

PriTay Turnstile Daily Log

Running Material List

- PLA
- LED light
- Motor
- Metal Rods

09/10/24: Research

Generator and Electric Current Storage Research:

- <https://www.wikihow.com/Make-a-Simple-Electric-Generator>
- Rotating a Magnet inside a copper wire generates a current in the wire -> solder it to the other parts/measure with a voltmeter
- Faster spinning = more current
- Thicker wire means less voltage, but more current
- Amount of voltage is proportional to Loops of wire
- Capacitors: when there's no voltage change in DC current it doesn't matter
- Charges/Decharges during change in voltage

$$v_c = V_1 \left(1 - e^{-t/\tau}\right) \text{ charging}$$

$$v_c = V_1 e^{-t/\tau} \text{ discharging}$$

Where:

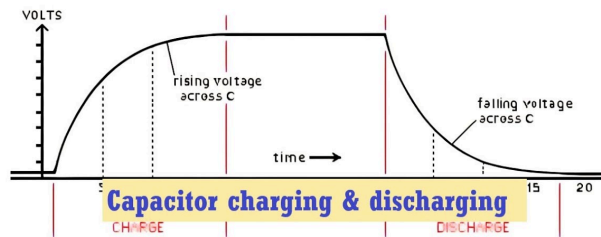
v_c - voltage across the capacitor

V_1 - input voltage

t - elapsed time since the input voltage was applied

τ - time constant

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- Use capacitors in parallel to increase capacitance

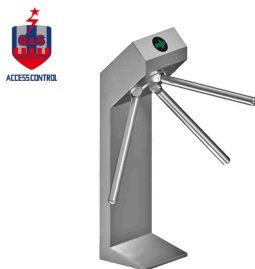
9/12: Research

Functionality of a Turnstile:

End Goals:

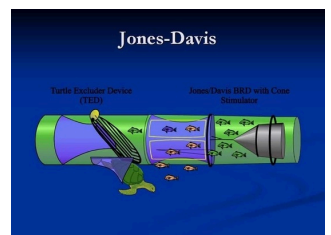
- Create an autonomous turnstile that can do a 360 degree turn with a locking & clicking mechanism on shape

Ideas: Basic Turnstiles



3 Main parts;

1. a motor drive device
 - Responsible for powering the mechanism's movement, the motor drive device typically consists of a DC motor and corresponding circuits. DC motors convert electrical energy into mechanical energy, facilitating the rotation of the tripod turnstile mechanism



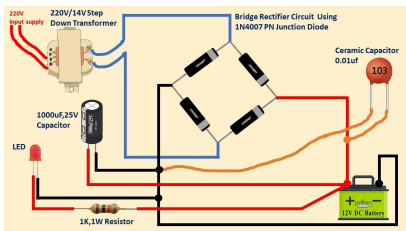
2. a reduction device – a semi-round opening held by a rigid triangular shaped frame at a set distance from the drawstring of the codend
3. sensor device – Part that determines whether a person has passed through the turnstile or not

More Generator Ideas:

- Decided to use a already existing generator
- Buy our own generator



- This looks cool, I'd think we need something like this to have enough coils
- Need to use gears
- Motor (energy generation) -> Diode (prevents backflow) -> Battery/Capacitor -> LED



- Idea for a how to charge a battery to light up an LED over time.

9/16

- Tested whether the motors would apply to our project
 - Motor wired with a 5 Ohm resistor and read through 10 bit ADC convertor



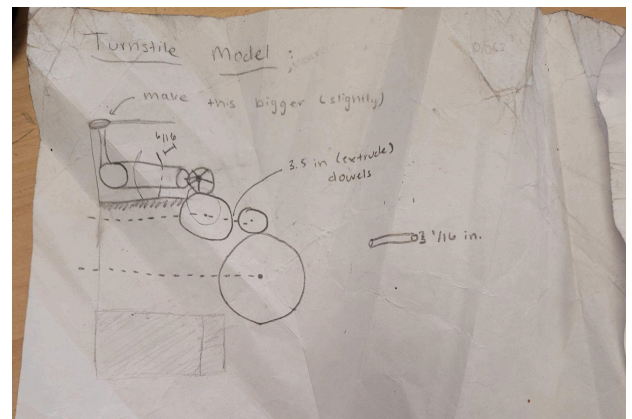
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- Video: https://photos.google.com/share/AF1QipNOx223AOq46OjTFOB_SsOoBDUA28I8fEx2ttXSBX_Z4NfHDIWRup-GzX75skWiVw?key=TTcxcFdfOHpWQVRfYVhYdOR6TIJ3NVRKOVYzVDZ3d
- The RPM of the fan is enough to produce ~0.60 Volts

