Note to Semi-Finalists

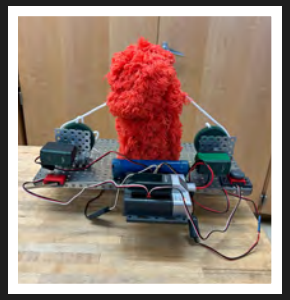
Thank you very much for participating in the HUNCH Design and Prototyping. This was by far the most difficult year for deciding finalists. Part of the difficulty was the number of teams participating but the most important part was the number of high quality of prototypes for each of the 10 projects.

Each Mentor helped choose potential finalists for their area and were then compared with the same type of projects across the country. Teams that were selected to be finalists had very tough competition and it was very difficult to down select. Although everyone wants to be a finalist it isn't possible and decisions have to be made. Some of the decisions include the requirements but also trying to show diversity of how the problem could be solved. There was no shortage of good and diverse ideas.

Being a Semi-Finalist is a great honor because each of you put together a project and data that made the teams think, learn and be excited about space. Your great ideas and hard work is what makes NASA HUNCH a challenge and a great experience for engineering. We hope you enjoyed the projects as much as we all enjoyed seeing your prototypes.

If you are a senior and moving on to college, industry, or trade schools, make sure you include your project with NASA HUNCH on your resume. You will find that your interview will center on "what did you do for NASA?" The more you tell them, the more they will want to hear. You will be receiving a letter of recommendation from NASA HUNCH describing Design and Prototype and the project you worked on. We hope that your work will translate to opening doors for your future. Thank you for being in the NASA HUNCH Design and Prototype Program.

FINAL DESIGN



Our duster arm is designed to collect dust and debris in the most efficient manner possible. Our duster arm is easily disposable, cleanable, and flexible to provide the most user-friendly experience possible.

- Easily detachable from robot
- Effective cleaning motion
- Flexible
- Easy to reuse and clean

FINAL DESIGN MATERIALS:

- VEX Cortex
- Screws
- 2 motor controller 29
- Velcro
- 2-wire Motor 393
- 2 Strings
- Bump Switch
- Gears
- Microfiber Cloth
- Plastic Tube
- 2 Metal Rods
- 1 Connector Plate

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FOR MORE INFORMATION SCAN QR CODE:

Final Remarks

Our duster arm has proven to be an efficient design by collecting large amounts of dust. The microfiber attached all around can trap dust from all angles, allowing it to serve its purpose. Overall, the final design can clean debris found in most locations, including the space shuttle.

NASA HUNCH

DUSTER ARM

NASA HUNCH
CIM: Periods 1-3
Ms. Albarez

Passaic County Technical Institute
45 Reinhardt Rd, Wayne, NJ 07470

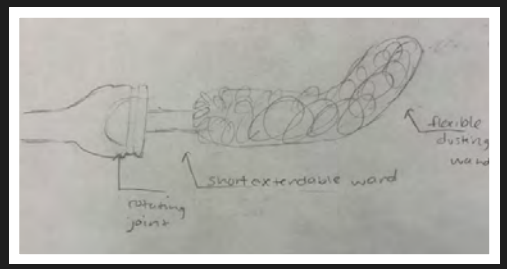
PROBLEM STATEMENT

Design a flexible and moving arm that can remove and absorb dust as the robot moves around the space station without releasing dust into the air.

PURPOSE

The duster arm prototype will be used to pick up and trap the dust and dirt without releasing it. The design will use a microfiber cloth to pick up the dust smoothly without scratching the surface. It will also be able to move using VEX parts and wil be easily replaceable for further use.

CONCEPT



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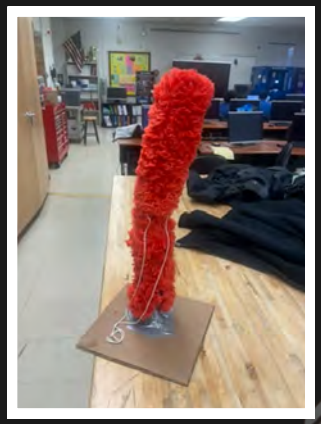
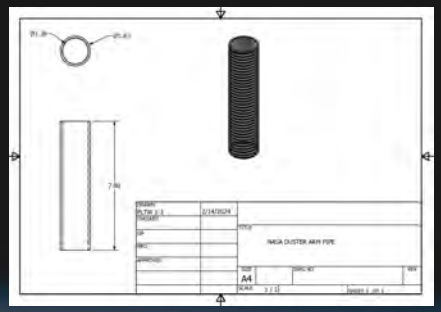
PROTOTYPE

