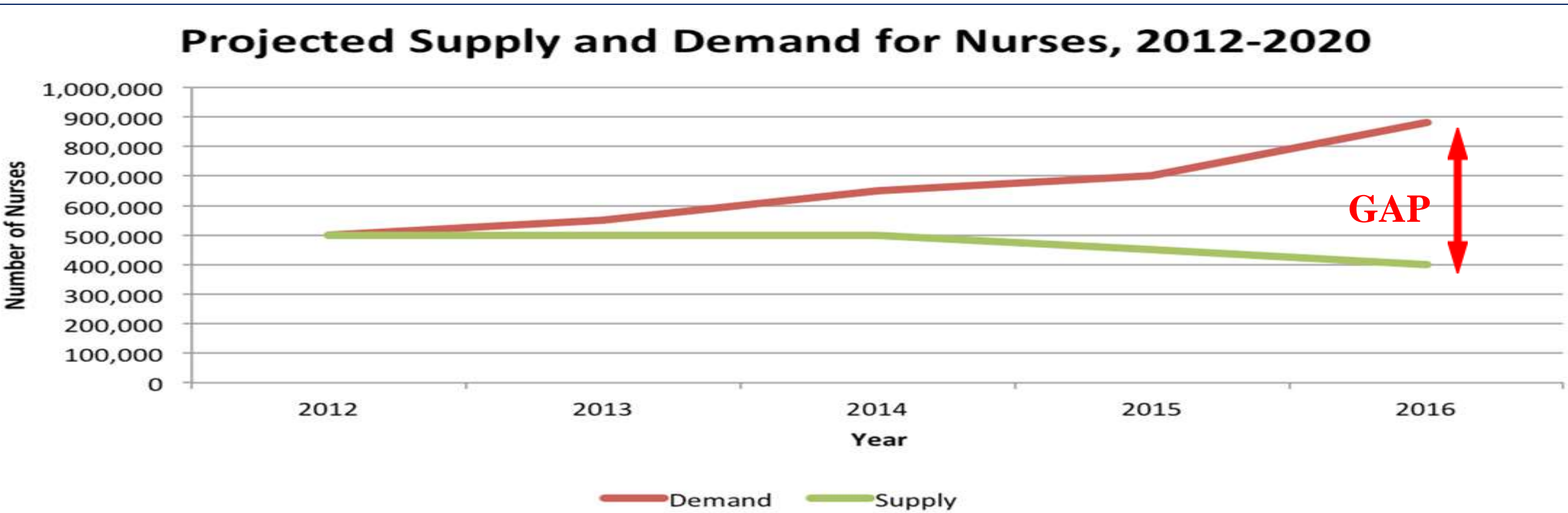


Context & Need Statement

According to the United States census bureau reports, there are currently 10 million Americans who have difficulty with walking. Consequently, the cost of assisted living in the United States is increasing an average of 370 million USD per year (Kaiser Health News 2015) and an expected shortage of 808,000 healthcare assistants are also on the rise (US Department Of Health and Human Services). An innovative solution is required to fill this gap between supply of healthcare assistants and the demand for them.

