
Deliveroid
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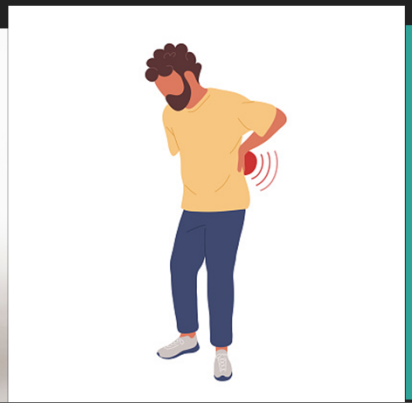
Background

- Robotics and Artificial Intelligence is an industry that is growing rapidly
- We create robots to speed up simple or complex tasks done by humans
- Personal robots are a category where the device's human interface and design make it useful for individuals to use.

Background

- In an office setting, transporting physical document is inevitable
- Having to get up from your desk to transport documents causes to stop your workflow, and lose productivity
- Not to mention having to carry around a large amount of files may also be a burden



Problem Formulation - Problem Statement

- **Target Users:** Offices/Classrooms
- **Problem Statement:** Automate the exchange of documents/items between offices and classrooms
- **Primary Goal:** Create an easier solution for users to be able to transfer documents from place to place
- **Long Term Goal:** Allowing the device to be able to move without guide tape
- **Short Term Goal:** Device will transport documents from one Office/Classroom to another

Problem Formulation - Design Requirements

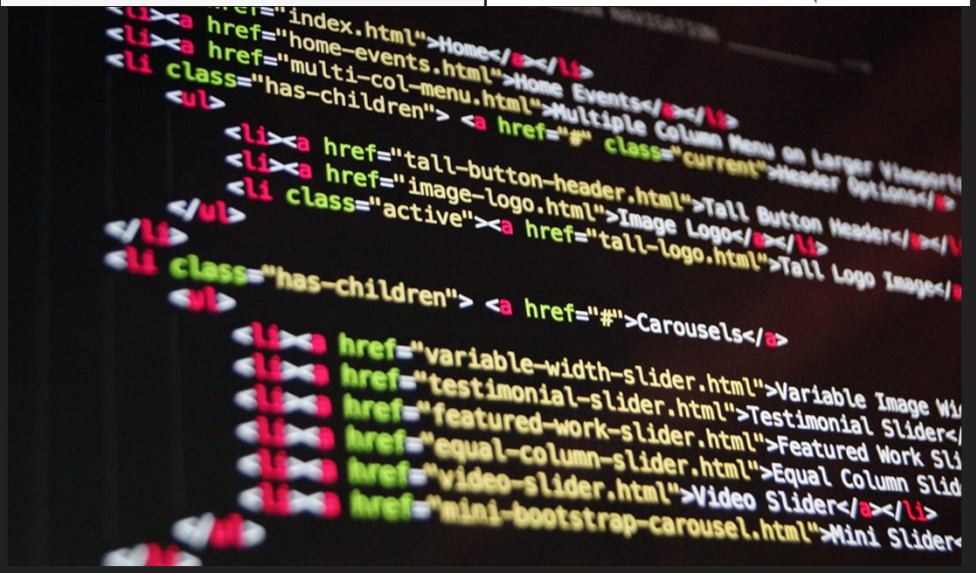
- Able to transport documents to and from a destination set by the user
- Able to notify the user if the device is overloaded and can’t transport
- Able to alert user if the device becomes stuck or something is blocking its path
- Small enough to maneuver through offices and classrooms without bumping into things
- Must run quietly to not disturb others
- Device comes with user interface for easy accessibility

Problem Formulation - Standards and Regulations

- **Federal Communication Commission (FCC) Part 15, Subparts C through F and H:** For radio frequencies used by the devices
- **International Organization for Standardized (ISO) Technical Committee 199:** Safety of machinery - Safety related parts of control systems
- **International Electrotechnical Commission (IEC) 61000-4-2:2008:** Electrostatic Discharge Immunity Test