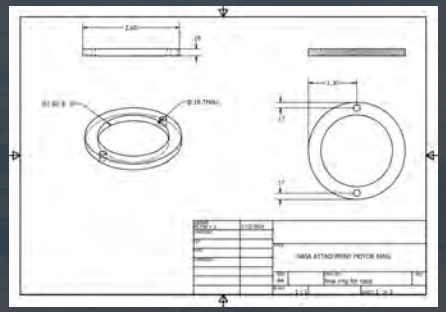


After extensive research, our team found that the microfiber cloth attached to the end of the duster arm is the most effective method of collecting dust and debris.

CAD DRAWINGS



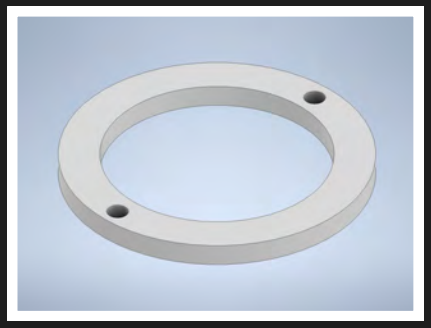
PLASTIC PIPE



ROTATION RING

FEATURES

CAD ROTATION RING



We designed a ring like feature to properly hold down the strings so it doesn't interfere with the 360-degree motion.

CAD PLASTIC PIPE

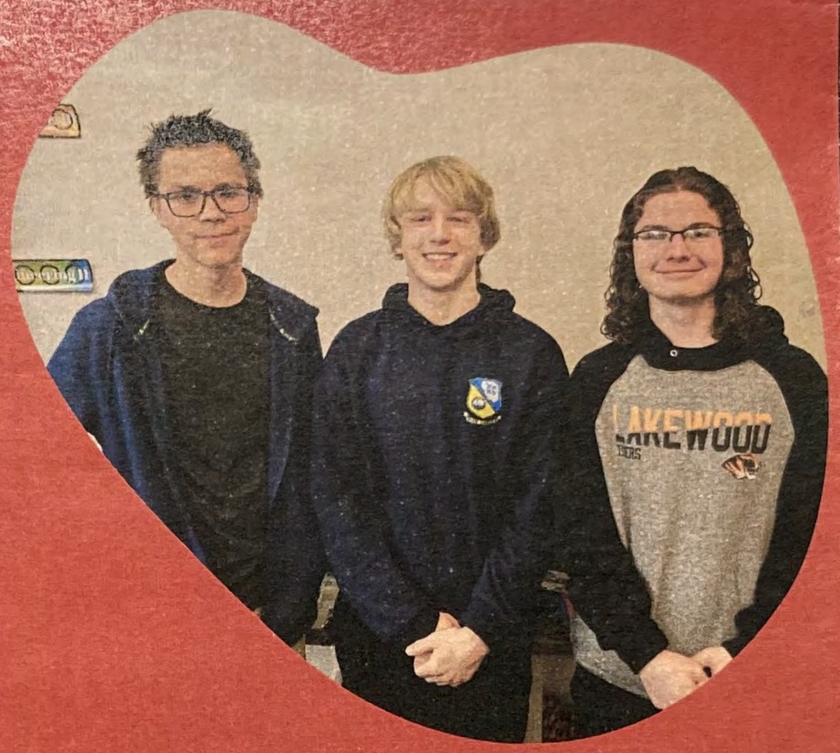
Our team designed a pipe that has stability and flexibility. It allows the arm to stay sturdy and move freely.

Project Overview

The puspose of the Kwadropus robot is to create an assistant to astronauts on any current and future space stations to help atumize cleaning in hopes to keep a more clean environment. To do this one of the elements is a duster arm, which we were tasked with designing.

Our design solves this problem by including many ranges of motion, and a moving arm head to pick up the dust, it does it effectivly and with speed

We have also created a system that is easy to integrate into the Kwadropus control team by using code and an Arduino to control our arm.



