



TUSIC

**Emily, Kristen, Hannah, Maggie,
Athmika**

shoutkey.com/us

Our Goal

A **PAGE TURNER** for musicians that is actuated with a **HANDS-FREE** method.

OUR MVP

1

Can reliably
turn sheet
music

2

Hands-free
trigger
mechanism

3

Professional
Construction

4

User testing
with pianists

5

Integrated
systems

LEARNING GOALS

Our individual goals.
How have we met them
thus far?

EMILY

System
integration,
program
hands-free
inputs

HANNAH

CAD, rapid
prototyping,
mechanisms,
system
integration

KRISTEN

System
integration,
Open-source
programming,
Prototyping

ATHMIKA

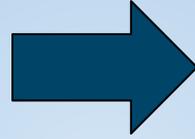
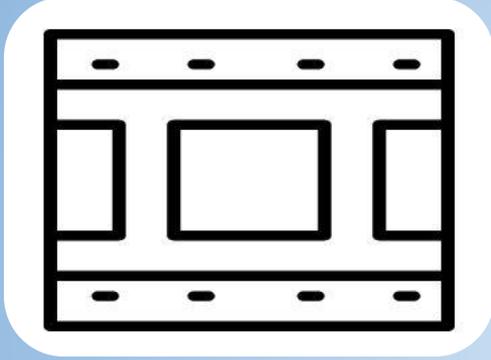
To learn
system
integration

MAGNOLIA

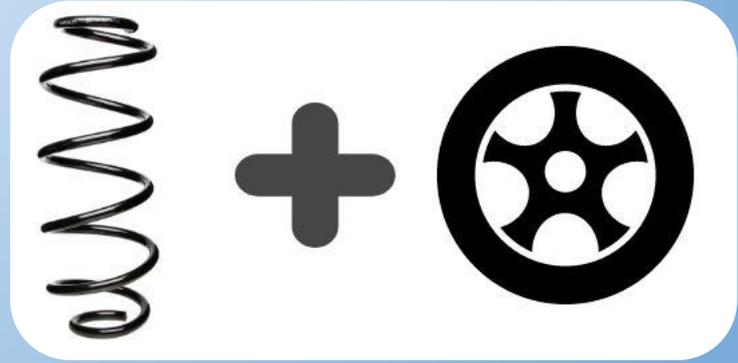
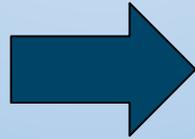
Tidier circuits,
Electrical
troubleshooting