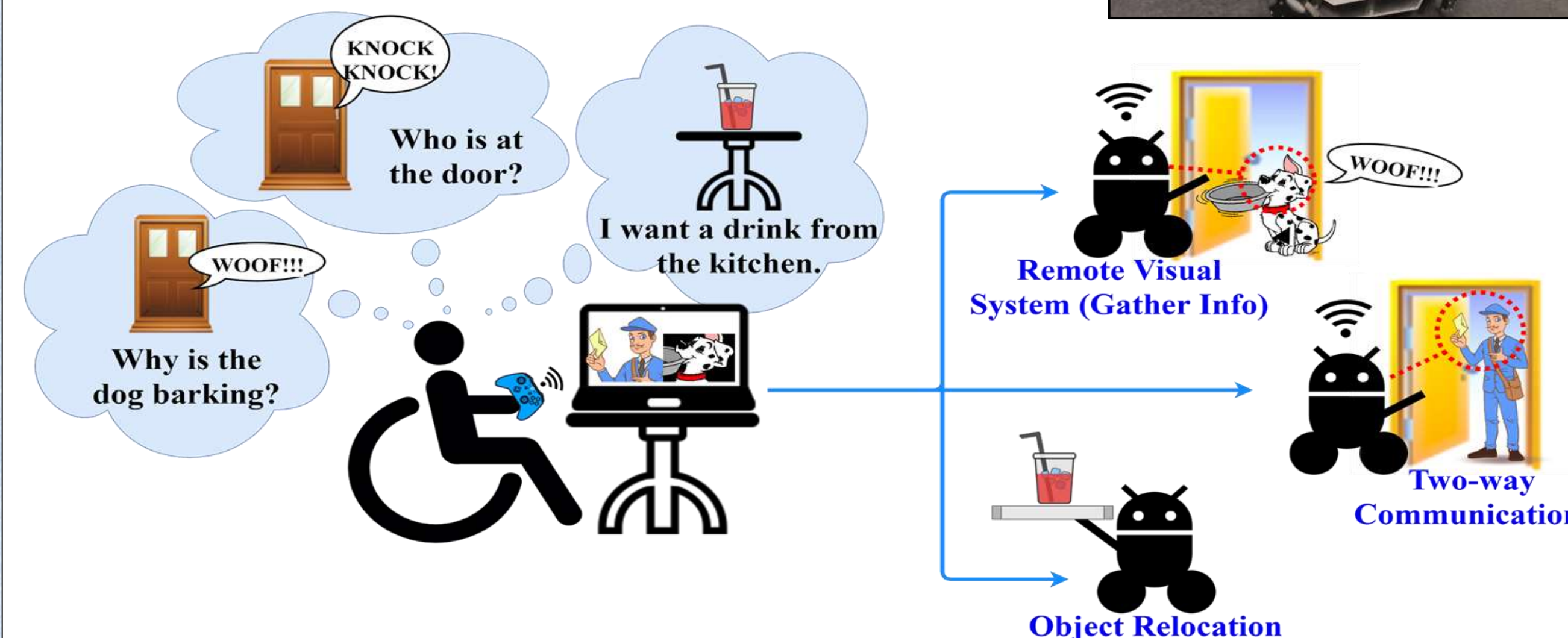


Need Statement

With 10 million people who need mobility assistance, shortage of caregivers, and the cost of assisted living getting higher, there is a need for a system to assist ambulatory impaired individuals with their day to day tasks such as object relocation, remote visual inspection and two way communication.

Concept Of Operations (Con-Ops)

- 1.) The leg-injured user to **provide visual inspection** of his/her home without ever having to physically move around.
- 2.) **Relocate any assets** of his choosing to fit the user's immediate needs.
- 3.) **Allow two-way communication** between the user and other people in the immediate vicinity.



Design of Prototype

Interface				
Category	Weight of Importance	Wireless Controller	Glove Control	Voice Control
Difficulty of Learning	0.4	7	3	8
Multi Directional Control	0.4	10	10	3
User Involvement	0.2	2	3	8
SCORE	1	7.2	5.8	6

