

Environmental Sensing Invention

Checkpoint 1



Team 301

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Team Organization

Team Members:

- Timothy Drafz
- Salsabil Soliman
- Fatema Alshehhi
- Sivanee Naghichetty

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.



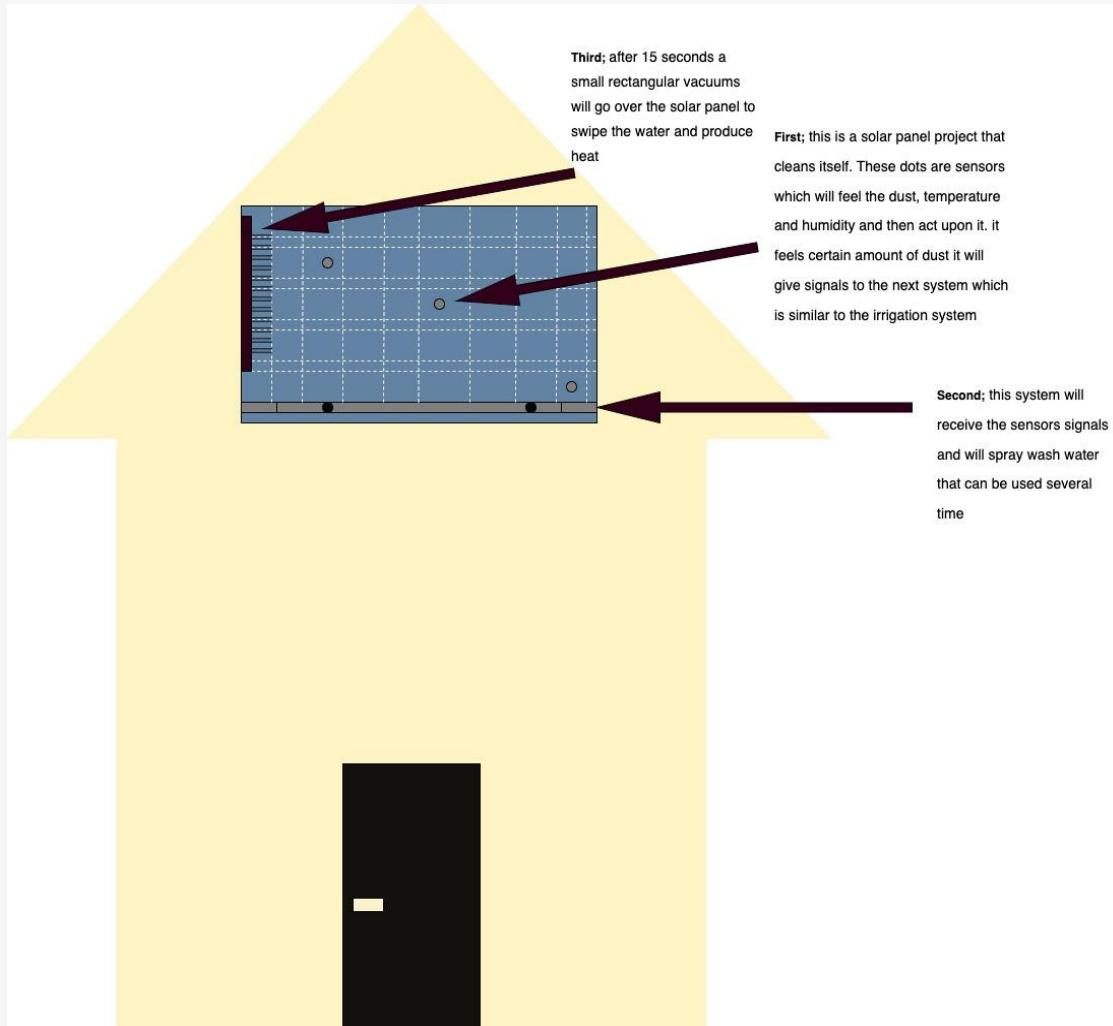
02

Overview of Three Design Concepts

First concept

A Fully equipped Solar Panel

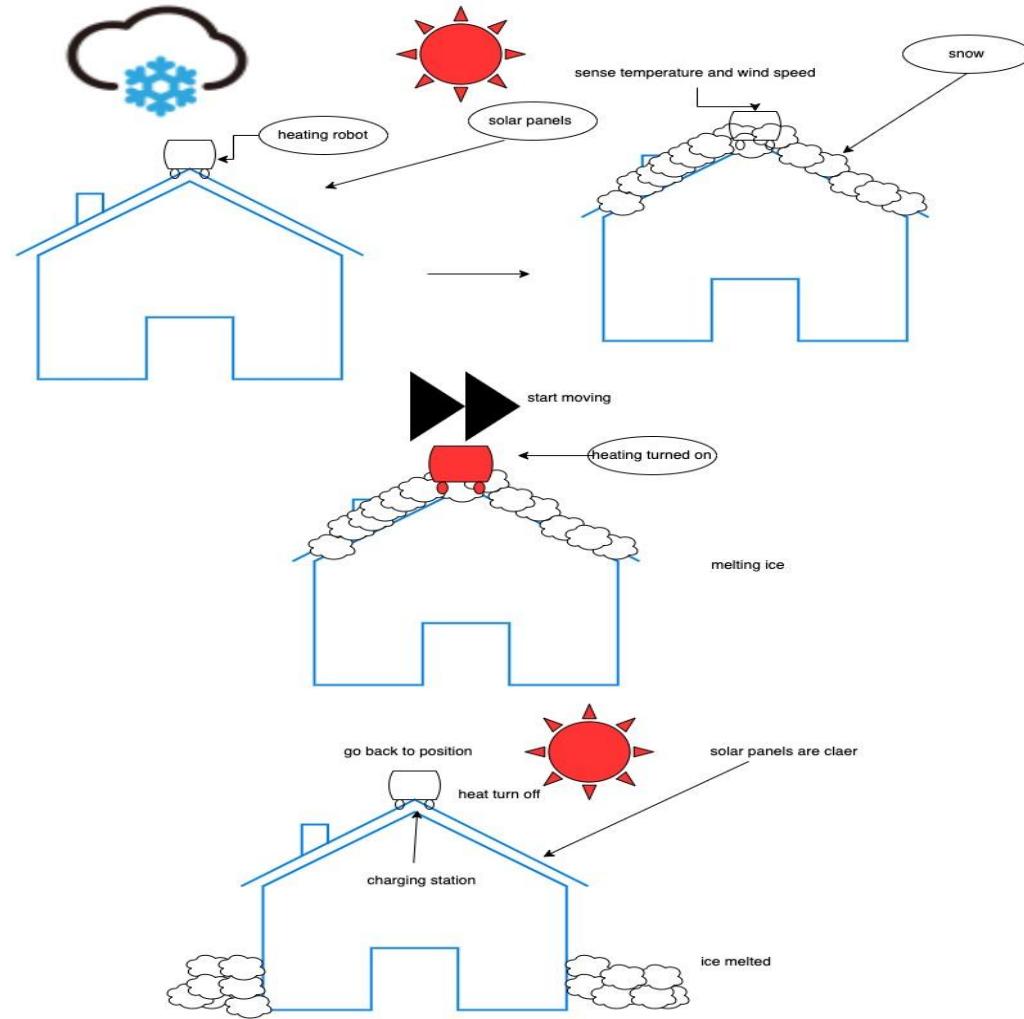
- Sense temperature and humidity
- Spray water
- Air produce and swipe dust