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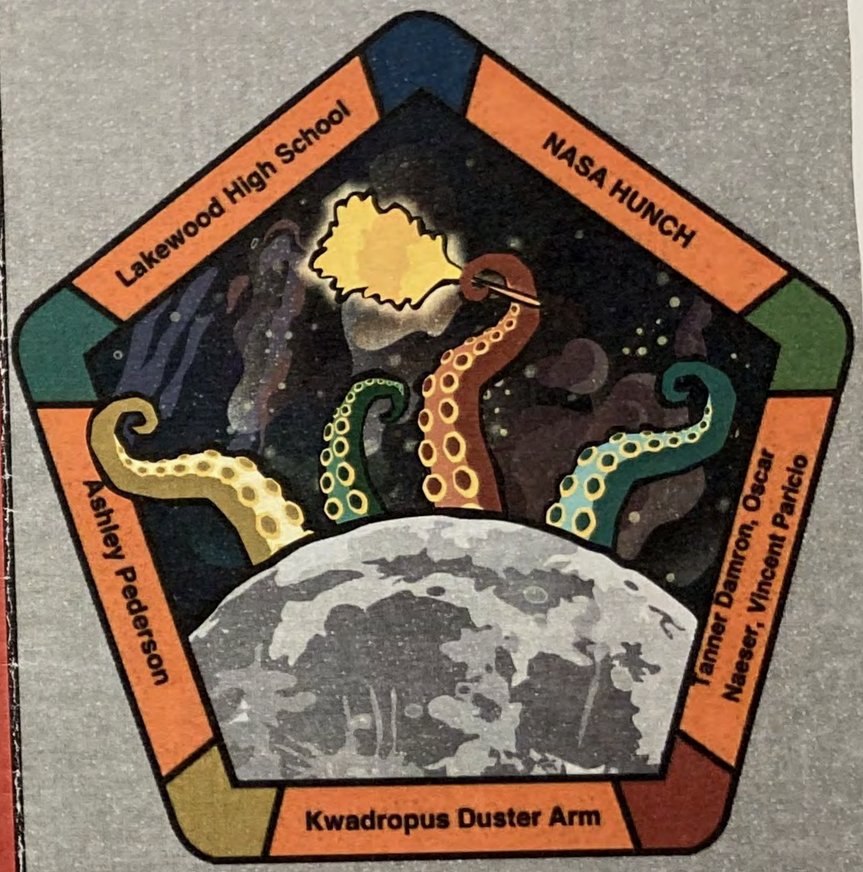
Kwadropus Duster Arm