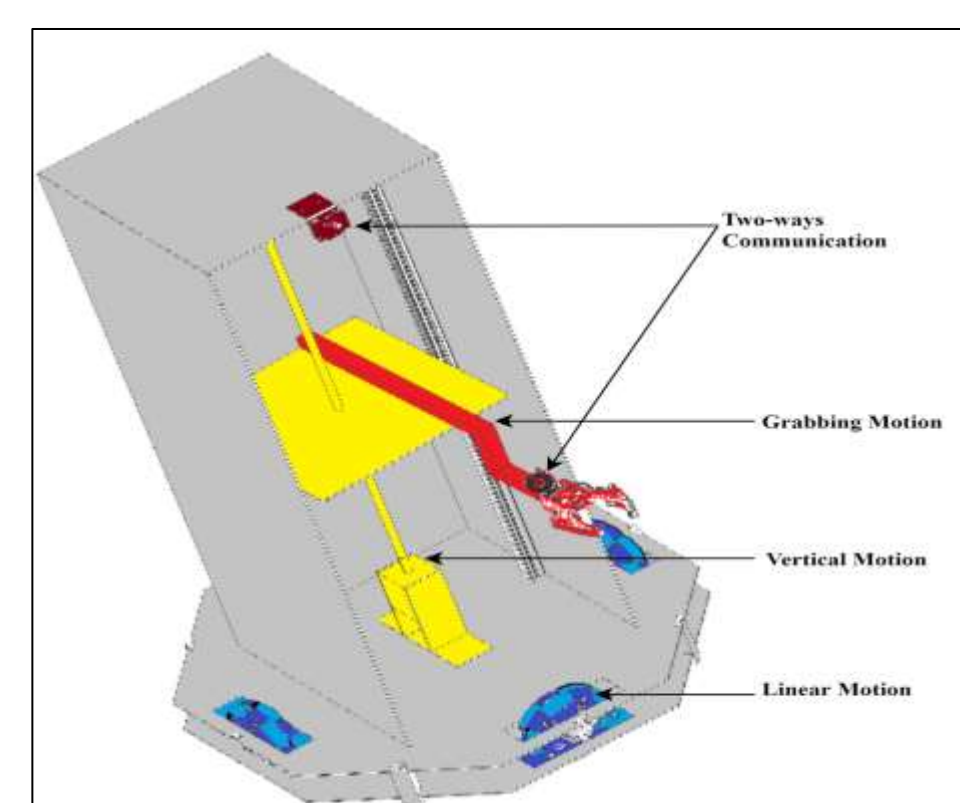
Wheels			
Specification	Dura Omni Wheel	Pneumatic Wheel	Mecanum Wheel
Cost per Unit	\$35	\$37	\$69
Weight	0.99lb	1.13lb	1.3lb
Load Capacity	120lb	120lb	80lb
Frame Material	Black Polycarbonate	Black Polycarbonate	Steel
Roller Material	Nylon	Rubber	SBR Rubber

Elevation Component			
Features	Lead Screw	Ball Screw	Sliding 80/20
Cost	\$70	\$200	\$30
Material	Steel	Steel	Aluminum
Weight	0.6lb	0.5lb	5.5lb
Noise	Quiet	Some noise	Noisy
Load Capacity	54 kg	75kg	200kg

