ME 370

Design Lab 3 Template
[Team 48]
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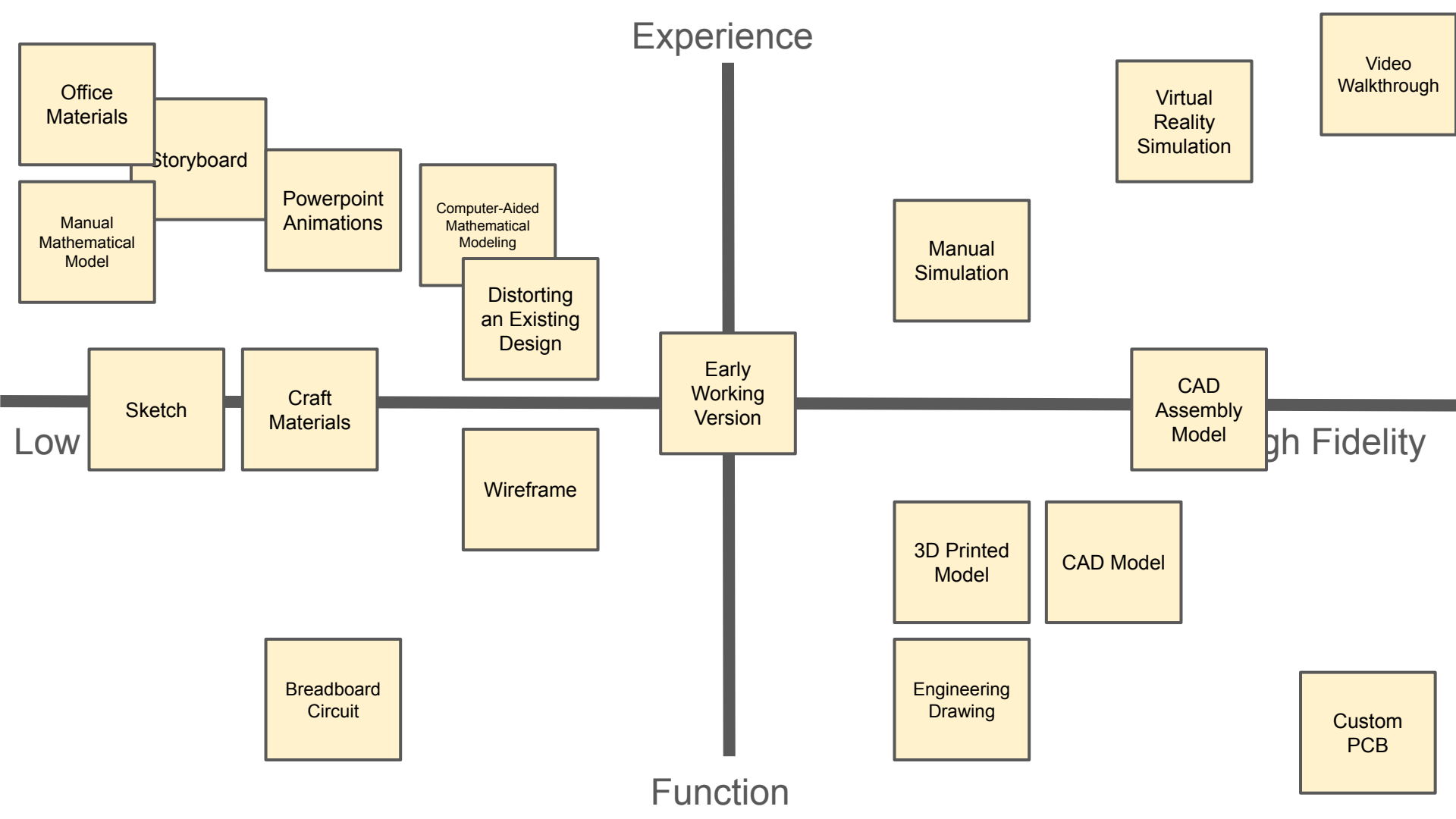