Second concepts

Heating robot

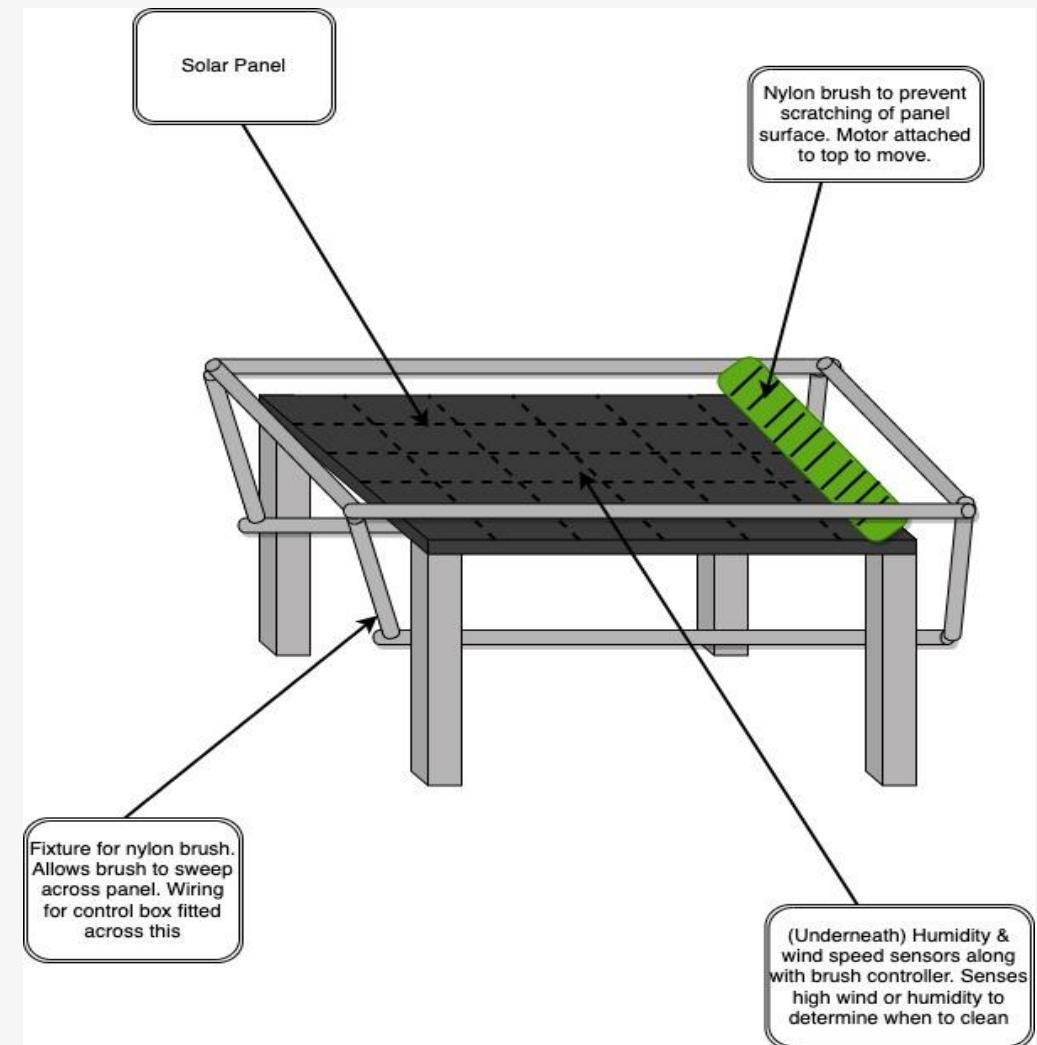
- Sense temperature and wind speed
- Heating turn on
- Moves around to melt the snow



