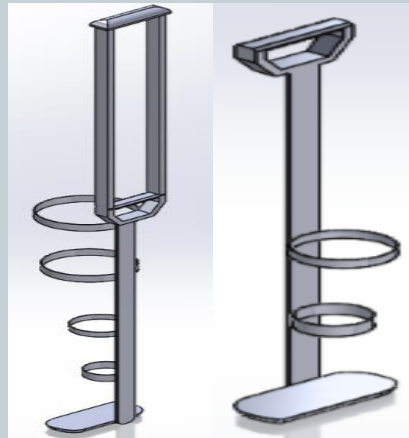




**NORTHERN  
ARIZONA  
UNIVERSITY**



**THE HOPE DEVICE**



**PRESENTED BY:**

**SULTAN ALAJMI, ABDULRAHMAN ALMUQRIN, ALI ALQURAISHI, MOHAMMAD HESHAM**

# Project Description

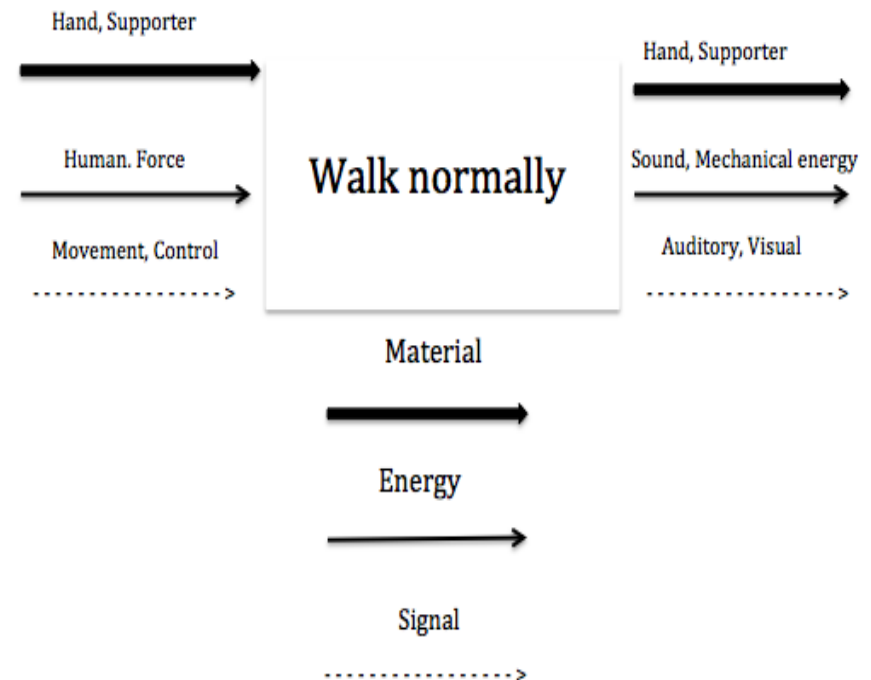
1

- Making supporters for people who has foot paralysis or injured and they are not able to walk. The device will make them able to walk using their hands holding the two different supporters that holds their foot.
- Following stakeholders who have teamed-up to complete current Senior Design- I Project on “*Assistive Device Project for Physically Challenged*” have been acknowledged as the primary sponsors:
  - Dr. Sarah Oman.
  - The Mechanical Engineering Department.

# Black Box Model

2

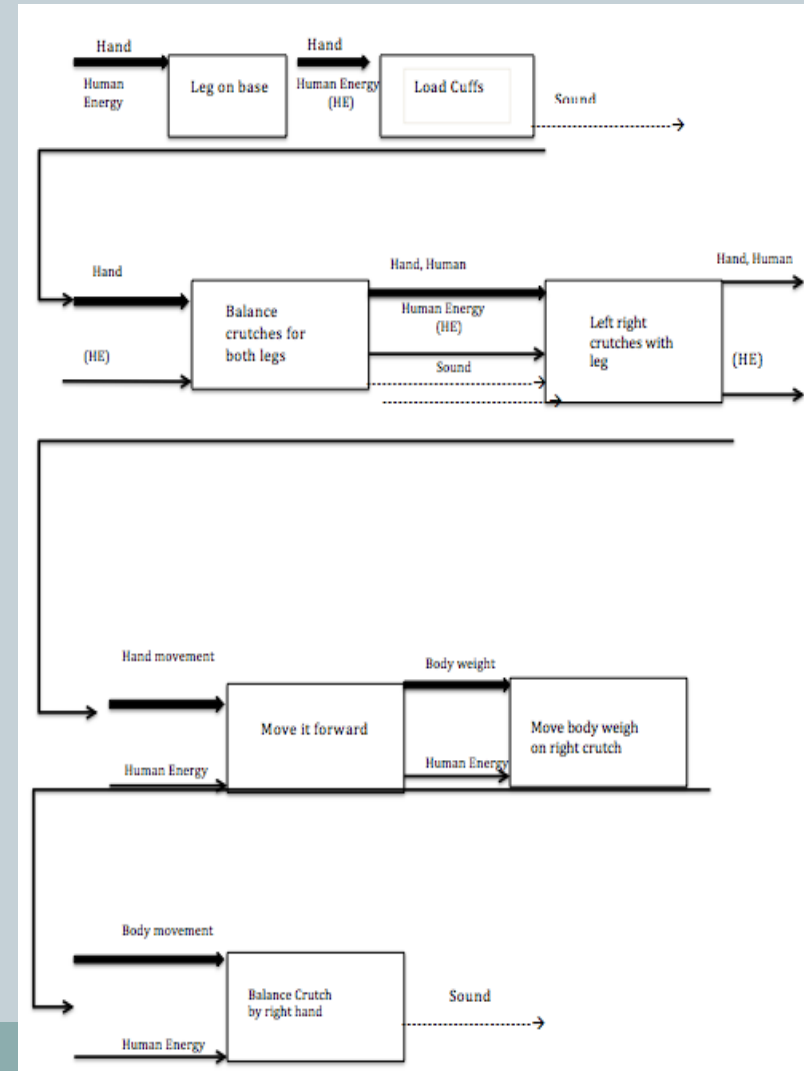
- Shows functionalism of this device .
- illustrates the main function and flows of the device
- function used in the black box model in verb-object form which is “Walk Normally” which can be described as the ultimate function.
- This function is related in one way or another to every customer need gathered previously.