Experience
Office Materials
Storyboard
Manual Mathematical Model
Powerpoint Animations
Computer-Aided Mathematical Modeling
Distorting an Existing Design
Virtual Reality Simulation
Video Walkthrough
Manual Simulation
Low
Sketch
Craft Materials
Early Working Version
CAD Assembly Model
gh Fidelity
Wireframe
3D Printed Model
CAD Model
Breadboard Circuit
Engineering Drawing
Custom PCB
Function

Were any of the prototypes on the list surprising to you? Pick 2 or 3 and explain why

Distorting an Existing Design

- This one was surprising because when I think of prototyping I typically think of a new product
- However it makes sense as if there is already a design it makes sense to build off of it

Virtual Reality Simulation

- A virtual reality simulation is something very high fidelity when creating a prototype to convey the experience
- I would think that going straight to a video walkthrough may be more helpful but that would depend on the design being prototyped

Manual Simulation

- Manual simulation helps us actually operate certain mechanical structure, and we can feel the friction existing in this mechanical structure and the driving force required.
- This will also help us determine the number of transmission structures and the ratio of the number of gear teeth

Which prototypes on the list prompted the most discussion from your group on where to place them? Pick 2 or 3 and describe how your group came to your decision

Manual Mathematical Model

- We werent sure where to put this between experience and function
- We decided it was more experience because its used to prove if something will work, it doesnt dictate how you will make it work

Engineering Drawing

- We werent sure what level of fidelity an engineering drawing was
- We decided it was pretty high fidelity because it typically includes dimensions/tolerances which would be something that you decide late in the design process

Video Walkthrough

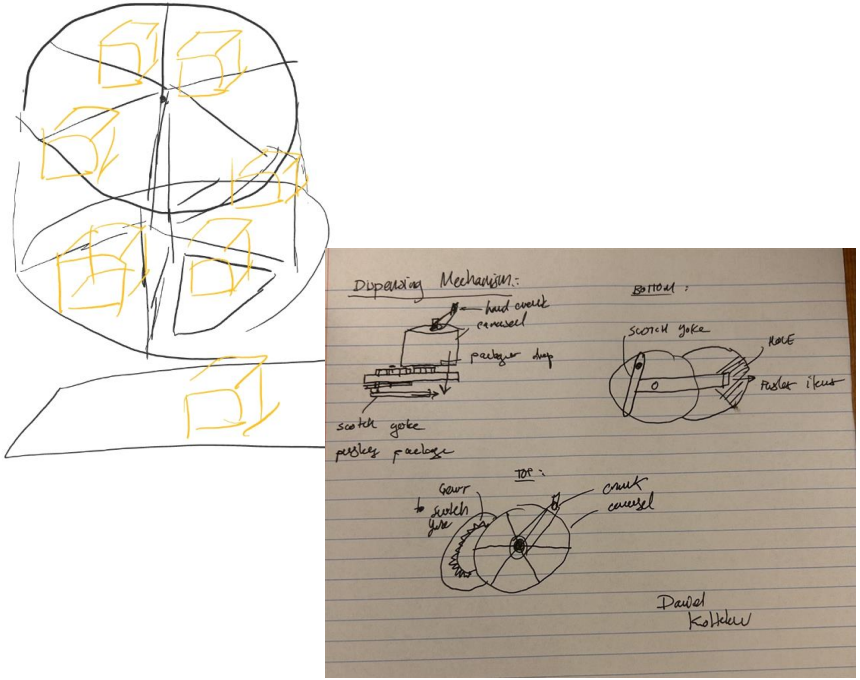
- We struggled if this was experience or function
- We decided on experience because it would help show someone how it works and what it looks like, it wouldnt decide how it functions

