

Environmental Sensing Invention

Checkpoint 1



Team 301

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01

Team Organization

Team Members:

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Charter

As a team, we are planning on applying all the knowledge we gained in electrical and mechanical skills into a new product. Our team will put full effort into designing a new environmental sensing product that aids users and is user friendly.



Mission Statement



Our team mission statement is to improve the clean energy generation industry, specifically solar energy, and make it more efficient so that users are able to get the most benefit from their solar energy source.



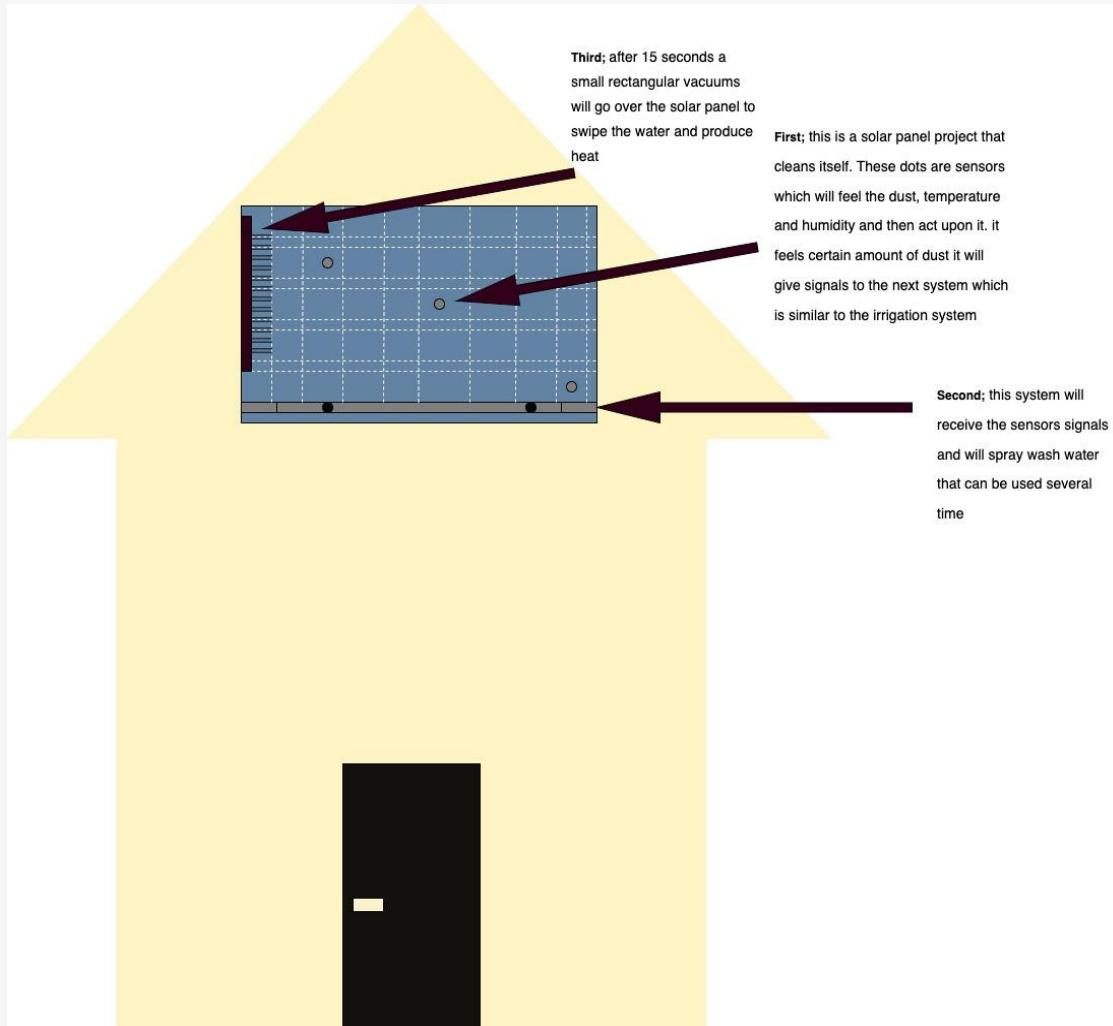
02

Overview of Three Design Concepts

First concept

A Fully equipped Solar Panel

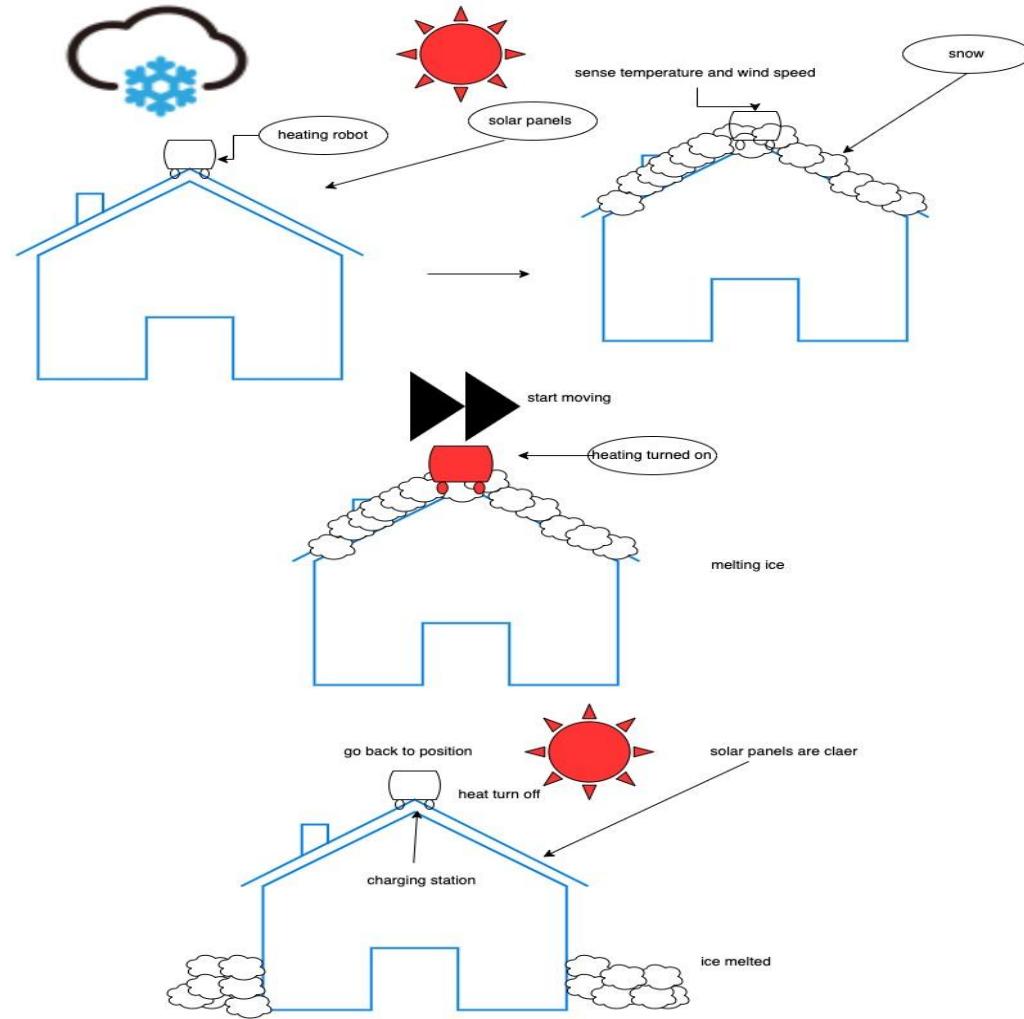
- Sense temperature and humidity
- Spray water
- Air produce and swipe dust



