Targets and Metrics

The targets for our project were determined by our functional decomposition of the system. For each function research was completed to find the approximate minimum or maximum values along with their respective metric. For example, the structure of our system was represented by the metric cm for both the height and width of the frame of the system. This was done for each function, and the critical targets and metrics were determined by which were necessary for the system to accomplish the customers' needs.

Some of the critical targets and metrics for our design included minimum and maximum values for: power, voltage, network range, and planning rate. For the power of the system, the needs of the customer as well as research into possible sensors and cameras that would accomplish our goals. In this case, Lidar was considered as a possible sensor. The critical target for network range is a minimum network range of 45 m.

The targets and metrics were derived from multiple sources, such as the needs of the customer/sponsor, and requirements found in spec sheets for our hardware components. The maximum and minimum power for the device was derived using the minimum power required to power the Jetson board, and the maximum was derived using the estimated battery capacity and target for the life span of the car in use. The minimum network range is set to be 45m because that is the distance of the course the car will drive over, and it is necessary to have a channel of communication throughout the entire drive. The minimum planning rate requirement is set to 10 Hz because we think that this is the smallest response time the car should have to changes in the environment which would require replanning.

The NVIDIA Jetson has several integrated components that will be able to validate many metrics for the board such as GPU temperature and CPU core usage. Targets that are not associated with internal software components will have to be validated with the collaboration of

team 503 to ensure that measurements of the camera, sensor, and size of the NVIDIA Jetson board will fit and integrate correctly within the car created by team 503. This will include physically measuring the size of the Jetson board, camera, and sensor. Validation of other targets such as camera and network range will have to be physically tested in an open space with a range of over 45m to ensure complete coverage of communication.

Target Catalog

Name	Target		Metric	Function
	Min	Max		
Weight	-	5	kg	Structure
Base width	-	15	cm	Structure
Base length	-	15	cm	Structure
Height	-	7	cm	Structure
Temperature range	-4	140	F	Structure
Acceleration			m/s^2	Power
Jerk			m/s^3	Stability
IP Rating	4	-	IP#	Structure
Power **	5	30	W	Power
Power duration	30	-	min	Power
Voltage **	12	36	V	Power
Communication rate	2.4	-	GHz	Communicate
Network range **	45	-	m	Communicate

Image resolution	20	-	pixels/in	Visualize
Camera frame rate	24	-	FPS	Visualize
Sensor range	30	200	m	Visualize
Sensor field of view	45	360	degrees	Visualize
Sensor update rate	30	-	Hz	Visualize
Storage size	1	-	GB	Processing
Classification refresh rate	0.144	-	kHz	Processing
Computing power (RAM)	4	-	GB	Processing
Number of objects tracked **	1	-	Number	Classify
Planning rate **	5	-	Hz	Planning
Localization rate	30	-	Hz	Localization
Localization error **	-	0.1	m	Localization

** Critical Targets