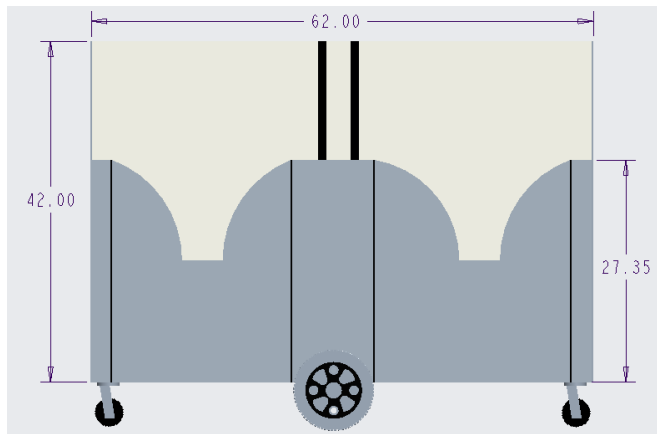


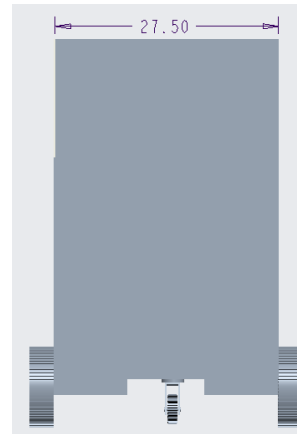
# Robotic Trash Cart Proposal

The robotic trash cart is a fully autonomous device that carries the recycling and waste bins to the curb for pick up and returns home. The elderly, disabled community, and people with limited strength and mobility in their extremities struggle to push or pull heavy objects, such as waste bins. This problem is magnified if their driveways are sloped, uneven, or become slick due to rain. The robotic trash cart consists of an aluminum frame with a fiberglass grated base, which holds the trash and recycling bins, using an array of sensors to autonomously transport the bins from the user's home to the curb for waste removal and back to the user's home. A gate in the frame of the robotic trash cart provides waste engineers easy access to the bins for quick trash removal. The primary markets for the robotic trash cart are waste management companies that can rent out the equipment to homeowners for a monthly fee and individual homeowners. Secondary markets include amusement parks, outdoor shopping centers, and transportation hubs, such as airports, train and bus stations, and waterway entries. These secondary markets have the greatest commercial applications for the robotic trash cart due to their dense foot traffic. Here, an autonomous system of multiple robotic trash carts can be implemented. Once a robotic trash cart senses that it is full of trash, it will autonomously navigate to the central waste site, where it can be emptied and return to its original location. The following are CAD drawings of the RTC.

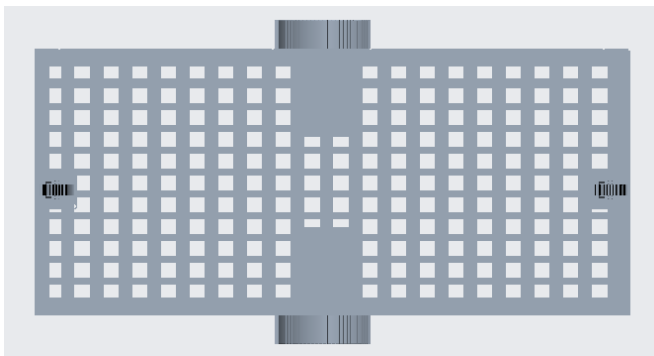
Front View of RTC:



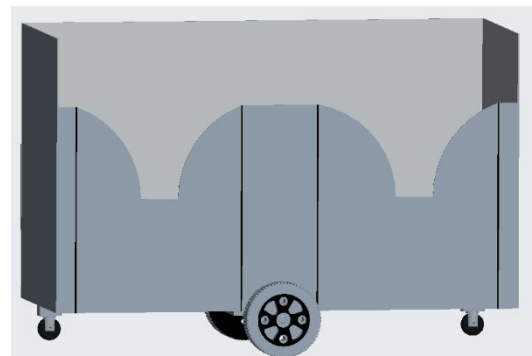
Back View of RTC:



Top View of RTC:



Front View of RTC:



## Customer Interview Questions

Number	Question
1	What Problems make it difficult to take your refuse to the designated pick up area?
2	Do you or any of your friends have trouble moving around and taking out the trash?
3	What is your biggest problem when taking out the trash?
4	Would you say most of your friends leave their trash can inside or outside their garage?
5	In general, would you say that most of your friends have concrete driveways or some have driveways of other materials, such as gravel or stone?
6	What is the easiest method for you to deal with the battery life of a trash cart?
7	Do you have problems placing your trash can so it doesn't tip over?