Second concepts

Heating robot

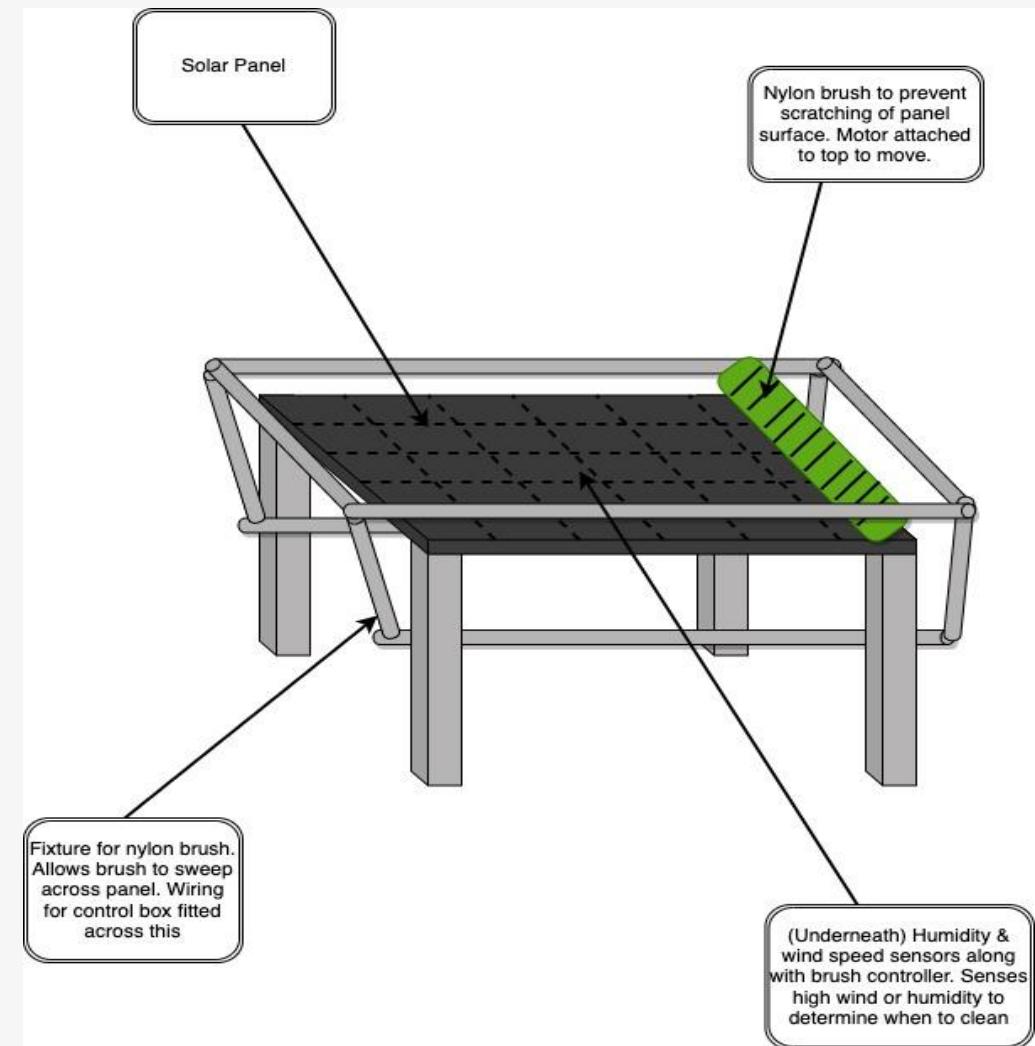
- Sense temperature and wind speed
- Heating turn on
- Moves around to melt the snow



Third concepts

Solar panel cleaning wiper

- Sense humidity and wind speed
- Knows when it needs to clean
- The brush motor turns on





