

Unresolved Issues

- → Programming the Unitronics display
- → Testing the stepper motor with micro stepping to determine maximum accuracy
- Machining to mount the linear encoder and rack to the display
- → Testing to determine maximum allowable resolution that will be accurate for the ball screw

Plan for the Future

- → January 2019:
 - Finish an initial prototype for presentation to EPC
 - Receive advice for revisions
 - After revisions:
 - Begin design for second module (absolute encoder)
 Aim to finish second module by end of March, and begin 3rd module (if possible)

How will the motion be controlled?



Unitronics HMI+PLC Unistream 10.4 Multitouch 32 bit processor Digital and analog input/output modules

| 360 Designs Initial Budget | | | | | | | | |
|----------------------------|--------|--|--|--|--|--|--|--|
| Expense Items | Cost | | | | | | | |
| Motors | \$75 | | | | | | | |
| Sensors | \$200 | | | | | | | |
| Labor | \$150 | | | | | | | |
| Shop use | \$150 | | | | | | | |
| Parts | \$600 | | | | | | | |
| Travel | \$300 | | | | | | | |
| Misc. Items | \$200 | | | | | | | |
| Prototype | \$325 | | | | | | | |
| Total Expenses | \$2000 | | | | | | | |
| Budget Total | \$4000 | | | | | | | |

| Designed Duck | 260 Designs | | | | | | - | | | | | | | |
|---|-----------------|--|------|-------|--------|-----|-------|------|--------------------------|--------|----------|------------|-------------------|---------|
| Project | : 360 Designs | | | | | | - | | | | | | | |
| Last Opdated | 11/19/2019 | | | | - 10 C | Mar | | | 1 | | 14. | | | |
| Expense Items | Vendor | Date Puchased | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | To | otal | | |
| Equipment/Tools: | | | | | | | | | | | 1 | | | |
| | | | | | | | | | | | \$ | - | | |
| Travel: | | а. | | | | | - | | | | | | | |
| | | | | | | | - | | | | \$ \$ | - | | |
| Supplies / Parts / Services | | | | | | - | | | | | | | | |
| linear actuator | Amazon | 10/27/2019 | | \$ 17 | 7 | | | | | | \$ | 177 | | |
| stepper motors | Amazon | 10/27/2019 | | \$ 4 | 4 | | | | | | \$ | 44 | | |
| brackets | Amazon | 10/27/2019 | | \$ 1 | 1 | | | | | | \$ | 11 | | |
| speaker | Amazon | 11/18/2019 | | | \$ 17 | | | | | | \$ | 17 | | |
| food dispenser | Amazon | 11/18/2019 | | | \$ 16 | | | | | | \$ | 16 | | |
| on a constant de la c | () Billion and | and the second | | | | | | | | | \$ | - | | |
| | | a a | | | | | | | | | \$ | <u></u> | | |
| | | | | | | | | | | | \$ | - | | |
| | | 2 3 | | | | | | | | | \$ | 2 | | Expens |
| | | | | | | | | | | | | | \$ 265 | Subtota |
| Shop Usage (est. Hrs): | | | | | | | | | | | Hours | | | |
| | | | 5 | | | | 2 | | | | | 0 | | |
| | | | | | | | | | | | | 0 | | |
| | a 20 | | 5 | | | | | | | | | 0 | | |
| Tax Expenses | | | | | | | | | | | | 0 | | |
| Purchase from 10/27/2019 | | | | 14 | | | 2 | | | | 1 | 4 | | |
| Purchase from 11/18/2019 | | | | 2 | | | | | | | | 2 | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | 0 | 0 | | |
| | | | | 1 | | | | Grad | Graduate Student Support | | \$ | (1 | including fringe | |
| | | | | | | | | | Shop Overhead | | \$ | - | | |
| | | | | 1 | | | | | University Overhead | | \$ | 13 | 5% of all expense | |
| | | | | | | | | | | Totals | \$ | 278 | \$ 4,000 | \$ 3,72 |
| | | | | | | | | | | | | | Budget | Exces |