

Figure 1: Requirements Matrix

Product: URC Mars Rover		Subsystem: Basic Requirements		Revision Date: 03/6/2017	
Market Requirements		Performance Measures		Units	
1	Rover can be set up and switched between tasks quickly	1	In-field rover set-up time	1	minutes
2	Rover batteries last the entire competition task	2	Length of time the rover can operate at full battery usage	2	minutes
3	Rover electrical components and wiring are robust	3	Distance the rover can travel on a full battery charge	3	meters
4	Rover completes tasks within given times	4	Force required to unplug a wire	4	lb
5	Rover tows wagon with carabiner	5	Max speed of the rover	5	m/s
6	Rover reports its location	6	Estimated rover location accuracy (diameter)	6	mm
7	Rover manipulates tools	7	End effector precision	7	mm
8	Rover arm unscrews/screws cylinder	8	Time to pick up screwdriver	8	sec
9	Rover takes photos	9	Time to move an object from the edge of the workspace to centered over rover	9	sec
10	Rover measures soil moisture	10	Minimum number of camera views	10	views
11	Rover digs for soil sample	11	Max arm setting time in cartesian space	11	ms
12	Rover measures sub-soil temperature	12	Camera panorama angle	12	deg
13	Rover starts up reliably	13	Panorama heading accuracy	13	deg
14	Rover collects soil sample	14	Photo scale accuracy	14	%
15	Rover flips open a cap	15	Photo scale accuracy error	15	%
16	Rover pushes a button	16	Distance error	16	cm
17	Rover pours fuel	17	Depth of soil measurement error	17	cm
18	Rover transmits video	18	Temperature sensor error	18	C
19	Rover fits between posts	19	Max weight arm can lift at 0.5 m from the base of the arm	19	kg
20	Rover travels over competition terrain	20	% Successful startup	20	%
21	Rover meets competition weight requirements	21	Size of handle the end effector can grasp	21	cm (dia)
22	Transmits data required distance	22	FPS at 480 x 640 resolution transmitted over 1km	22	FPS
23	Rover navigates autonomously	23	Max allowable width of rover	23	m
24	Rover complies with FCC regulations	24	Max incline before rover tips in any orientation	24	degrees
		25	Vertical drop it can withstand	25	m
		26	Minimum speed in sand and gravel	26	m/s
		27	Rover turning radius	27	m
		28	Max weight in any competition configuration	28	kg
		29	Minimum bandwidth at 1 km	29	Mb/s
		30	Gate detection distance	30	m
		31	% FCC rules followed	31	%
Ideal Values		Importance (optional)		Ideal Values	
Measured	Desired	Target	Upper Acceptable Limit	Lower Acceptable Limit	
-	5	15	2	-	
78	90	-	1500	75	
1370	1200	-	1000	-	
-	2	2	0.5	-	
3.5	1.66	3	1	-	
2.5	5	1	5	-	
-	10	20	35	50	
-	20	30	30	90	
-	5	30	5	2	
5	4	4	1000	3000	
-	500	-	360	270	
360	270	10	1	-	
-	5	10	1	-	
-	10	10	2	-	
-	10	20	10	5	
-	1	1	10	3	
-	7	5	4	-	
100	100	100	100	95	
-	5	5	5	2.5	
15	15	30	30	5	
-	1	2	1	-	
80	45	45	45	30	
-	0.5	0.5	1	0.5	
1	1	1	1.66	1	
-	0.25	0.5	0	-	
-	50	50	40	-	
15	10	20	20	4	
-	10	20	20	-	
100	100	-	-	100	