03

User Needs and Benchmarking

User Needs Steps



- Benchmarking to gather ideas and needs
- Brainstorming
- Categorizing

The product should be easy to use/ user friendly	The product should work on multi dirt levels areas not just light	The cleaning area should be bigger/wider	Would be better if it need replacement after working for a long time	The product worked on a high dirt level surface	Improving user-robot interaction experience	Cleaning product/water	Can be used frequently	efficient/functional design	Can shut itself down to save power
Nice Display and design	Efficient and long lasting product	Good electrical and mechanical build	The cleaning area should be bigger/wider	Smart technology/algorithms for user need and interaction	Improving user-robot interaction experience	The robot need to be able to act by itself	The robot left no stains after cleaning	easy to maintain	able to map out the area and create consistent pathways
Easy to use	Works on multiple layers	Follows set patterns	Can be manually operated	Can automatically restart programmed sequence	Ability to control the working time	Competitive price	Should be able to process data correctly as it should	efficient battery life	The robot need to be able to act by itself
Does not need to be watched	Can work for longer periods of time	Cleans heavy build-up	Can reach high places safely	can recharge itself	Does not break easily	Can be used in smaller areas	Long-lasting	Wireless	Finishes quickly
Need longer battery life	Efficient battery use	Control the space in where it is working	Knows how to process data and act when unusual object was on the way	Ability to control the working time	cost efficient	Solid balance	Doesn't lose power quickly	How to work on different environment/surface	
can work under any pressure of work given	feedback to the user like showing battery remaining	does not waste users time and meet the purpose that it was made for	sustainable	uses less resources	easy to set up	Can process data correctly as it should	Programming errors	Efficient work	The ability to do daily work

should have camera installed	have an emergency shutdown option								
		the ability of manual/remote troubleshooting	can be both manually/self controlled	should be able to move from solar panel to another	should know its way back to the charging station	should be able to know when to charge	should be able to know how long does it run on a certain charge	should be able to calculate the efficiency according to the sensor data such as wind speed and humidity	should be able to operate in different area size
is safe to use	use the energy generated by the solar panels to recharge	know when is the best time to start/stop working	easy to move from one place to another	can operate by itself for a long time periods	needs less human supervision	the ability to deal with different weather conditions	should have a good electrical isolation for safety purposes	must be waterproof	the user should be able to track the robot
Good price with good quality	Long-lasting Materials	Works under worst circumstances and has good features	Should not miss areas and be able to clean the entire surface	The cleaning patterns should be improved/smarter	The prices should be reasonable for the technology and services it provides	Should be able to move in any direction needed	Should use a reliable materials	Should be able to operate efficiently in various conditions	easy to maintain
Should be able to identify and mark the edges of the area	It does not need regular maintenance	The algorithm/ coding need to be fixed as it gets stuck/confused against simple linear surfaces/ should be able to clearly identify the path	It does the job accurately and takes actions fast	Good set up process	Good Instructions and make it as simple as possible	It should states how to be used in different environment with good Instructions	Customer services that is aware of common mistakes between users to answer questions or common questions answered on the Instruction paper	It should have high sensing and accurately does it job	Easy to use and understand