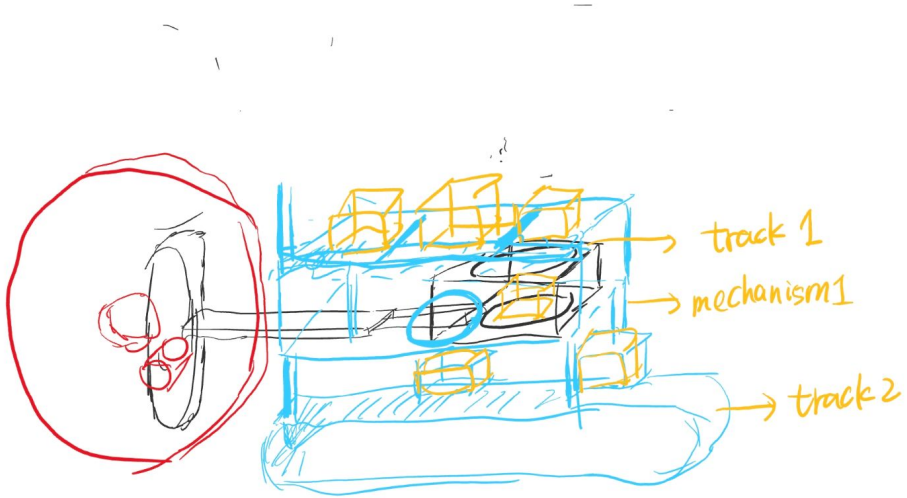
Design Variables	Design Constraints
● Speed of the robot ● Gear ratios ● Materials used for construction ● Payload being transported	● Budget ● Time ● Spatial footprint of design ● Payload weight criteria ● Manufacturing methods allowed ● Driving mechanism (hand-crank)

Identify <u>at least 3</u> questions about the design for your selected destination that your team would like to answer using prototypes

● What dispensing mechanism are we using?	● How is the payload going to be stored in the robot?	● How do we connect different transmission mechanisms?
3D Printing	**Craft/Office Materials**	**Gears and transmission**
● Components we will need to buy/design ● What mechanism we will use (gears,linkages,etc.) ● What movements we want to have ● It will allow us to make a pretty detailed prototype but also change it up pretty easily	● Appearance ● Relative scale of robot	● Speed ratio of different turntables ● Restraint device ● We can use this prototype to demonstrate our most basic transmission process, how to combine two devices together.

As a team select **two** of your prototype ideas and **sketch them**





Question it answers: What dispensing mechanism are we using?

Question it answers: How do we connect different transmission mechanisms?

Based on the previous sketches answer the following questions

Question it answers: What dispensing mechanism are we using?

1. Is there any other useful information you can get from this prototype?
2. What other prototype(s) would you like to create to fill gaps in your knowledge?
3. Would you change which method you picked? Why or why not?

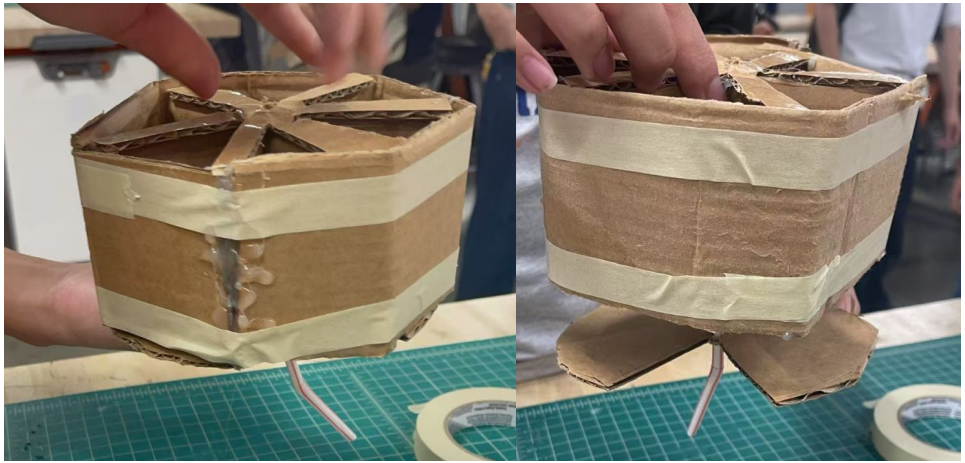
This prototype rotates to push objects from each area into the hole, allowing them to fall. We might design a multi-layered turntable to store more objects, addressing the limited number of objects we can store. We won't change our approach, as the turntable is easier to integrate with gears and facilitates the movement of the cargo cart in Project 2.

Question it answers: How do we connect different transmission mechanisms?

1. Is there any other useful information you can get from this prototype?
2. What other prototype(s) would you like to create to fill gaps in your knowledge?
3. Would you change which method you picked? Why or why not?