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

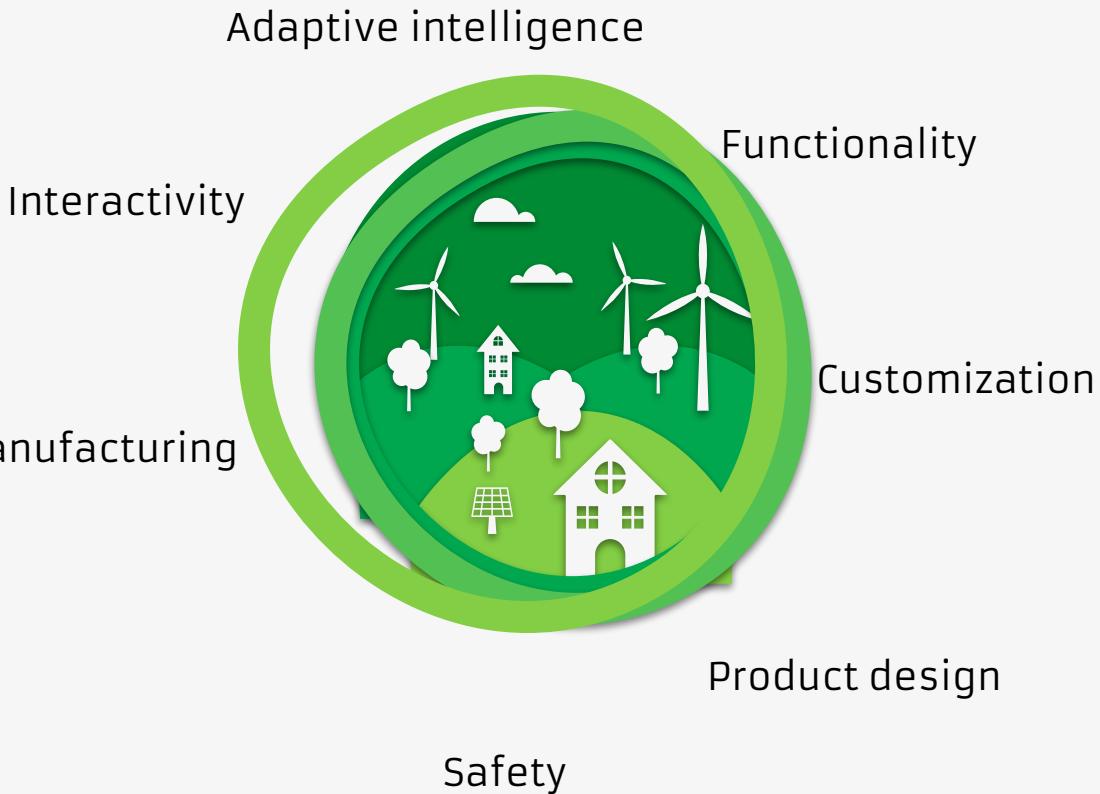
Product Requirements

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
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
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 the motor stops working in the middle of the ocean it senses the temperature and pressure if it's high it sends a signal to the nearest coastguard	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
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 keep them boats so when it's high it sends signals to 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 different types of data	different types of moving(wheels, flying, floating..)	have different 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	can be controlled via app or from a long distance
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	use rechargeable battery
help farmers	solve an environmental issue	sense environmental 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 wind 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

App that reports energy output of panels to the user inefficiencies and report when cleaning required	Panels with wind speed detection sensors to avoid strong wind as much as possible to prevent build-up	Robot with power wash attachments to clean off dirt after sensing storm						
Retractable sprinkler (coiling) 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 limit to prevent potential malfunctions	Panels 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 can act as weather unit via app by collecting 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	Moving 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

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 tower 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

	less programming	Vibrating mode and movement	Changeable rules and materials	it senses airflow and temperature		
a car or boat motor that has sensors so when the motor stops working it will tell us the depth of the ocean it senses the air pressure and pressure if it's high it would a signal to the nearest coastguard	it fits most budgets	small flexible robot can sense the temperature and cleans the solar panels		Emergency boats that have a temperature sensor, humidity, and pressure so it can determine all of these info and act on it	it feels humidity in cars mirror and it gives signals	
a small wireless phone that has sensors to measure pressure and temperature the newest coastguard or police Station	it does not need much maintenance	the design is attracting	hybird	it's useful for different ages	users would use it for different purposes	
a smart watch for babies to determine their body temperature and heart rate so when it's high it sends signals to phones charged and it light up	sparingly materials	waterproof	it can be used in different environments with high and low temperatures	no more than 10V	it's used in frag 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 the plants, plants and animals	it get charged by battery or solar panels	collecting data to help farmers in climate and environmental topics
					a small robot sense humidity and start to clean the mirrors	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 or boat 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 programmed to clean at once if it detects large amount of humidity	give recommendations for the user based on the sensed data
Robot using	Small fans attached to panels that blow away dirt at set intervals	Robot connected to weather app that will go out and clean after storm	Robot attached to panel that sprays water to clean when sensing debris	Emergency boots that have a temperature, humidity, and pressure so it can determine all of those and act on it	must be safe to use

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	large fan system set on industrial panel areas to clear off multiple panels	Panels that solve an environmental issue	App that reports energy output of panels to show user inefficiencies and report when cleaning required	can be used in bad weather
it feels the humidity and takes the water from it	Hydrophobic solar panel top to prevent water spot build-up	Panels that use actuators to lower into a water basin to rinse and go back up	Panels that can plug itself to the charger when needed	Robot programmed to clean every night to allow maximum sun time for panel	sense Environmental conditions
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 with heating elements built into top layer to melt ice in inclement weather areas	gives feedback to the user when error occurs	melt ice from the solar panels	process data received from the sensors and does action base on that
Panel that vibrates to shake off dirt	it feels the wind and moves with it to generate energy	its collecting data under water or air pressure	a small robot sense humidity and start to clean the mirrors	Robot programmed to detect when temp exceed a set threshold to prevent potential malfunctions	have to use wifi
Restractable sprayer (ceiling) system that closes at night and sprays off panels	Robot programmed to clean at set intervals unless it detects large amount of humidity	Panels that are connected to weather app to turn upside down before inclement weather	it can be used in different environments with high and low temperatures	Cleaning robot that can detect when temp exceed a set threshold to prevent potential malfunctions	it get powered by battery or solar panels

Enviromental (green)



THANKS

DO YOU HAVE ANY QUESTIONS?

Fatema Alshehhi - faalshe2@asu.edu

Salsabil Soliman - smsolima@asu.edu

Timothy Drafz - tdrafz@asu.edu

Sivanee Naghichetty - snaghich@asu.edu



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