Sprint 2 Takeaways

SOFTWARE



MECHANICAL



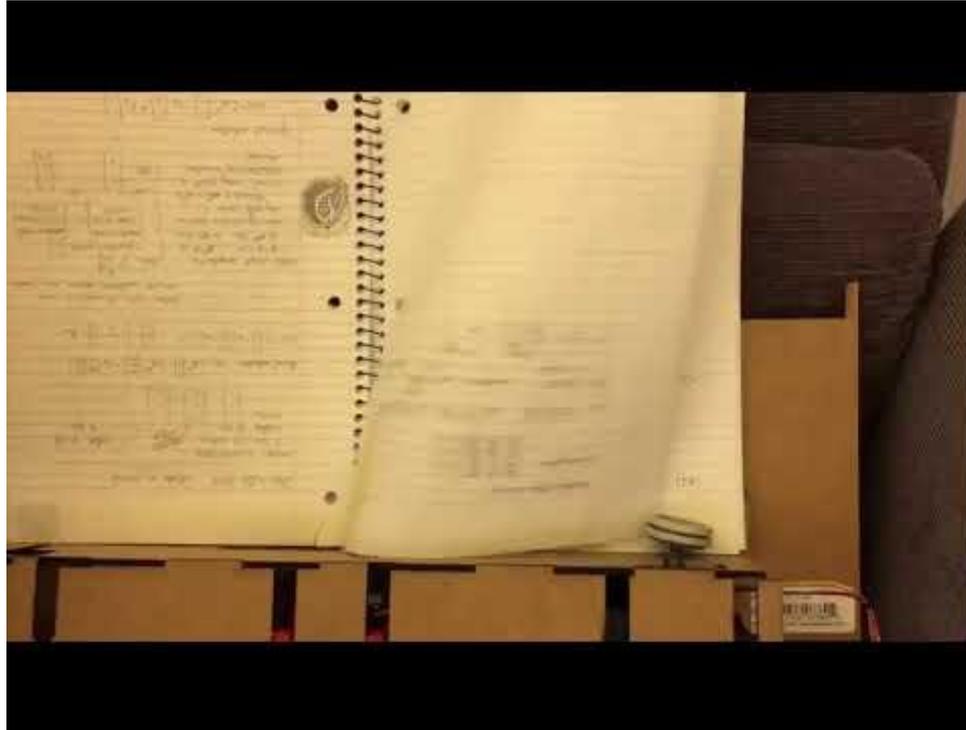
Deliverable 1

Final Pedal Integration



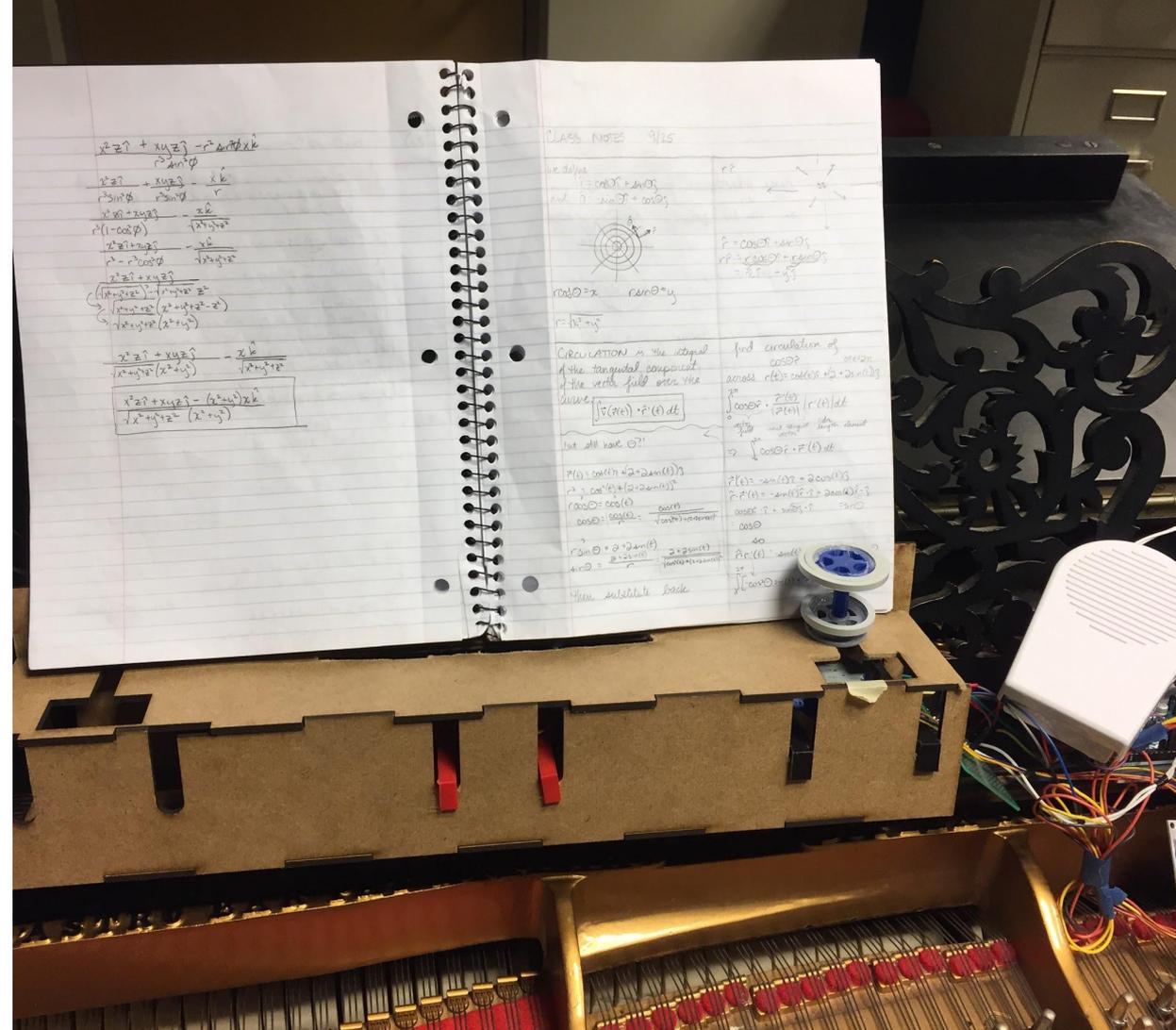
Deliverable 2

Moving one piece of paper consistently



Deliverable 3

Live music testing



$$\sqrt{x^2+z^2} + xy\hat{j} - r^2 \sin^2\theta \hat{k}$$
$$r^2 \sin^2\theta$$

$$\frac{x^2+z^2}{r^2 \sin^2\theta} + xy\hat{j} - \frac{x^2+z^2}{r^2 \sin^2\theta} \hat{k}$$

$$\frac{x^2+z^2}{r^2(1-\cos^2\theta)} - \frac{x^2+z^2}{r^2 \sin^2\theta}$$

$$\frac{x^2+z^2}{r^2 \cos^2\theta} - \frac{x^2+z^2}{r^2 \sin^2\theta}$$

$$\frac{x^2+z^2 + xy\hat{j}}{\sqrt{x^2+y^2+z^2}} - \frac{x^2+z^2}{\sqrt{x^2+y^2+z^2}}$$

$$\frac{x^2+z^2 + xy\hat{j}}{\sqrt{x^2+y^2+z^2}} - \frac{x^2+z^2}{\sqrt{x^2+y^2+z^2}}$$

$$\frac{x^2+z^2 + xy\hat{j}}{\sqrt{x^2+y^2+z^2}} - \frac{x^2+z^2}{\sqrt{x^2+y^2+z^2}}$$