9/18

- Looked over research and determined how turnstile motors work
- Began to create a sketch of CAD model

9/20

- Completed first sketch
 - On the right
- Researched other CAD designs and altered our design



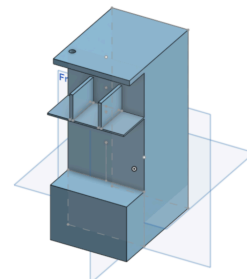
9/24

- Finalized research and determined what materials we need to order
- Worked more on the circuit

9/26

- Got all the materials printed out
- Start on cad onshape

-



10/7, 10/9, 10/11

- Prisha: worked on CAD onshape and finished it, collaborated with Tanya
- Tanya: Completed essay prompts for competitions

 PriTay Comeptition Submissions

10/15, 10/17:

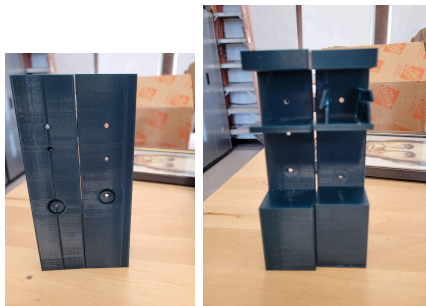
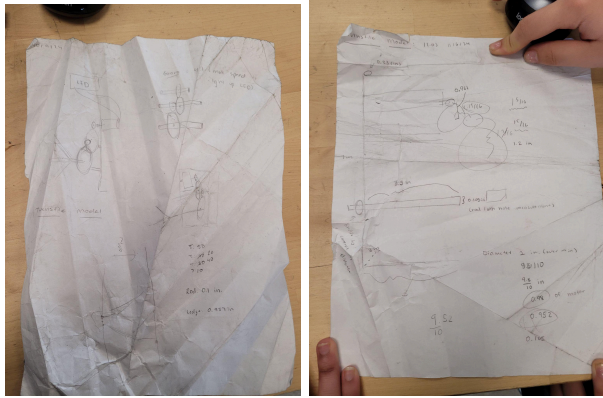
- Printing days

10/21/24:

- Prints came out – but sizes too small
- We need to fix the sizes of the holes inside the base; but the size of the LED hole is good
 - The LED hole size is 0.5 in – we kept that.
- We need to size the base up to fit the gears and just make it bigger in general
 - We changed the base to make it 6 x 1.5 in; we made it bigger to incorporate the gears and hold them
- Dowels are too flimsy, and they don't fit into the base because the holes in the base are too small
 - We made the dowels slightly bigger – 0.1 instead of 0.03
- Not enough room to fit the electric motor
 - Made cubbies to fix the motors and the gears (the new cubbies were 0.3 in extrude and 1 in away from the top – we made them big enough to fit the motor O
- Turnstile is too flimsy
 - We made the extrude be 0.5 in thick to make it stronger
- The proportions of the sizes are whacky, the turnstile needs to be situated in a good space within the model

<https://cad.onshape.com/documents/71cb078a598738f811db9275/w/ff5666558366334c21c7581b/e/a98d8f7c12632846bcd2be8b>

New Sketches:



10/29/24

Gear Ratios:

First 2: $50:20 = 2.5:1$

Second 2: $40:10 = 4:1$

For every rotation of the turnstile, the second gear turns two and a half times. Since the second and third gears are on the same axis, the third gear also turns 2 and a half times. The 4th gear turns 4 times every time the third gear turns. This means that the final gear, and thus the motor, rotates 10 times every time the turnstile makes a full rotation.

Since one turnstile turn is only one third of a rotation, each time the turnstile is used, the motor turns 3.33 times.