04

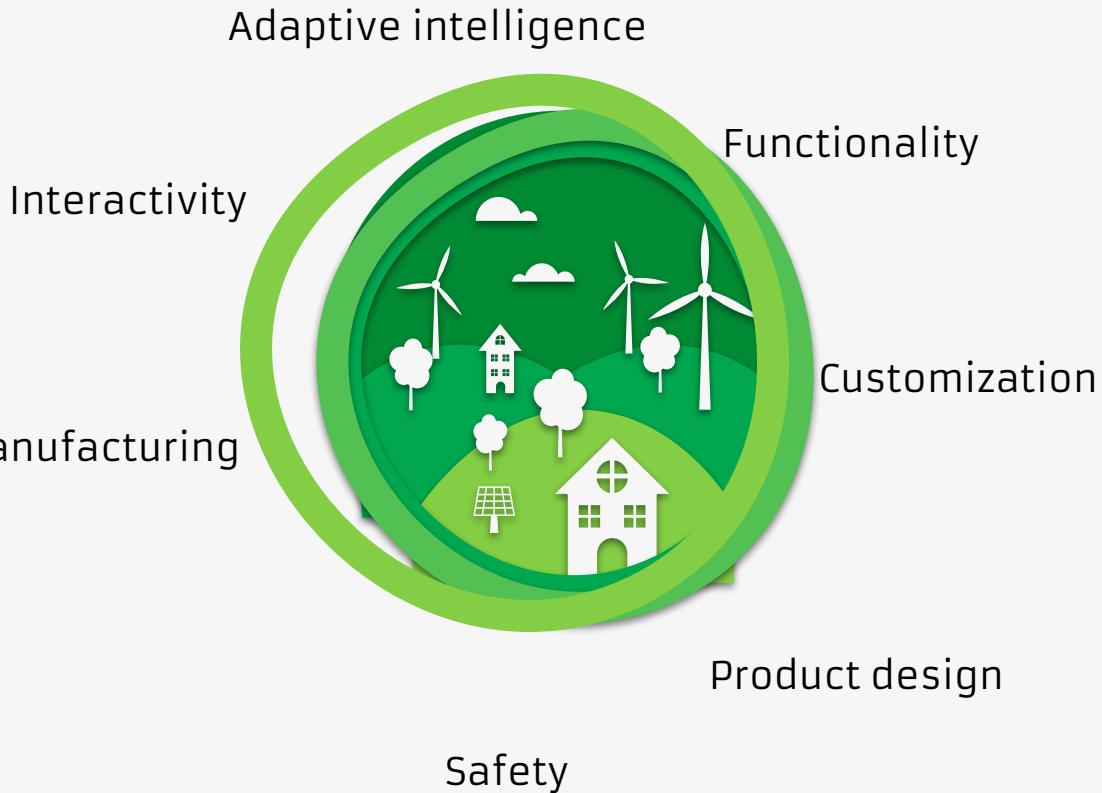
Product Requirements

What if I was the customer?

We had 7 main categories for our product

Standout requirements :

- Ready to set up
- Easy to maintain
- Good Quality with less technical complexity





05

Design ideation

Brainstormed ideas

Changeable rules and materials	flexible, light, good display	less programming	helps with solar panels and renewable energy	Collecting data to actively take action	users would use it for different purposes	it can be used in different environments with high and low temperatures	its collecting data under water or air pressure
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no more than 10V	the design is attracting	it fits most budgets	it does not need much maintenance	waterproof	it feels the wind and moves with it to generate energy	hybird	sparingly materials
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it get powered by battery or solar panels	small flexible robot that sense the temperature and cleans the solar panels	a small robot sense humidity and start to clean the mirrors	a small robot that feels the high or very low temperature in cars and warn by sending signals and notifications via an application	a car or boat motor that has sensors so when it moves it starts working in the middle of the ocean it senses the temperature and pressure and connects to the nearest coastguard or police Station	a small wireless phone that shows temperature and pressure and connects to the nearest coastguard or police Station	it's useful for different ages	it feels the humidity and takes the water from it
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it sense air flow and temperature	Emergency boats that have a temperature sensors, humidity, and pressure so it can determine all of these info and act on it	a small watch for babies to determine their body temperature and their heart beats so when it's high it sends a signal to the phone registered and it light up	it feels humidity in cars mirror and it gives signals	it senses the temperature humidity and oxygen in the air. if there is less oxygen the car sends signals to the phone registered	Vibrating mode and movement	collecting data to help researches	it's used in foggy days to sense humidity, temperatures and bodies near to the car
it is used in farms to sense temp and humidity and keep track of their plants and animals							

different technique for cleaning base on the dirt level to improve efficiency	knowing when it needs to be recharged	can plug itself to the charger when needed	estimates how long can it work on the current battery level					
easy to use and understand	give recommendations for the user based on the sensed data	a robot that have more than one feature and sense diffrent types of data	different types of moving(wheels, flying,floating...)	have diffrent types of speed(setting low, medium, high)	emergency shutdown to avoid damaging the equipments	good isolation water/heat	can be used in bad weather	suggesting the type of the clothes based on the weather reading
predict weather changes by measuring the atmospheric pressure and temperature	measure temperature and atmospheric pressure to people when hiking	help sailors preserve food and goods	the ability to act by itself most of the time	have to use wifi	must be safe to use	gives feedback to the user when error occurs	interactive	user friendly
help farmers	solve an environmental issue	sense enviromantale conditions	process data received from the sensors and does action base on that	controlling irrigation systems	help make greenhouse more efficient	temperature and humidity control	helping sailors/captains to drive by knowing the speed and direction to use less energy/fuel	controlling temperature and humidity to preserve food in the best condition possible
								help in preserving goods like wood

Grouping

Pink	Daily Life Ideas
Green	Environmental
Yellow	Farmers Help
Blue	Common Features