Problem Formulation - Constraints

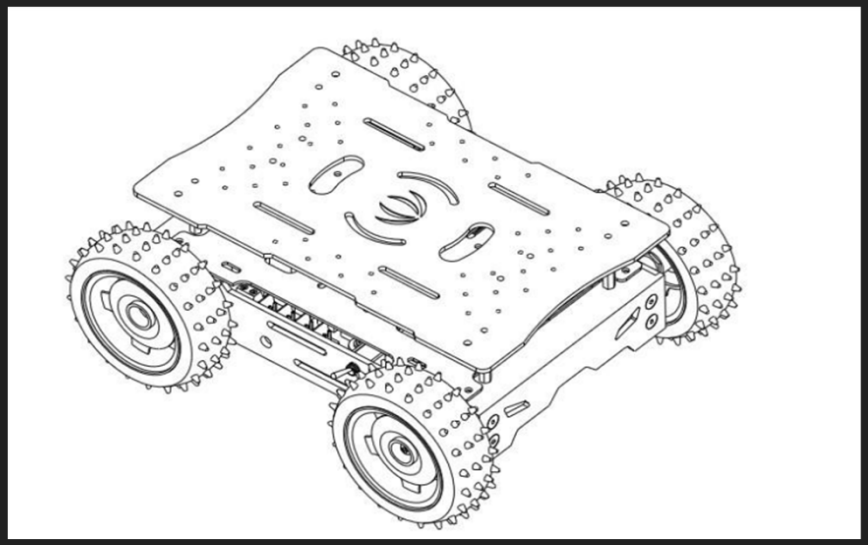
- **Socio-cultural:** Device should look both sophisticated and sleek, while also being relatively easy to use.
- **Financial**: Product should not cost over $200
- **Intellectual:** Limited knowledge on autonomous robotics
- **Environmental:** Using recycled parts from the lab



Solution Generation

Solution Generation - Individual Ideas #1

Small Car

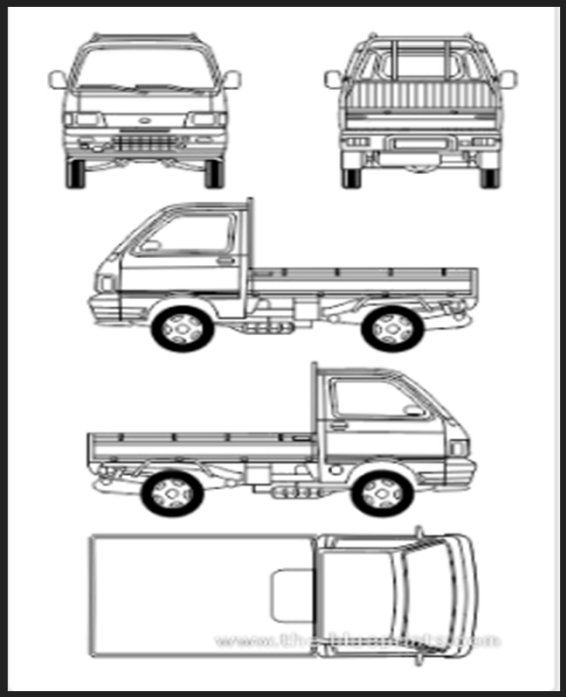


- **Design Summary**
  - Miniature design for standard 8.5x11 sheets of paper
  - About a foot long

- **Design Methodology**
  - Made for smaller workspaces
  - Faster mobility
  - Greater Maneuverability