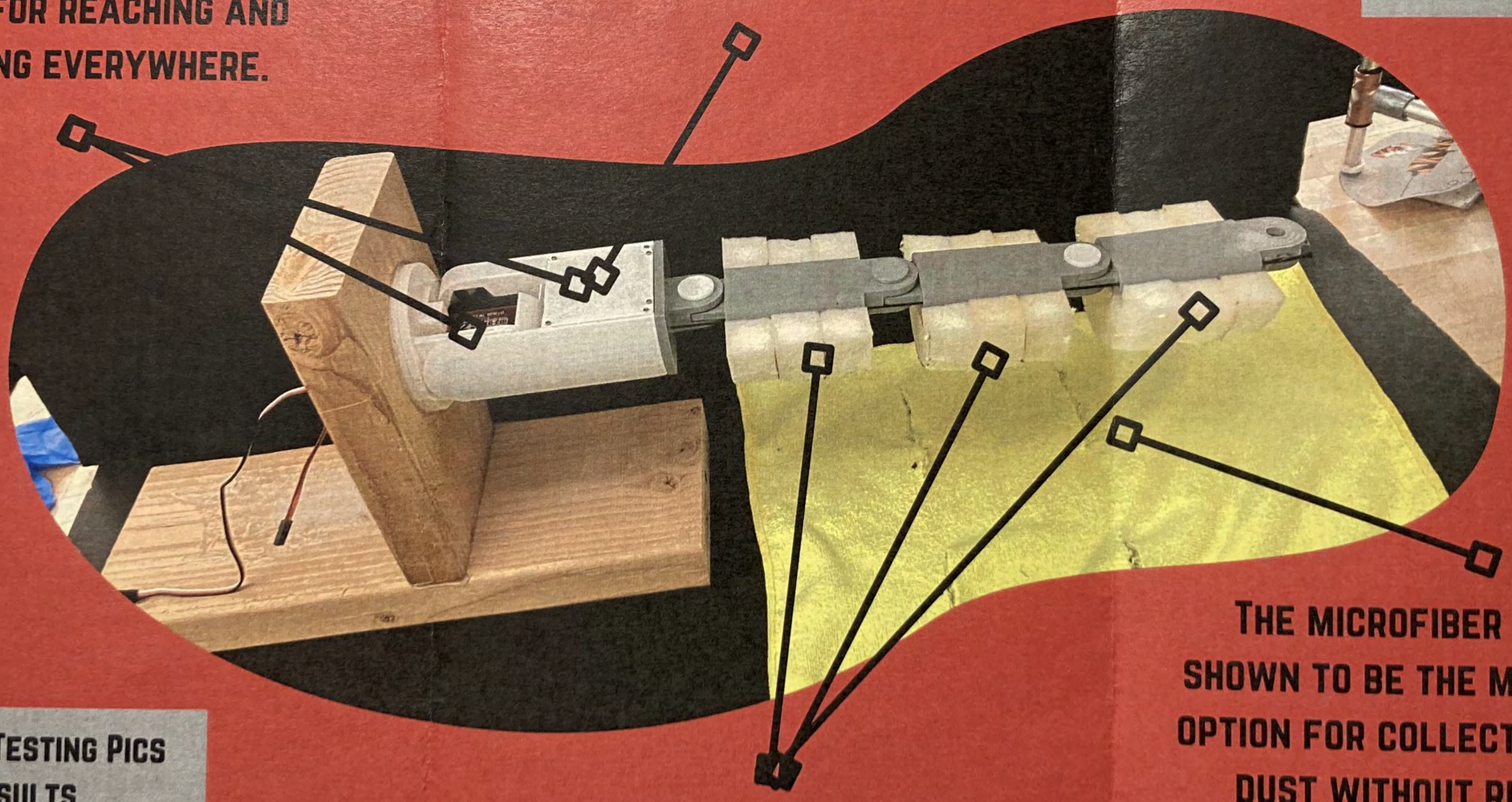
Lakewood High School

Oscar Naeser
Vincent Paricio
Tanner Damron
Ashley Pederson

These motors give us access to a full range of motion, up down and to the side. As well as a potential for rotation. Ideal for reaching and dusting everywhere.

String is pulled against the wheel and then will be moved around the wheel when it is attached to both sides at the tip of the arm in order to help it bend and reach most of the surface area effectively.

Duster Arm in Action



Duster Arm Testing Pics and results

The foam is used to support the cloth is memory foam, which was chosen for its incredible shaping qualities as well as being safe for space.

The microfiber towel was shown to be the most effective option for collecting nd storing dust without releasing it. Along with being a very cheap, and easy material to aquire it is an ideal cleaning cloth. It is presented in a sleve for the most efficient removing and attaching