# Hypothesized Functional Model

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- The black box model is essentially a precursor to the hypothesis functional model and as such, illustrates the main function and flows of the device.
- The functional model is indicative of the various functions, sub functions, and flows that this device carries out.
- The functional model will help team to develop the Functional model delta, which will indicate specific functions and/or flows that weren't included in the design that are desired by its customer base.
- functional modeling is a great way to break down a product into functions and flows that are more approachable and more direct to the customer needs which helps in concept generation process.



# Designs Considered Overview

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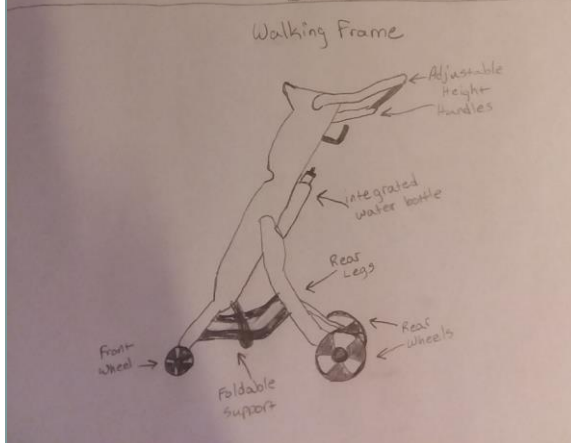
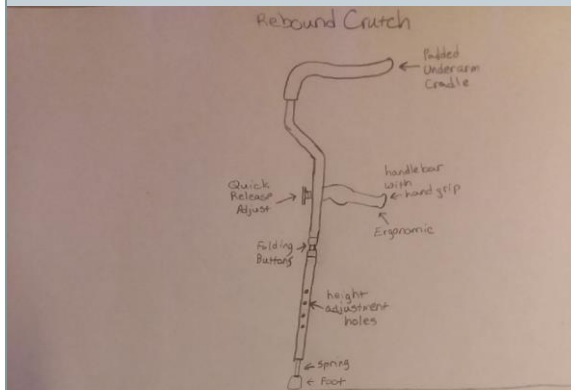


Figure – 1: Rebound Crutch and Walking Frame

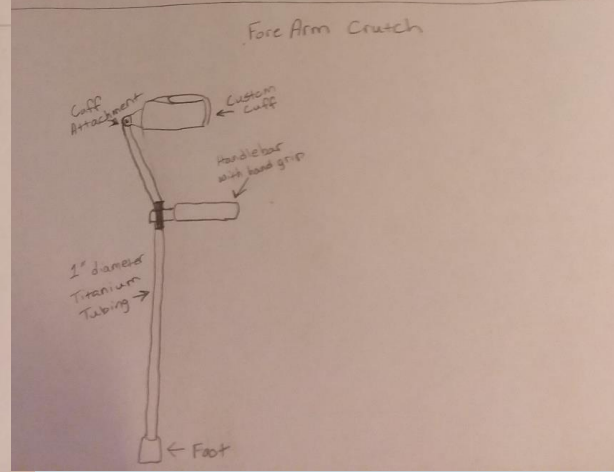
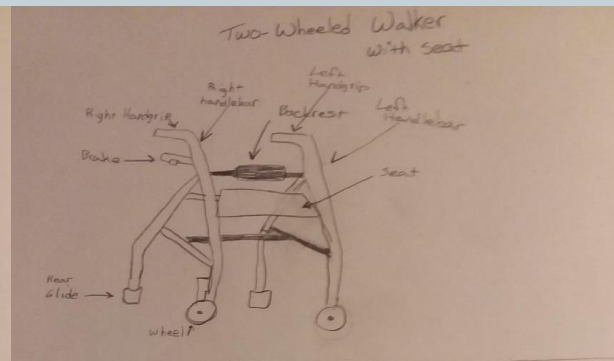