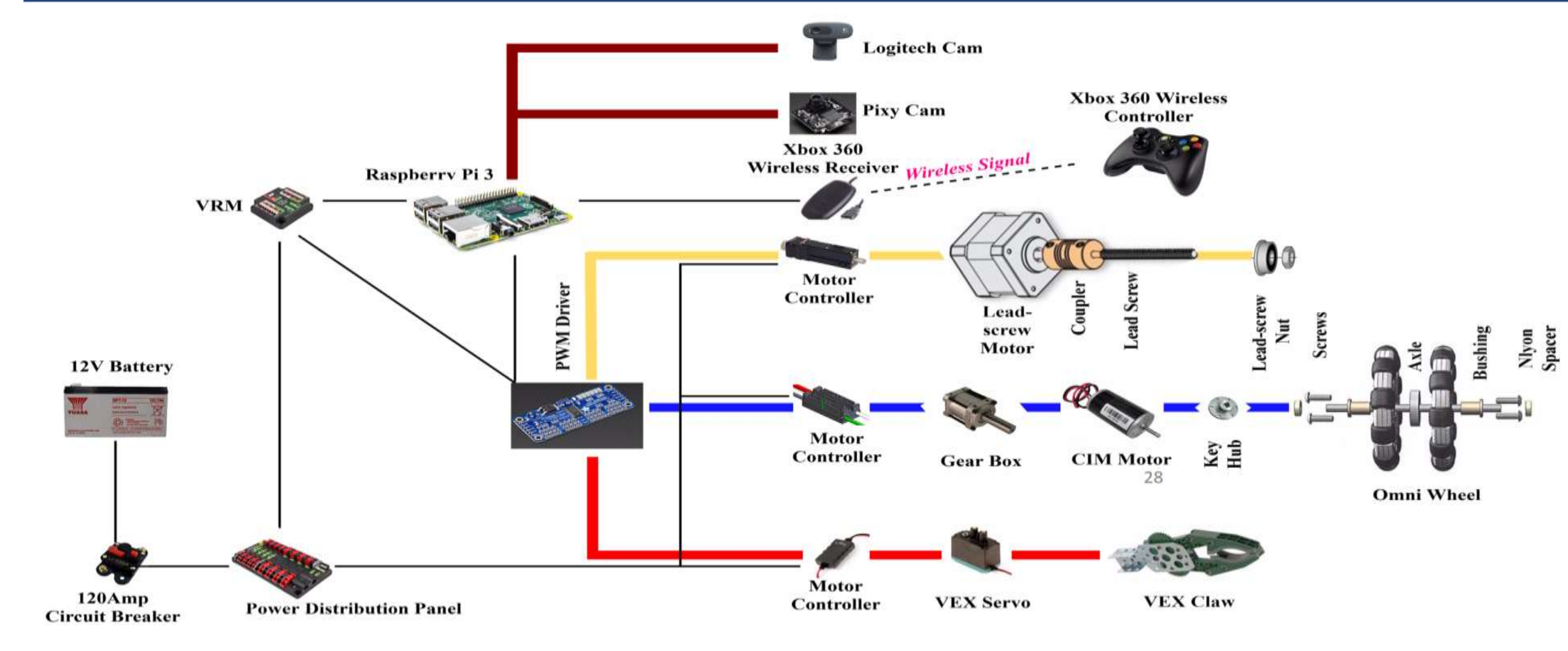
*Higher number preferred

Prototype Detail

- Height: 1.4 m
- Width: 0.7 m
- Weight: 19 kg
- Cost: \$1,675
- Microcontroller : Raspberry Pi 3
- Programming Language: Python
- Time Spent: 8 months