PROJECT PROGRESSION

PROJECT DEMO

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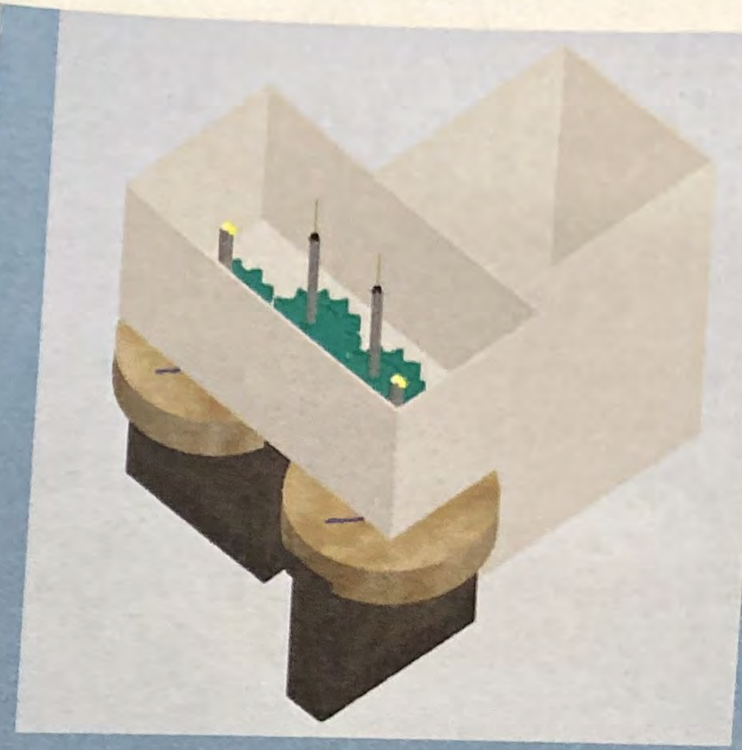
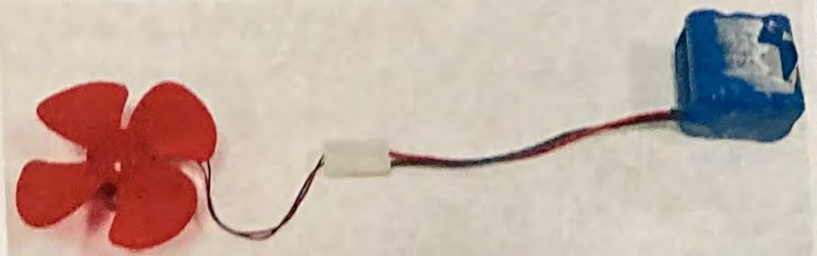


KWADRUPUS DUSTER ARM

CLEAR CREEK HIGH SCHOOL
CLEAR CREEK ISD
LEAGU CITY TX, 77573
BY
OLIVIA VARGHESE &
YOXIMI LINDO

FAN + HEPA BAG SYSTEM

The layout of the box allows dust to enter the box through the bottom. Then the dust will travel to the other end of the box with the use of a fan. The usage of a fan guarantees that the dust will go inside of the box rather than flying away and interfering with the astronauts any further. The other end of the box contains a HEPA bag to collect the dust.



DUSTER SYSTEM

In order to effectively clean up as much dust as possible one duster will be vertical while the other will be horizontal. The two dusters will rotate and when they rotate, they will overlap in the same area, so the dust is completely cleaned up. The usage of carriage bolts allows the bristles to the wooden holder. The carriage bolt runs through the bristle holder, the box, and the sprocket system.

SPROCKET SYSTEM

For our sprocket system, we used a total of 4 sprockets. Our goal is to rotate the cleaning bristles inward to move all the collected dust into our duster box. One sprocket was placed on each bristle. To have the 2 inner sprockets rotate inward, we placed 2 small sprockets in the middle. The inner sprockets are not attached to anything, their purpose is to rotate the outer sprockets inwards. In order to rotate the middle sprockets, we are utilizing a drill to spin it, which would then rotate the rest of the gears. One of our bristles is higher than the other to make their rotations smoother. This doesn't affect the sprocket system.

PROBLEM STATEMENT

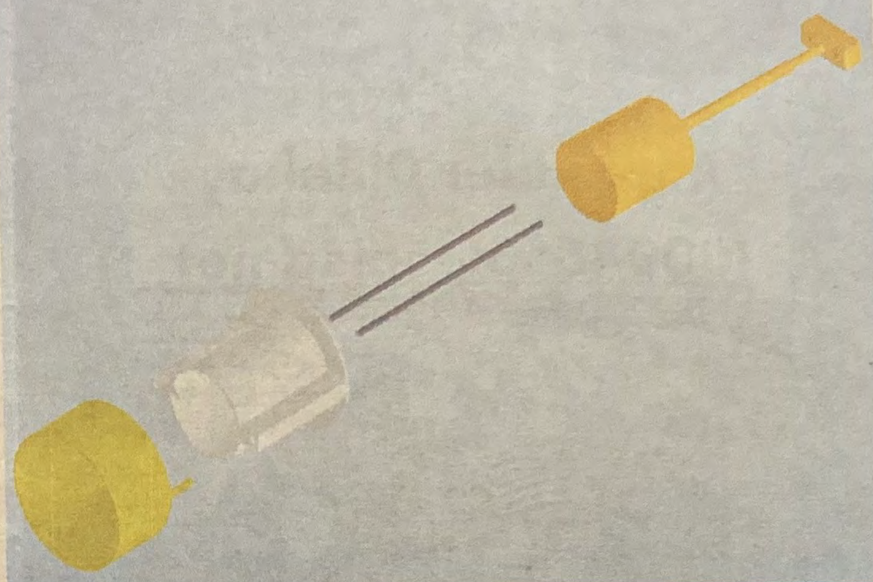
Develop a flexible and moving dusting arm that will be able to remove and absorb dust as the robot moves around the module walls without liberating dust into the surrounding volume.