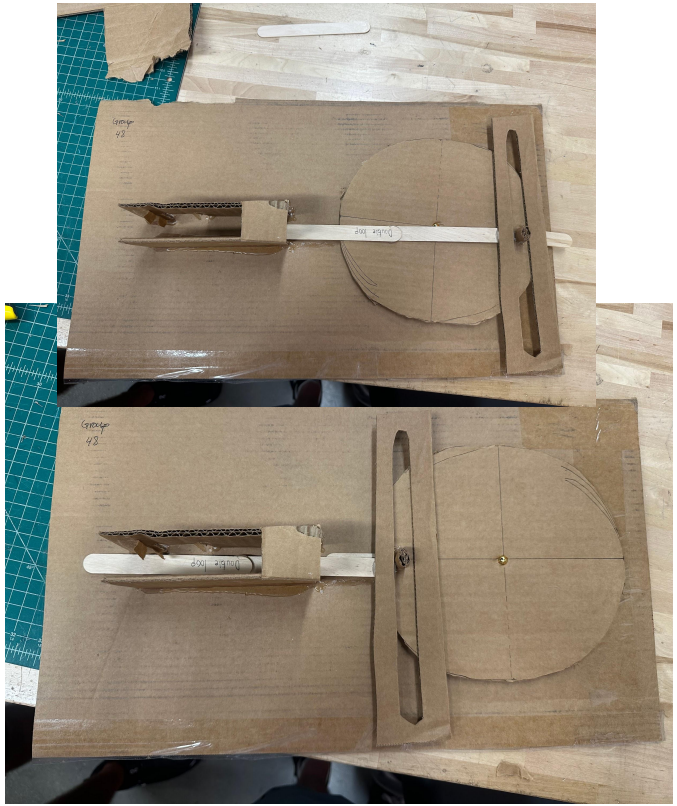
Our prototype's transmission is achieved through rotation. The regular rotation of the turntable realizes the regular sliding of the card slot. We will create a gear-link prototype to complete the concept. We will not change our connection method, using gears with different numbers of teeth and multiple gears.

As a team build **two prototypes**. Remember the **question** you're aiming to answer with this prototype; it could be as simple as trying to figure out what form or shape the design concept should take, or it can be as specific as honing in on a specific element of the design and simulating the experience or function of it.



The goal is to show how we drop. The key structure of our prototype is to make objects fall by rotating them. We use a circular shape and make each grid hold objects.

As a team build **two prototypes**. Remember the **question** you're aiming to answer with this prototype; it could be as simple as trying to figure out what form or shape the design concept should take, or it can be as specific as honing in on a specific element of the design and simulating the experience or function of it.



The goal of this prototype is to get a feel for how the scotch-yoke mechanism will work. The part on the left is where the carousel (prototype 1) will drop the packages into. Once dropped they will be pushed out by the scotch-yoke.

Answer the following discussion questions:

1. What were you able to discover/communicate with these prototypes?

We were able to get an idea of the real-life scale of our design. We were also able to grasp the functionality of our dispensing mechanism, and thus improve issues we are encountering with excessive friction.

2. If you had more time and resources, what would be the next prototype to build?

The next prototype iteration would involve more 3D printed components as that is a material we believe a bulk of our final design will include. We also want to look into making the mechanism smaller so it fits the shoebox spatial constraint.

Post lab:
Your post lab submission will be a TEAM submission
Ensure that your post lab has the following:

- Part I
  - Your group's 2x2 with all post-its
  - Your responses to the 2 discussion questions in Part I
- Part II
  - Your identified design constraints, variables and unanswered questions
  - Descriptions of at least 3 prototype ideas, one for each question
  - Sketches of at least 2 prototype ideas per team
  - Your responses to the 3 reflection questions in Part II.6
- Part III
  - Pictures of each of your team's two low fidelity physical prototypes
  - Your responses to the 2 discussion questions in Part III.2 and III.3

Note: As a team, you should start to work on a CAD or detailed engineering drawings as you work towards more complete prototypes (D4 & D5)

Note: The course instructors expect you will continue to work on your prototypes for D4,