Solution Generation - Individual Ideas #2

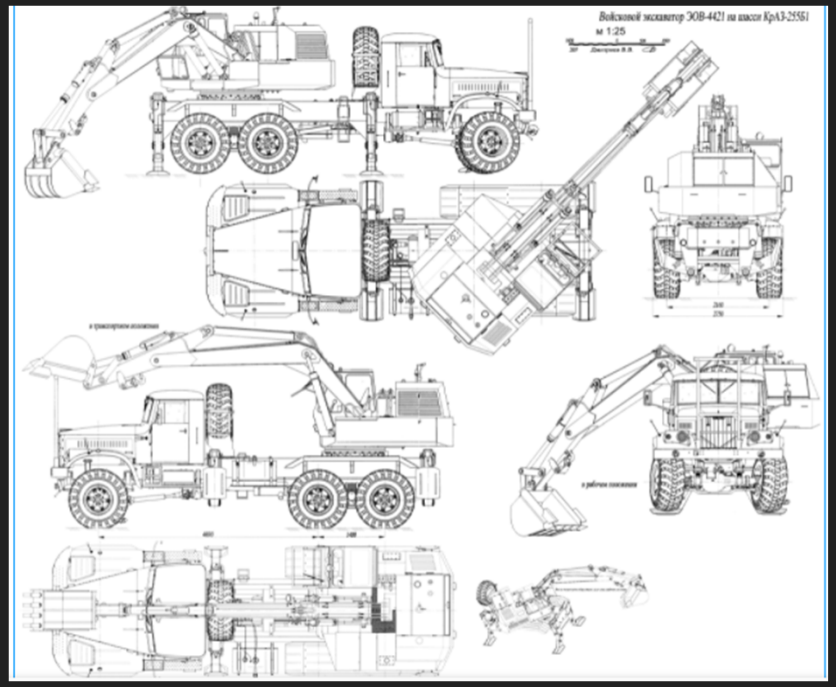
Large Truck



- **Design Summary**
  - Larger design to transport more than just sheets of paper
  - Double the size of small truck
- **Design Methodology**
  - Durable design
  - Moves more things at once
  - More secure delivery

Solution Generation - Individual Ideas #3

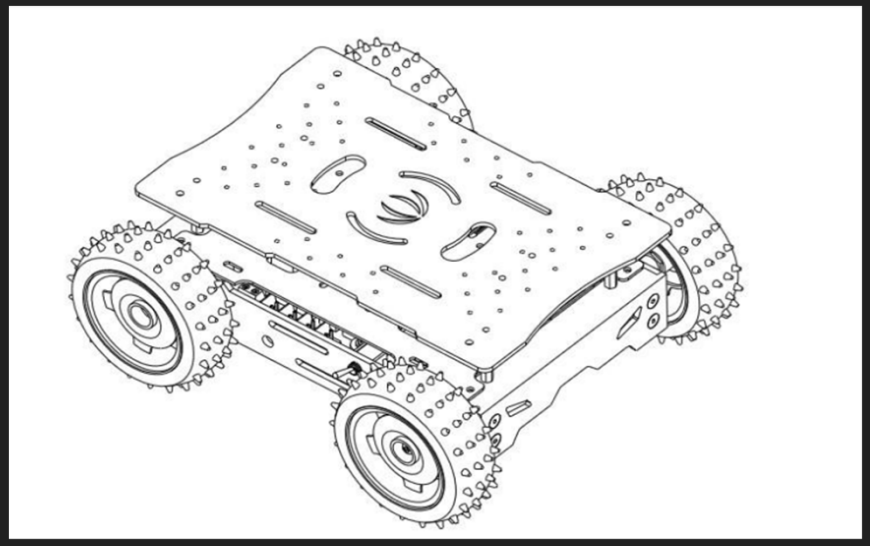
Multipurpose Truck



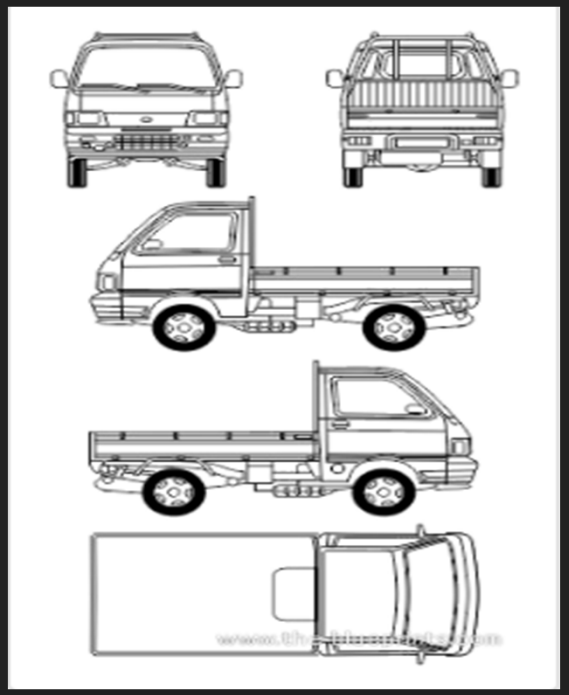
- **Design Summary**
  - Medium sized design with multipurpose functionality
  - Able to perform more than just transporting documents
- **Design Methodology**
  - Utilizes mechanical arm to pick up items that are in a designated location

