Motion Control Photography

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Introduction

Motion-Control is a filmmaking technique that adds *motion blur* to traditional stop-motion animation.

The system needs to precisely move the camera and subject during the exposure to produce the motion blur.

This movement repeats for multiple iterations or "passes". Each pass focuses on a different condition, typically lighting. All layers of footage are combined as one.

Motion blur = realistic movement

***Blur exaggerated to demonstrate the difference**

Objectives

1. Design a traditional 3-axis Pan-Tilt head on a dolly track with Lens Focus

2. Design a 3-axis gimbal to manipulate the subject (miniature spaceship)

3. Design an electronics enclosure to handle up to16 stepper drivers

4. Design software package with microcontroller to program stepper movement
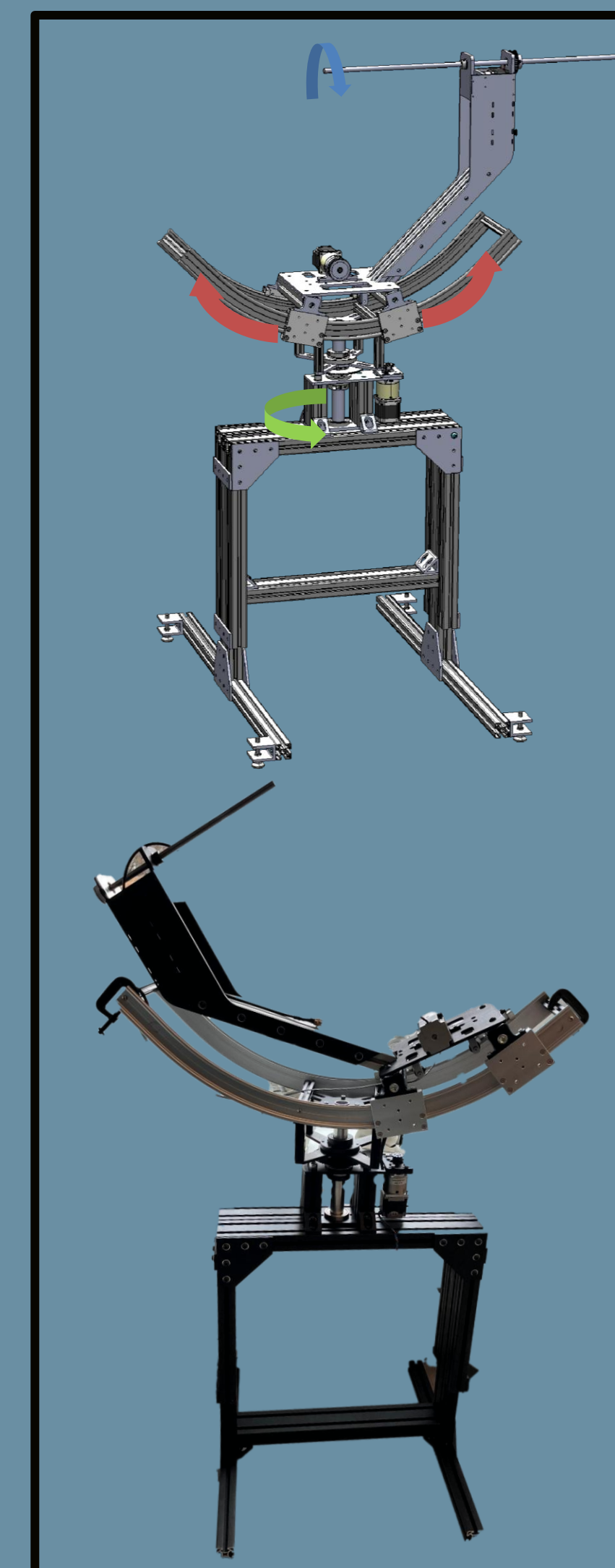
5. Construct a miniature spaceship