Customer Statements

Question #	Customer Statement	Interpreted Need
1	Shirley P: The containers are heavy to begin with. When they are full there is the possibility of the container tipping over on you when you either pull or push it. The edge of the carport to the pick-up area isn't far but for me it is hard when garbage is full.	The city of Tallahassee has a program in which they will get the waste containers for an elderly or handicapped person but they need to fill out a questionnaire. A solution for this problem is any device that will help take the containers to the designated pick up area without tipping over.
1	Salwa Soliman: It's so heavy sometimes I can't bend it towards me to pull it to the pick-up location. Also, it's too far to walk to the pick-up area.	Salwa has a similar problem to Shirley and a device that takes the containers to the designated pick up area without tipping over would help resolve this problem.
2	Becky Hall: A couple of friends come to mind. One of my friends isn't very mobile at all and in a wheelchair; so one thing that could help is to have the trash cans as low as possible to make it more accessible to people in wheelchairs.	People with disabilities have difficulty grabbing and moving things that are high off the ground or very low to the ground. We need a product that is well within reach of people with limited mobility.
3	Becky Hall: The distance of having a long driveway is my biggest problem I'd say. Some of my friends will put it in a certain spot to make it a shorter trip next time, even if it's not the best location for a trash can. One of my friends had such a long driveway that they paid their neighbor to just come take out the trash for them. So distance I'd say is the biggest problem for myself and most of my friends.	Carrying or pushing the heavy trash containers is difficult for the elderly, disabled, and anyone with limited mobility or strength. Reducing the distance they have to travel to take out the trash is vital.
4	Becky Hall: Most of my friends actually have their trash cans inside their garage due to their communities demanding that the trash cans cannot be seen from the street. Some of my friends also hide their trash cans behind their fences or gates just in case the trash smells and they don't want to leave it in their own garage.	The RTC needs to prevent the trash containers from being an eyesore.
5	Becky Hall: Most of my friends including myself have concrete driveways, because we're in a more residential area. However, I do have a couple friends further away that have a gravel and/or dirt driveway.	The terrain the RTC traverses is important to know in order to use an appropriate transportation system, which can involve wheels, tracks, etc.
6	Becky Hall: A rechargeable battery I believe would be the easiest and best idea; like a rumba that does its job then goes and plugs itself back in.	A docking station can be built that recharges the batteries of the RTC when it is not transporting the trash to the pick-up location. Solar panels on the trash cart can help to supplement its power needs.
7	Becky Hall: I usually have trouble deciding where to place my trash can, whether it should be on the street or the driveway. I also usually think about if it's going to rain because there's almost a river running down my driveway to the shoulder of the street then to the storm drain. If I know it's about to rain, I'll place it on the flat part on the road so the river doesn't take my trash can.	A locking mechanism is needed to keep the RTC in place when it is at the designated pick up location or at the home base. Something needs to be done to prevent the RTC from hydroplaning in the rain.

# Lean Business Model /Business Model Canvas

Organization/Project Name: Robotic Trash Cart

Key Resources (6 )	Key Activities (5)	Value Proposition (1)	Customer Relationships (4)	Customer Segments (2)
<ul style="list-style-type: none"> <li>Storage facilities</li> <li>Distribution network for sales team</li> <li>Manufacturing of RTC</li> <li>Design and development of RTC and autonomous systems</li> <li>Mobile support</li> <li>Component parts (repairs)</li> </ul>	<ul style="list-style-type: none"> <li>Design and develop product</li> <li>Code that enables user control of the RTC and autonomous functions</li> <li>Arrange for a contract manufacturer (or we could assemble ourselves)</li> <li>Technicians to provide maintenance services</li> <li>Telephone and online chat operators to offer technical support</li> </ul>	<ol style="list-style-type: none"> <li>Waste Management Companies               <ol style="list-style-type: none"> <li>No more pick up of trash bins from the backyard</li> <li>Additional revenue stream leasing RTCs to customers.</li> </ol> </li> <li>Home Owners               <ol style="list-style-type: none"> <li>Alleviate stress from pulling/pushing heavy bins</li> <li>Avoids rain/cold/snow when taking trash out (convenience)</li> <li>Automates the trash dispensing to the curb allowing home owners to be away during trash collection weeks</li> </ol> </li> <li>Amusement Parks/Locales with dense foot traffic               <ol style="list-style-type: none"> <li>Trash cart can be strategically placed as foot traffic changes throughout the day</li> <li>Trash carts move to the primary dumpster when they are full</li> </ol> </li> </ol>	<p>Possible Partnership with waste management companies/amusement parks to train technicians on maintenance of the RTC or provide maintenance services (warranty). Client managers familiar with a user's trash dispensing system will provide personal assistance for troubleshooting problems. We will offer customer service support for individual homeowners.</p>	<ol style="list-style-type: none"> <li>Waste Management Companies</li> <li>Home Owners</li> <li>Amusement Parks</li> <li>Local, state, and national parks</li> <li>Locales with dense foot traffic, such as outlet malls, transportation hubs, sporting events/stadiums</li> </ol>
<p>Key Partners (7 )</p>			<p>Channels (3)</p>	
<ul style="list-style-type: none"> <li>Waste Management Companies</li> <li>Retirement communities</li> <li>Amusement Parks</li> <li>Outlet malls</li> <li>AARP</li> <li>Homeowners Association</li> </ul>			<ul style="list-style-type: none"> <li>Direct sales to waste management companies/home owners/amusement parks</li> <li>Online sales to the home owners</li> </ul>	
<p>Expenditures (8) (Cost Structure) →</p>	<ul style="list-style-type: none"> <li>Manufacturing costs of the RTC (wholesale price if using contract manufacturer)</li> <li>Distribution costs for deliveries of RTC</li> <li>Design and development</li> <li>Storage costs</li> <li>Company operating costs</li> </ul>	<p>Revenues (9) →</p>	<ul style="list-style-type: none"> <li>Selling or leasing of the RTC</li> <li>Consulting services for customization of RTC and/or autonomous system for trash dispensing</li> <li>Mobile support for mechanical failures</li> <li>Maintenance agreements</li> <li>Replacement Parts</li> </ul>	