Electrical Components Diagram

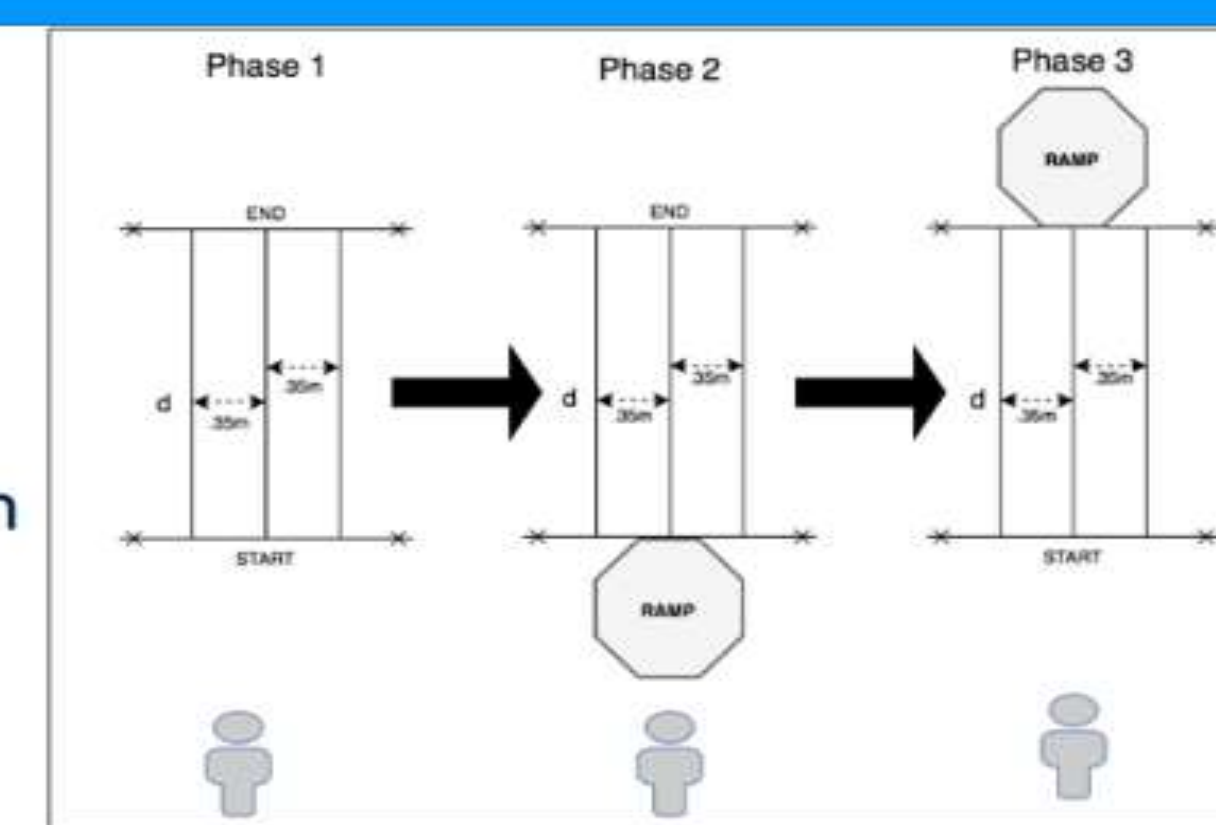


Testing Results

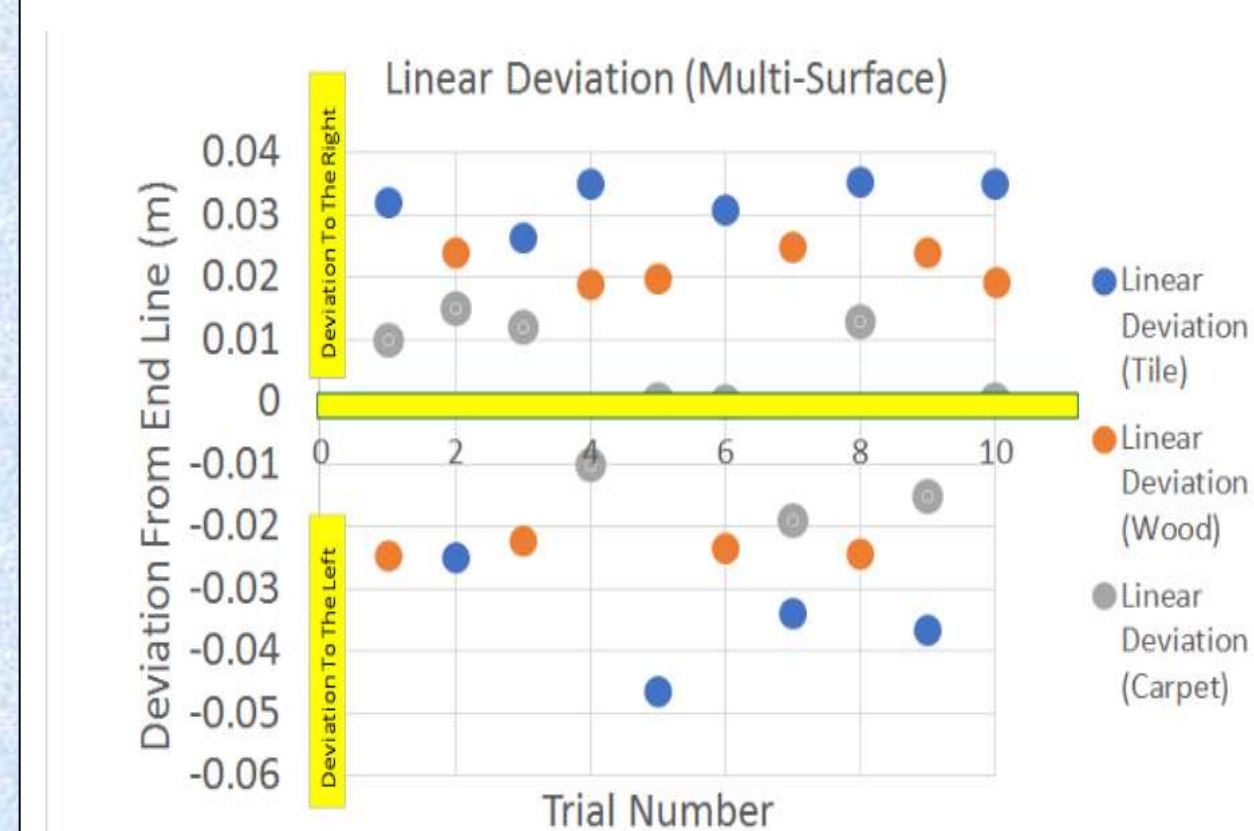
Linear Test - Multi Surface

Objective:

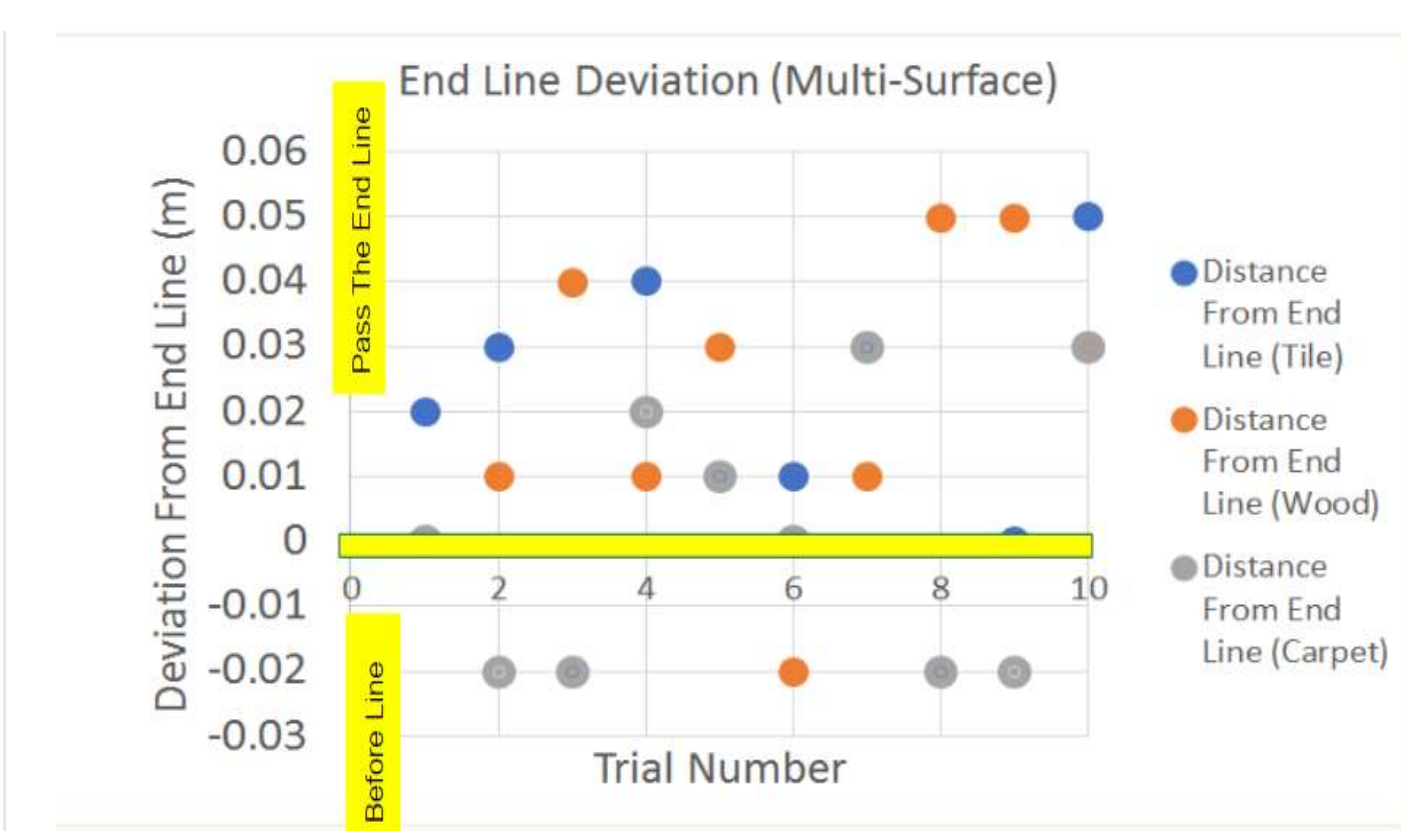
1. To ensure the robotic system can move in a linear direction
2. Measure deviations from the center and upon stopping