11/23/24

- Examined printed materials
- Decided to use metal rods instead
- Suggested making it bigger--- smaller gears are harder to work with.
- Decided where to assemble the gears

11/25/24

- Glued gears to rods in appropriate places in order to attach them
- Lifted the motor up, so that that it aligns with the top gear

- Glued a knob on the rod so that they do not move horizontally

12/3/24

Positives:

- The hot glue was effective at stopping the lateral movement of the rods
- The Structure of the turnstile is pretty good
- The rods are pretty great
- The Cardboard to lift the motor worked well
- The hole can fit the LED
- The circuit w the 2 wires works

Problems:

- Fragile/ Weak gear systems (Impossible to generate enough power) - LED never lit up
 - Find a way to test gears so that we don't have to make a new turnstile model each time.
- Motors isnt aligned w bottom gear
 -
- Turnstile is low key too small - it only works for a short amount of time
 - Is not too scale - we can base it on the gears
- The gears can be crocked or change
 - Compound Gear
- Hot glue cant prevent gears from being pushed forward
 - Remove the back face, and hot glue both ends
- The turnstile is too weak
 - We will just say that it doesnt matter and that its not to scale

How will we test the gears:

1. Test how many rpms are needed to light the LED using the Motor
2. Design a gear series that meets that RPM comfortably
3. Modify the Turnstile design in order to

12/05/24

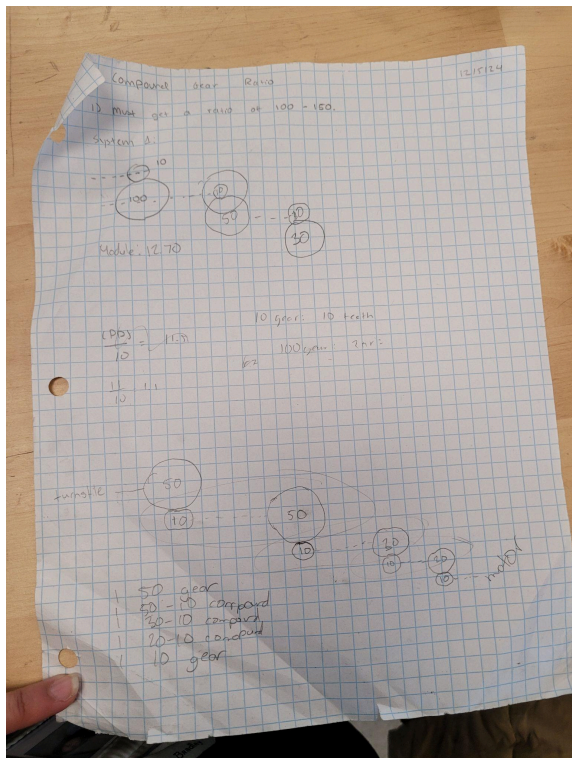
- <https://photos.app.goo.gl/UHuPndVFBafGwKQKA>
- The motor must spin 100 times per second in order to light up the LED
- If we can turn the turnstile 3 times per second, the gear ratio must at least be 100
- We should aim for a gear ratio of 150.
 - $10 * 5 * 3$
 - The Gears we will make: 10, 100, 10, 50, 10, 30

12/9/24

- The gears w the system are being printed out – depending on how big they are we can base the turnstile system off it

12/11/24

- New Problems:
- The gear ratios are too big, meaning that the compound gears do not have room for their axles
- Holes diameters are too small
- 4 numbers that multiply up to 150
- $5 * 5 * 3 * 2$
- Have two LEDS, One that is on from a battery/external power source, and another that uses the motor. Figure out a way to have not both LEDS be on at the same time.



12/13/24:

- Worked on our documentation – we found all our pictures of our progress organized our work over the year

12/15/24:

- Final Day of the semester!