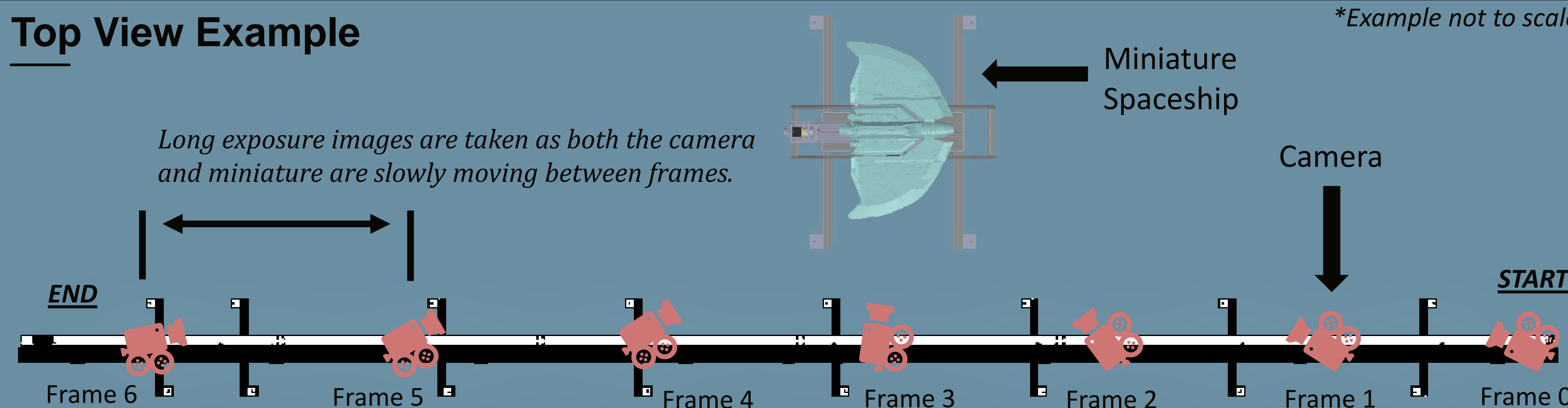## Design and Construction
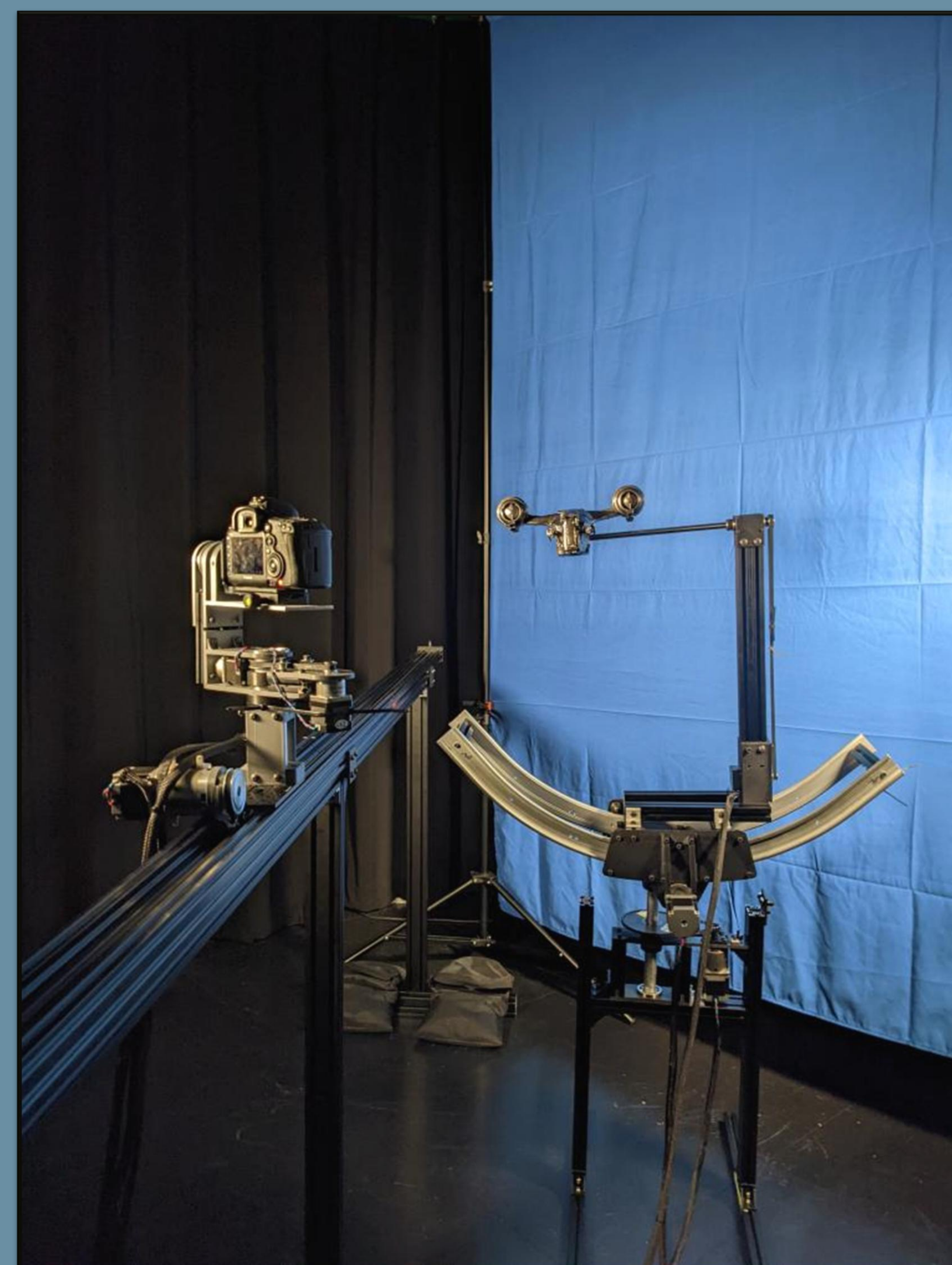
Camera Pan-Tilt Head
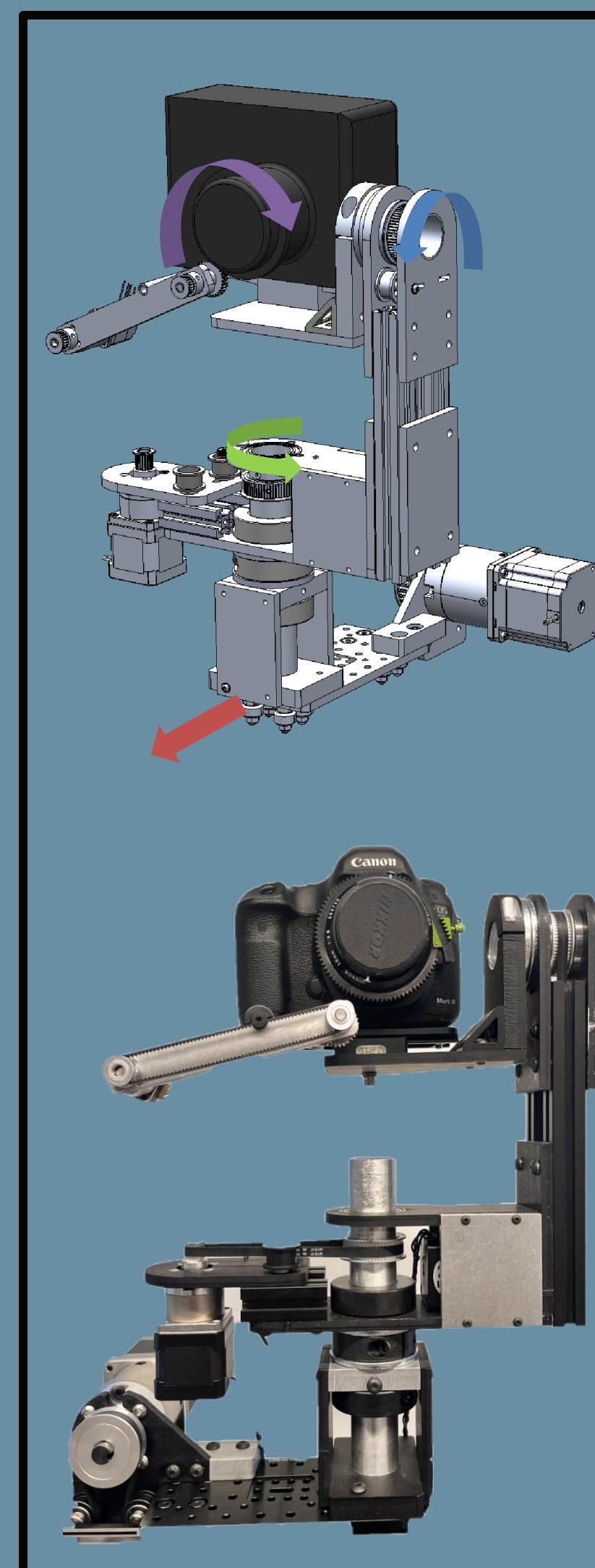
Miniature Mover

Top View Example

*Example not to scale

Long exposure images are taken as both the camera and miniature are slowly moving between frames.

Miniature Spaceship

Camera

END   *START*

Frame 6   Frame 5   Frame 4   Frame 3   Frame 2   Frame 1   Frame 0

Hardware and Electronics

The system utilizes 7 stepper motors with the ability to support 16 total motors.

Powered by Teensy 4.1 Microcontroller, using daisy-chained shift registers to reduce I/O pins needed.

Operated via a CNC pendant featuring a 6x4 keypad, rotary encoder, and LCD screen.

Results

Follow this QR Code to view the resulting shot.

Conclusion

Our team created a motion control system using a Teensy4.1, 7 total stepper motors, and a CNC "JogBox" pendant to control.

With this system, we filmed a series of precisely replicable passes, all combined to create a film-quality shot of our model.

Acknowledgements

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