To achieve the problem statement we began by researching a few questions:

What is the best material to dust with? After prototyping with different materials, microfiber nylon seems to be the best at not only dusting, but also at being able to get rid of dust caught on it.

How can we make the duster not need to be replaced extremely often? We will make the duster self-cleaning, making the duster only needing to be replaced when the fibers spread apart.

What is the best way to pickup dust efficiently? We discovered that a spinning duster is better than a reciprocating (pushing in and out to dust) due to the dust not getting flung around as much and more of it catching in the duster.

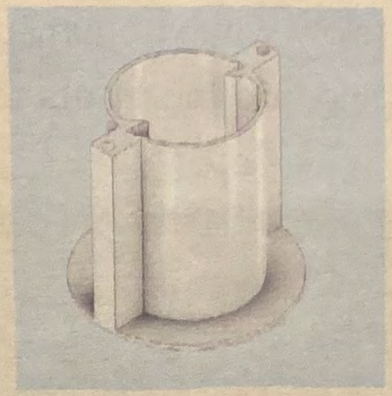


JUSTIFICATION

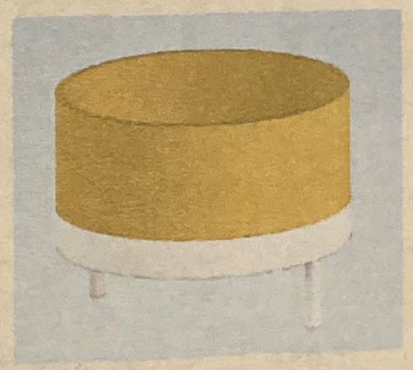
This duster helps relieve task load for astronauts as it allows for there to be one less thing Astronauts need to do so as they can focus on more beneficiary tasks while the duster dusts the module.

CAD MODELS

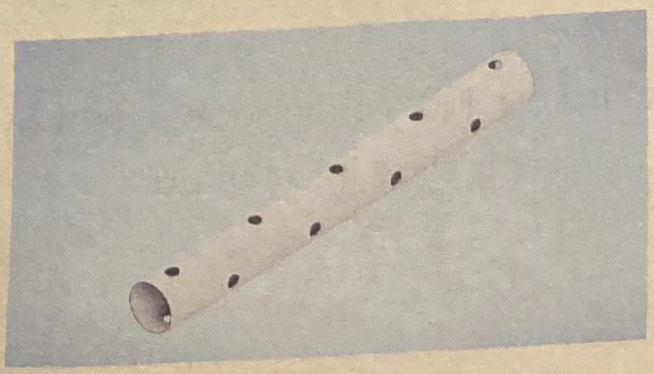
The duster is split into 3 subsections: the housing, the top, and the shaft



Top:

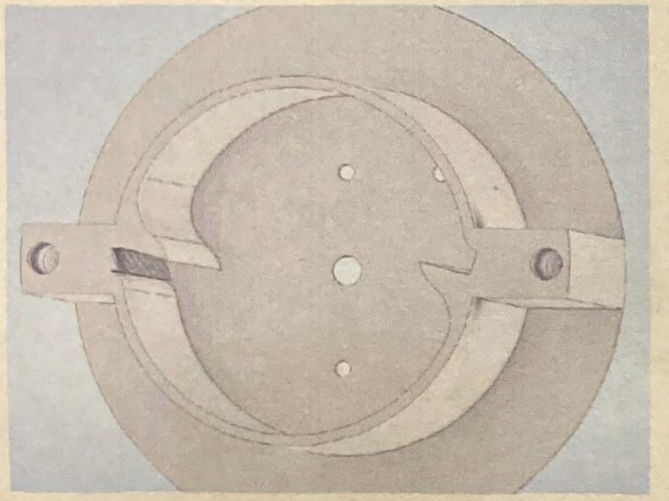


Shaft:



DUSTER CLEANING

The duster will be self-cleaned via a simple process: spinning the duster fibers relatively slow with vacuum-powered "fins" digging into the fibers to remove dust.



