Functional Decomposition

Figure 1 depicts the functional decomposition for the RTC. The self-aware module is a stretch goal and is highlighted in yellow.

Physical Support	Transportation	User Interface	Self Aware
Carries Load	Acceleration	Controller Capability	Object Detection
Maintains Stability	Deceleration		Navigation
Accessibility	Brakes		Autonomous
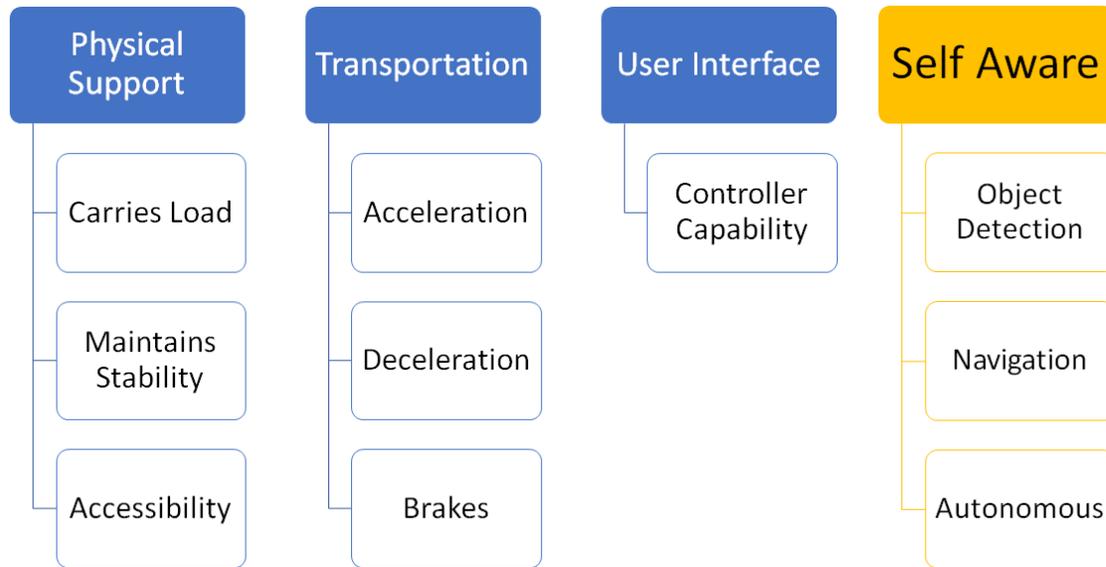
Figure 1. *Functional Decomposition.*

The entire purpose of the RTC is to be able to transport the RTC from the home base to the waste pick-up location and back to the home base. In order to accomplish this, the RTC must be mobile and able to accelerate, decelerate, and come to a complete stop. The RTC will need brakes as well to prevent it from rolling downhill or have someone steal it. The RTC must also be able to carry a heavy load (full waste bins) and maintain stability while transporting the waste bins. The local waste management company in the city of Tallahassee is Waste Pro USA, which from now on will be referred to as Waste Pro. The waste engineers for Waste Pro dispose of the trash in the waste bins by aligning the bins with a mechanical arm on the garbage trucks. This arm hooks into the front of the bins, lifts up the bins towards the garbage truck, repeatedly dumps the trash in the waste bins, and sets the bins down onto the street. The waste engineers then take the bins back to curb. This process is lengthy, and we do not want to make it any longer. The waste engineers in Tallahassee are paid salary and will most likely not buy into a system that increases their work for no increased pay. For this reason, the bins need to be easily accessible for the waste engineers. It should also be simple for users to dispose of trash into the waste bins. Based on our customer interviews, the user interface and the controls of the RTC must be simple to use.

Our stretch goals are to make the RTC self-aware and autonomous. In order to implement autonomous functionalities, the RTC needs to have object detection. This is vital for self-navigation of the RTC. The terrain the RTC traverses can complicate autonomous navigation. The wheels or tracks of the RTC can slip in the mud or gravel. This will affect any tracking

mechanism and the work performed by the RTC. Adding autonomous functionalities to the RTC can be the second iteration of this project. Below is a list of the tasks that the RTC must accomplish:

- Get from the home base to the drop-off location

- Return from the drop-off location to the home base

- Prevent the trash from falling out during transport

- Prevent the trash bins from tipping over