App that reports energy output of panels to show user inefficiencies and report when cleaning required	Panels with wind speed detection that turn away from wind as much as possible to prevent build-up	Robot with power wash attachments to clean off dirt after sensing storm						
Retractable sprinkler (spraying) system that closes at night and sprays off panels	App based robot that is sent out to clean via phone when user wants	Hydrophobic solar panel top to prevent water spot build-up	Cleaning robot that can detect when temps exceed a set threshold to prevent potential malfunctions	Panel with heating elements built into top layer to melt ice in inclement weather areas	Panels that detect build-up and alert owner of energy inefficiency	Power wash attachment to panel that washes every night	Robot that cleans panels at intervals unless detecting incoming rain/snow	Cleaning robot that attaches to a larger unit via app to collect humidity, temp, wind speed, etc.
Panels that sense rain and turn upside down	Panels that are connected to weather app to turn upside down before inclement weather	Robot connected to weather app that will go out and clean after storm	Robot programmed to clean at set intervals unless it detects large amount of humidity	Robot programmed to clean every night to allow maximum sun time for panel	Panel that vibrates to shake off dirt	Array of robots assigned to individual panels that act in unison to clean	Array of power wash attachments to each panel set to programmed interval cleaning	Large broom system that goes across multiple in-line panels to sweep off
Robot that can sense debris and go clean it with large brush	Attachment to panel that sprays water to clean when sensing debris	Small fans attached to panels that blow away dirt at set intervals	Robot programmed to timer so that it goes out and cleans at specified times	Solar panels set on motors that tilt to dump debris	Broom attachment that senses dirt and sweeps across panel to clean	Motors that flip panel upside down each night to remove debris and prevent overnight build-up	Large fan system set on industrial panel areas to clear off multiple panels	Robot using rotating bristle brushes to clean off panels
								Windshield wiper style system attached to panels

Smartphones

- less programming
- Vibrating mode and movement
- Changeable rules and materials
- it senses airflow and temperature
- Emergency boats that have a sensor to sense pressure so it can determine all of these and act on it
- it feels humidity in cars mirror and it gives signals
- a car or boat motor that has sensors so when the motor stops working it can sense the ocean. It senses the temperature and pressure so if it's high it sends a message to the nearest coastguard or police Station
- a small wireless phone that also has sensors to sense pressure and communication to the nearest coastguard or police Station
- it does not need much maintenance
- it fits most budgets
- flexible, light, good display
- the design is attracting
- hybird
- it's useful for different ages
- users would use it for different purposes
- it senses the temperature, humidity and oxygen in the air. If there is no oxygen the car sends signals to the phone registered
- a small watch for babies to determine their body temperature and send messages so when it's high it sends signals to the phone registered and it lights up
- sparingly materials
- waterproof
- It can be used in different environments with high and low temperatures
- no more than 10V
- it's used in foggy days to sense humidity, temperature and bodies near to the car
- a small robot that feels the high or very low temperature in cars and warn by sending signals and notifications via an application
- its collecting data under water or air pressure
- Collecting data to actively take action
- helps with solar panels and renewable energy
- it feels the wind and moves with it to generate energy
- It is used in farms to sense temp and humidity and keep track of plants and animals
- It get charged by battery or solar panels
- a small robot sense humidity and start to clean the mirrors
- collecting data to help people in climate and environmental topics
- it feels the humidity and takes the water from it

Ranking

3		2		1: is the most important	
different types of moving (wheels, flying, floating,...)	Changeable rules and materials	gives feedback to the user when error occurs	it is used in farms to sense temp and humidity and keep track of their plants and animals	Broom attachment that senses dirt and sweeps across panel to clean	process data received from the sensors and does action base on that
Vibrating mode and movement	less programming	estimates how long can it work on the current battery level	can plug itself to the charger when needed	Large-scale water cleaning system that moves across x-y axes to clean off panels in # x # area	the ability to act by itself most of the time
App that reports energy output of panels to show user inefficiencies and report when cleaning required	Any of robots assigned to individual panels that act in unison to clean	help make greenhouse more efficient	controlling irrigation systems	Solar panels set on motors that tilt to dump debris	must be safe to use
Motors that flip panel upside down each night to remove debris and prevent overnight build-up	Panel with wind speed detection that turn away from wind as much as possible to prevent build-up	help farmers	Power wash attachments to each panel set to programmed interval cleaning	it senses airflow and temperature	have to use wifi