Inside of these fins are slits, where vacuum-powered air will suck the dust pushed off the duster by the fins

The fins are 100% changeable as they simply slide into the part

GROUP MEMBERS

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MORE INFORMATION

SCAN ME

KWADROPUS DUSTER ARM

NASA HUNCH

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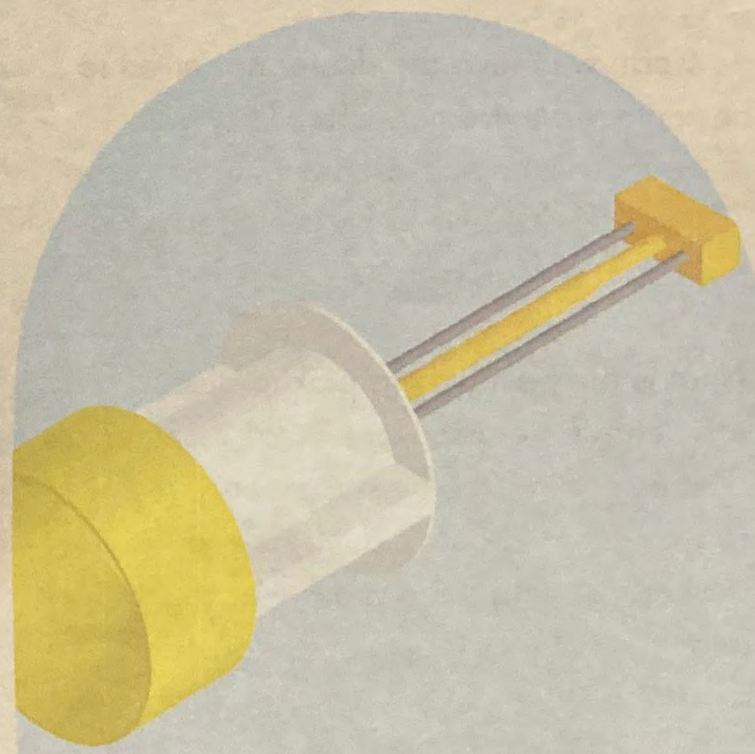


NASA Hunch

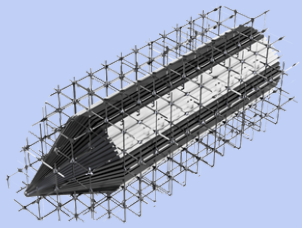
Kwadropus Duster

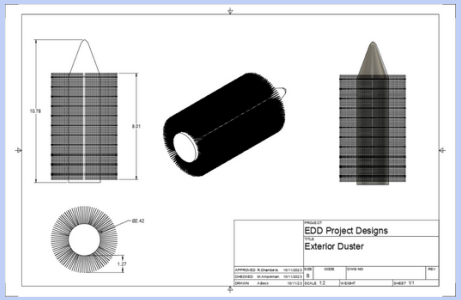
Robot - Duster Arm

Madeline Ampleman, Alayna Beck, Miles Cohen, and Samuel Wilson

School: SMSD Center of Academic Achievement

Teacher: Renee Chambers





Description:

The arm is about 12 inches long. It is connected to a servo motor that will rotate the duster and allow for maximum dust collection. Its interior is a cushiony foam cylinder that tapers into a cone on one end to dust corners effectively. The foam interior will allow for the duster to gently dust surfaces without pushing the robot away from the surface. The foam cylinder will also give the duster some structure while still being flexible. The duster is made of many stands of microfiber thread Which have thousands of tiny follicles on each strand which allows for the duster to collect and hold dust so that it is not released back into the air.

The cleaning case has many small rounded spikes that will brush the dust off of the duster which will then be vacuumed from the case. This allows for the duster to be reused and last a while.

Link to Video Pictures and documentation