CLASS NOTES 9/15

We define
 $r = r\cos\theta + r\sin\theta\hat{j}$
and $\hat{k} = \cos\theta\hat{i} + \sin\theta\hat{j}$



$\cos\theta = z/r$ $\sin\theta = y/r$
 $r = \sqrt{x^2+y^2}$

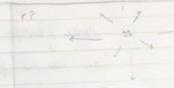
CIRCULATION is the integral of the tangential component of the vector field over the curve.

$$\int_C \vec{v} \cdot d\vec{r} = \int_C \vec{v} \cdot \hat{t} \, ds$$

but all have \hat{t} !

$$\vec{v}(\theta) = \cos(\theta)\hat{i} + \sin(\theta)\hat{j}$$
$$\vec{r} = \cos(\theta)\hat{i} + \sin(\theta)\hat{j}$$
$$\cos\theta = \cos(\theta)$$
$$\sin\theta = \sin(\theta)$$

$$\vec{v} \cdot d\vec{r} = \cos^2\theta + \sin^2\theta = 1$$
$$\int_0^{2\pi} 1 \, d\theta = 2\pi$$



$$r = \cos\theta + \sin\theta\hat{j}$$
$$r = \cos\theta\hat{i} + \sin\theta\hat{j}$$
$$\hat{t} = -\sin\theta\hat{i} + \cos\theta\hat{j}$$