We created a folder for all of our images:

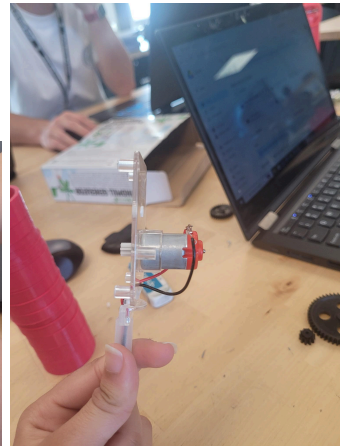
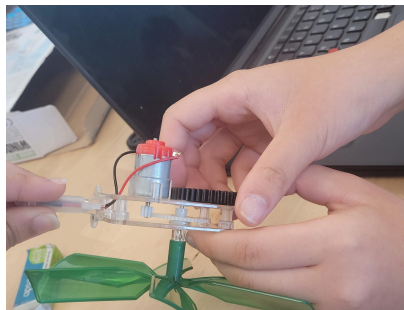
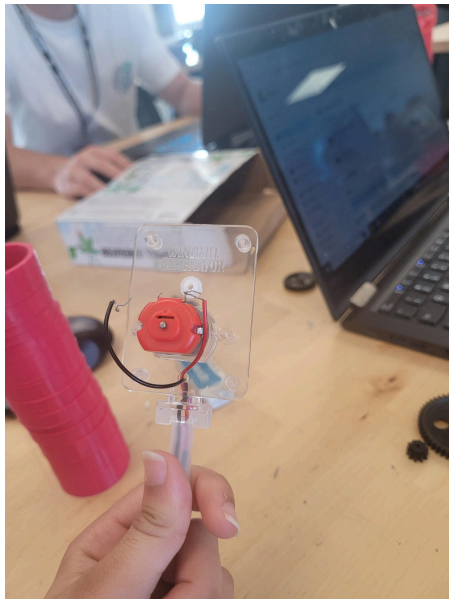
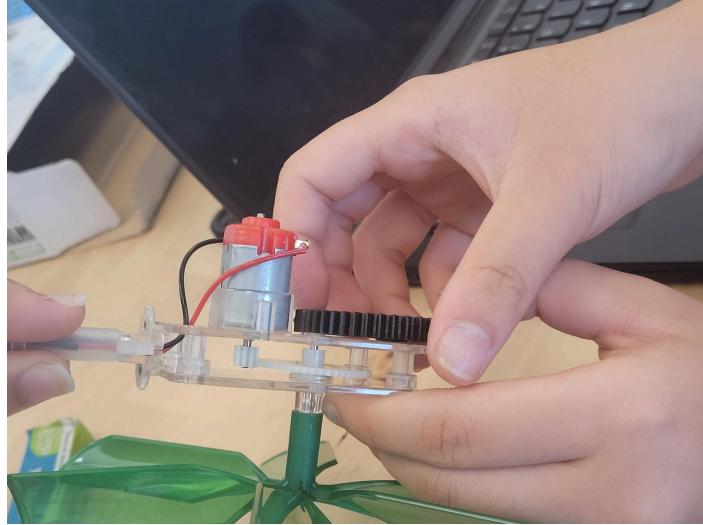
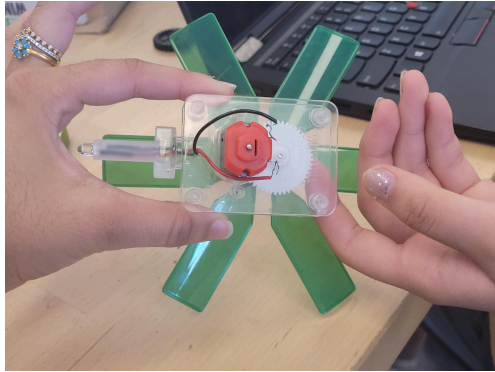
<https://drive.google.com/drive/u/O/folders/1axilcl6Bm1wg83um1eTt-ordhsgeaAoY>

Also we made a video:

<https://drive.google.com/file/d/1etP5kNyHbF5hOVUdNtJHC47SpCcQrQ4P/view?usp=sharing>

11/08/24

- ☒ ~~Change position of LED hole~~
 - (0.23 in & shift to to the top left of the shelf)
- ☐ Move Shelf back a little
- ☐ Fill in the bottom
- ☐ Incorporate the turnstile
- ☐ Remove the caps in the gears, thus making the dowels and holes both bigger



FIRST DELIVERABLE ACHIEVED
- THE LED LIT UP WITH THE MOTORS





Update:

Samsung Solve For Tomorrow Log-In

Email: tanya1wu@gmail.com

Password: X\$L@iB2AnkGkHLA

Power your Future Log-In

Email: tanya1wu@gmail.com

Password: X\$L@iB2AnkGkHLA