Distance From Center - Multi Surface



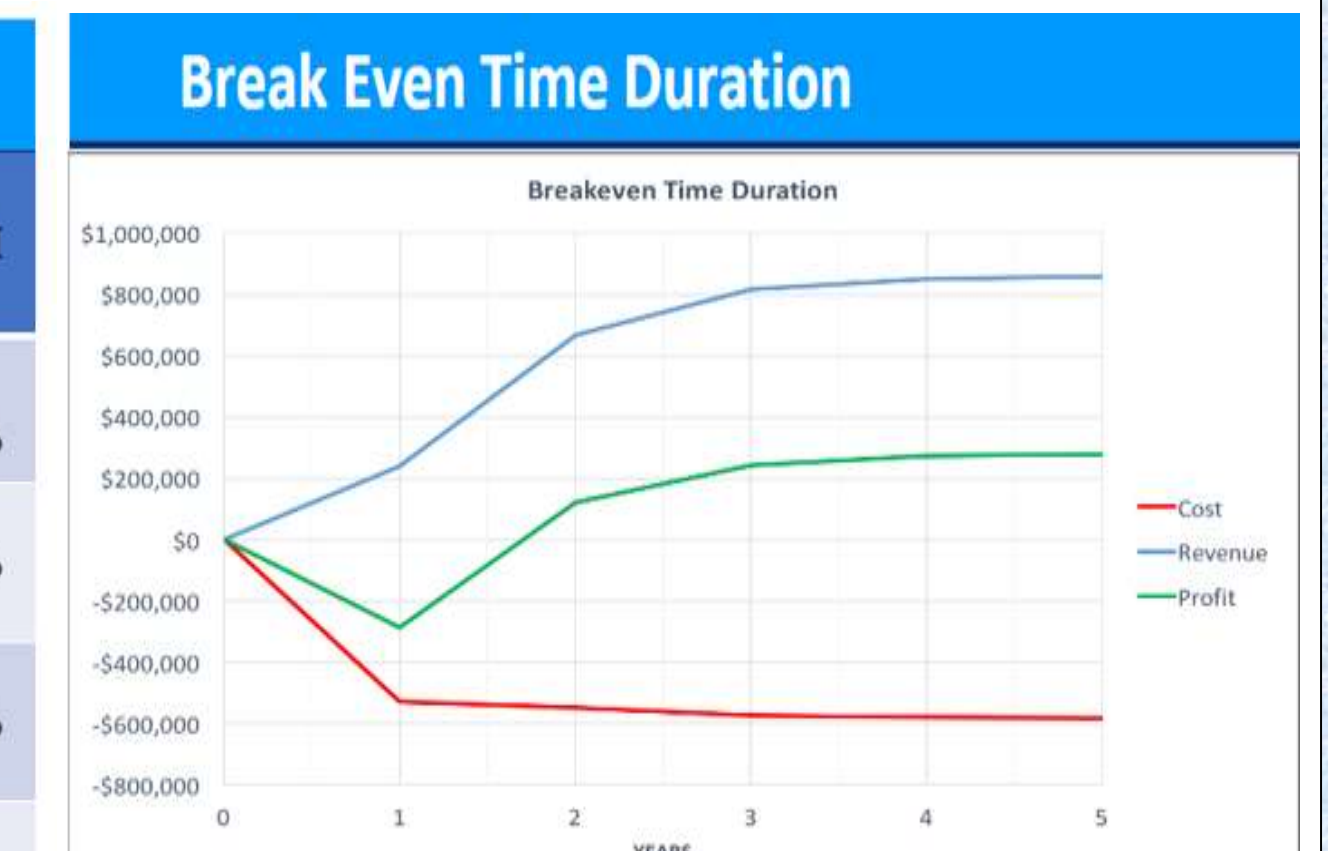
Deviation From End Line - Multi Surface



Business Plan

- Expected to break even in 17 months
- At the end of the 5th year, expected gross profit is \$629,000

Business Analysis						
Year	Cost	Revenue	Profit	# Ramp's Produced	NPV	ROI
1	\$527,000	\$240,000	\$287,000	60	-\$265,741	54%
2	\$546,900	\$668,000	\$121,100	167	\$103,824	22%
3	\$572,800	\$816,000	\$243,200	204	\$193,060	42%
4	\$579,100	\$852,000	\$272,900	213	\$200,590	47%
5	\$580,500	\$860,000	\$279,500	215	\$190,233	48%



Business Case - Profit			
Years	Expected	Optimistic	Pessimistic
1	60	75	45
2	167	209	125
3	204	255	153
4	213	266	160
5	215	269	161