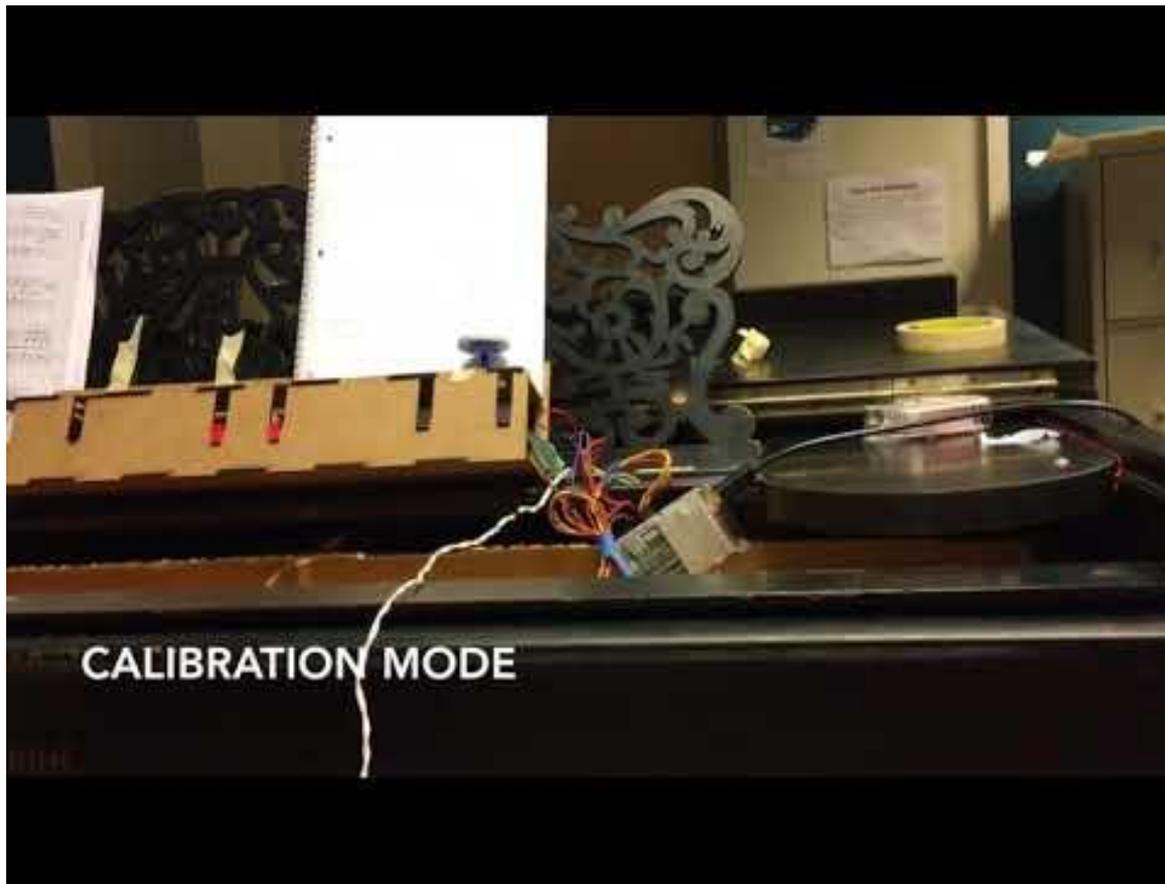
Find circulation of $\vec{v} = \cos\theta\hat{i} + \sin\theta\hat{j}$ around ellipse $x^2 + 4y^2 = 1$

$$\int_C \vec{v} \cdot d\vec{r} = \int_C \cos\theta \hat{i} \cdot (\cos\theta \hat{i} + \sin\theta \hat{j}) \, ds$$

$$\int_0^{2\pi} \cos^2\theta \, ds$$

$$\int_0^{2\pi} \cos^2\theta \, d\theta = \pi$$

Demo





Deliverable 4

RaspPi Integration

OUR MVP



1

Can reliably
turn sheet
music



2

Hands-free
trigger
mechanism



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Professional
Construction



4

User testing
with pianists



5

Integrated
systems

BIGGEST RISKS

- Consistent turning of page
- Calibration of live playing

FINAL GOALS

Overall Goal:
Polish our MVP

Mechanical

- Tweak sizing and fit of pieces
- Adding more wheels to the side

Software

- Continued testing of live music (possible different instruments)

Electrical

- Neater wiring

Documentation

- Professional recap of each of the sprints
- Final website running on Olin server