Solution Generation - 2 Chosen Designs

Design 1



Design 2



Design #1 Pros and Cons

Pros	Cons
The size is very small.	Only can transport small amount items
Maneuverable	Design is less stable
Cheaper Design	Less durable
Papers are transported in protective capsules	Frame does not accommodate paper shape
Deliverables are clearly labeled	Capsules cannot transport non-foldable items, Like envelops
Currently in possession of frame so we know how it looks	Extra work for user to gently roll documents and insert in capsules

Design #2 Pros and Cons

Pros	Cons
Design is very durable	Costs more to manufacture as it requires more parts/components
Will be able to fit more stuff	Additional microcontroller connections and power consumption
Can carry large items such as desktops.	Items must be flat in shape in order to fit onto truck bed
Has a weight sensor to keep track of load limit.	Additional programming of microcontroller needed for more components
Better design to fit documents more securely	Device moves slow

Solution Generation - Design Matrix

	COST	Aesthetics	SIZE	Efficiency	Practicality	Total Score
Weight	3	4	1	5	2	
Design 1	3	2	4	3	3	
Aggr. Score	9	8	4	15	6	42
Design 2	3	3	4	5	4	
Aggr. Score	9	9	4	25	8	55

Solution Generation - Design Matrix Categories

- **Efficiency(5):** Measure of how well the selected design would be at performing its sole function. We base this on speed and how much the device can carry on each trip. Our ultimate goal of this project is to create a device that will make it easier for professors to move documents from place to place without the need to leave their desk. In order to do this we need to make sure that the Deliveroid is able to complete its work in a timely manner similar to what it would take someone to do themselves.

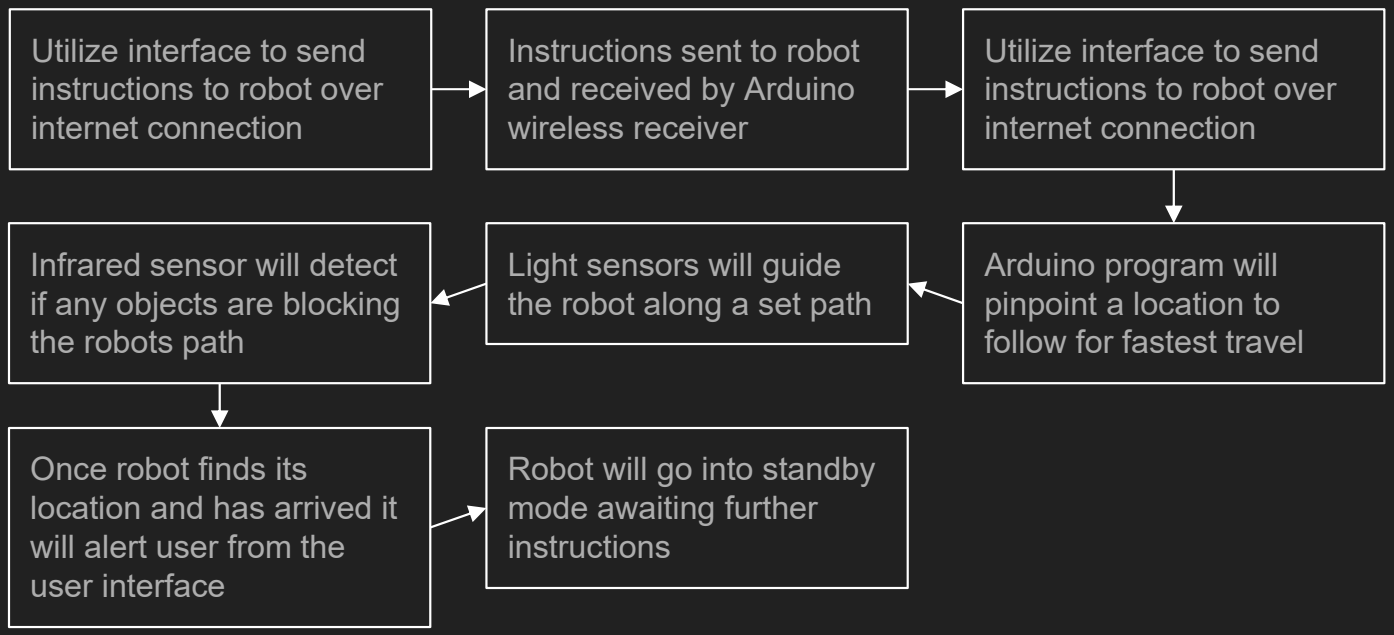
- **Cost(4):** Measure of how expensive the design will be to implement. In order to create a device that will compete in the market we need to take careful notice of its cost. This will be extremely important should our device ever reach mass production.