Farmers (yellow)

3 Daily life (pink)		2		1: 1 is the most important	
it's useful for different ages	no more than 10V	predict weather change by measuring the atmospheric pressure and temperature	it senses the temperature, humidity and oxygen in the air. If there is less oxygen the robot sends signals to the phone	users would use it for different purposes	hybird
sparingly materials	it feels humidity in cars mirror and it gives signals	a small wireless phone that shows temperature, pressure and connects with nearest coastguard or police station	a small robot that detects rain/snow at intervals unless detecting incoming rain/snow	the design is attracting	easy to use and understand
suggestion the type of clothes based on the weather reading	help in preserving goods like wood	a car seat motor that has sensors so when the motor stops working it can detect the ocean it senses the temperature and pressure and then sends signal to the nearest coastguard	small flexible robot that sense the temperature and cleans the solar panels	it does not need much maintenance	user friendly
help sailors preserve food and goods	Robot programmed to timer so that it goes out and cleans at specified times	Robot using rotating bristle brushes to clean off panels	Robot that can sense debris and go clean it with large brush	Robot connected to weather app that will go out and clean after storm	give recommendations for the user based on the sensed data
Robot using rotating bristle brushes to clean off panels	Small fans attached to panels that blow away dirt at set intervals	Robot programmed to clean it with large brush	Robot that goes out and clean at set intervals unless it detects large amount of humidity	Attachment to panel that sprays water to clean when sensing debris	process data received from the sensors and does action base on that

3		2		1: 1 is the most important	
different techniques for cleaning base on the dirt level to improve efficiency	Panels that sense rain and turn upside down	Panels that use actuators to lower into a water basin to rinse and go back up	Large fan system set on industrial panel areas to clear off multiple panels	solve an environmental issue	App that reports energy output of panels to show user inefficiencies and report when cleaning required
it feels the humidity and takes the water from it	Hydrophobic solar panel top to prevent water spot build-up	Panel with heating elements built into top layer to melt ice in inclement weather areas	A small robot sense humidity and start to clean the mirrors	can be used in bad weather	process data received from the sensors and does action base on that
Large broom system that goes across multiple in-line panels to sweep off	Any of robots assigned to individual panels that act in unison to clean	Panel that collects data under water or air pressure	It can be used in different environments with high and low temperatures	sense Environmental conditions	good isolation water/heat
Panel that vibrates to shake off dirt	it feels the wind and moves with it to generate energy	Robot programmed to clean at set intervals unless it detects large amount of humidity	Robot with power wash attachments to clean off dirt after sensing storm	flexible, light, good display	waterproof
Restractable sprayer (ceiling) system that closes at night and sprays off panels	Panels that are connected to weather app to turn upside down before inclement weather	Panel with heating elements built into top layer to melt ice in inclement weather areas	Cleaning robot that can act as weather unit via app to collect inclement temp, wind speed, etc.	process data received from the sensors and does action base on that	gives feedback to the user when error occurs
Windshield wiper style system attached to panels	Windshield wiper style system attached to panels	Robot programmed to clean every night to allow maximum sun time for panel	Emergency boots that have a temperature, humidity, and pressure so it can determine all of what is wrong and act on it	it fits most budgets	must be safe to use
Melt ice from the solar panels	Collecting data to help researches in climate and environmental topics	Robot programmed to clean every night to allow maximum sun time for panel	App based robot that is sent out to clean via phone when user wants	have to use wifi	temperature and humidity control
Cleaning robot that can detect when temp exceed a set threshold to prevent potential malfunctions	Collecting data to actively take action	Robot with rechargeable battery	Windshield wiper style system attached to panels	1: 1 is the most important	

Enviromental (green)



THANKS

DO YOU HAVE ANY QUESTIONS?

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