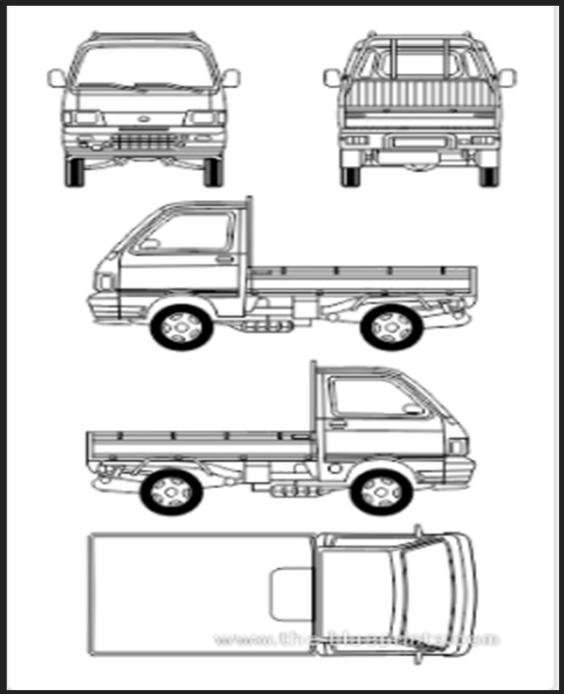
- **Aesthetics(3):** Measure of how pretty to the eye our device is. We want to make a device that will look sophisticated and sleek while being relatively easy to use. This will capture the potential customer's eye, thus increasing our demand

- **Practicality(2):** Measure of how easy our device it to use. We want to make sure our device is easy to use even for young ages. We are planning on creating a device that will replace a human function of getting up and walking from one place to another. We want to make this process even easier for the user and to do this we need to make the device very simple to use so that the user chooses to use it instead of doing something themselves

- **Size(1):** Something that we don't have to consider as much is the size of the device. Since where it will be operating will be a place with a lot of space space

Top Design Solution - Software Block Diagram

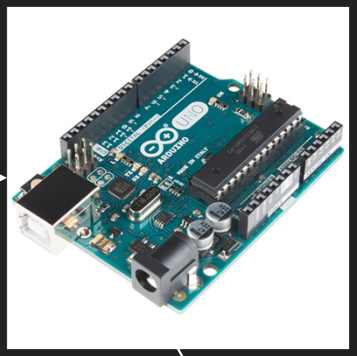




Top Solution Design - Hardware Block Diagram

Instructions are sent over the internet from user interface

Instructions are received to Arduino wireless receiver



Light and infrared sensors are used to aid the device's navigation

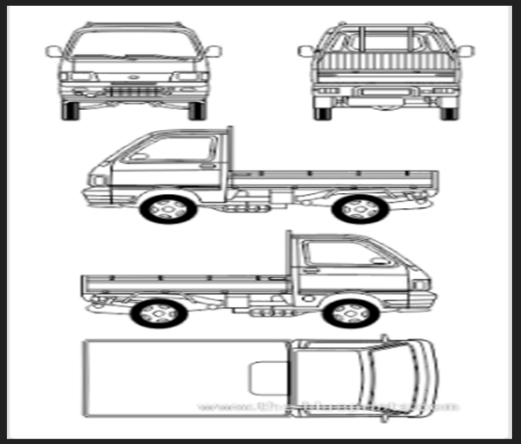
Device travels to its destination

Conclusion

While we did not use the frame originally given to us, we believe that this design is more efficient and a better fit for our design requirements.

Our previously defined frame was more optimized for transporting random items while this one is for an office setting

While this may incur more costs we believe this design will still be within our budget



Questions?