Figure – 2: Two wheeled walker and force arm crutch

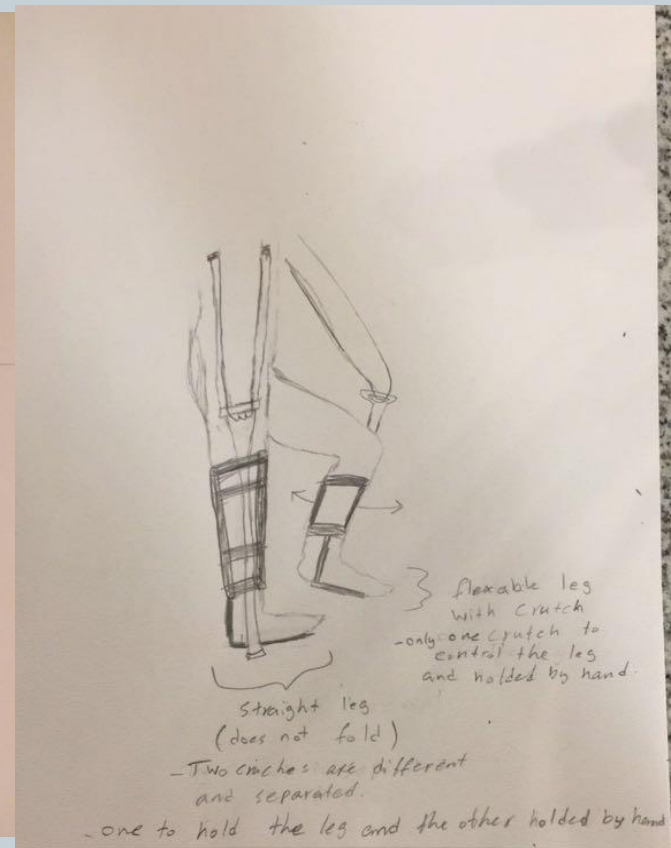


Figure – 3: Main Device

# Advantages/Disadvantages

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- **Rebound Crutch** is easy to use, provide comfort over traditional crutch design and improves the posture of the user. Disadvantage: causes armpits to be rubbed raw and they can cause major wrist pain.
- **Walking frame** designed with adjustable height handles and supportive mechanics which helps relieve stress and pain in the back. Disadvantage is the cost as it has an expensive prices and most people prefer cheaper option.
- **Two wheeled walker** offers using wheels to make walking smoother as well as a seat to sit when you are tired. Disadvantage : It is difficult to use for some people who stand at full height the wheel can spin out of control which cause accidents.
- **Force arm crutch** provides more ergonomic position the hand and wrist also improves agility and walking speed. It can be difficult to use in rainy or snowy weather as it relies on user strength when using it.
- **Main device** provides comfort, light weight and convenience for the user. Disadvantage: Depends on body weight and height which could be inconvenience for some people to use.

# Pugh Chart

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- The Pugh chart is the tool that analysis the designs below which are manual method, morph concept and bio inspired design.
- Pugh chart is important tool for designing project as it points the importance of sum the criteria for each design and analyzing each one.
- It also gives the team members the insight to analysis the application of the criteria for the three designs in this Pugh chart.

Criteria	Manual Method			
	Ali	Abdulrahman	Mohammed	Sultan
concept				
Cost	+	-	-	-
Durable	-	-	S	-
Aesthetics design	-	+	-	+
afordable	+	+	+	+
safety	S	S	+	+
stable	S	+	-	S
Sum +	2	3	2	2
Sum -	2	2	3	3
Sum S	2	1	1	1

# Decision Matrix

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- The decision matrix was done by assuming the four designs below which are Ali manual method, Abdulrahman bio inspired, Mohammad Morphological concept and Sultan manual method.
- The ranking estimated to be from 0 to 100. On the other hand, weigh estimated to be from 0 to 1.
- This decision matrix showing the evaluation for these designs below and A.M.M got the highest ranking which is 93.33 and M.M.C got the lowest ranking which is 90.83.
- Decision matrix helped the team to point the best design that we can propose and prevent proposing the other designs which saves the team time and work.

		A.M.M	A.B.D	M.M.C	S.M.M
Criterion	weight				
Cost	0.13	90	85	95	90
Durable	0.17	95	100	80	80
Aesthetics design	0.17	80	100	95	95
afordable	0.18	100	95	90	100
safety	0.17	100	90	95	95
stable	0.18	95	85	90	90
Total	1	93.33333333	92.5	90.83333333	91.66667
Relative Rank	1_4	1	2	4	3



# Meeting Customer Requirements

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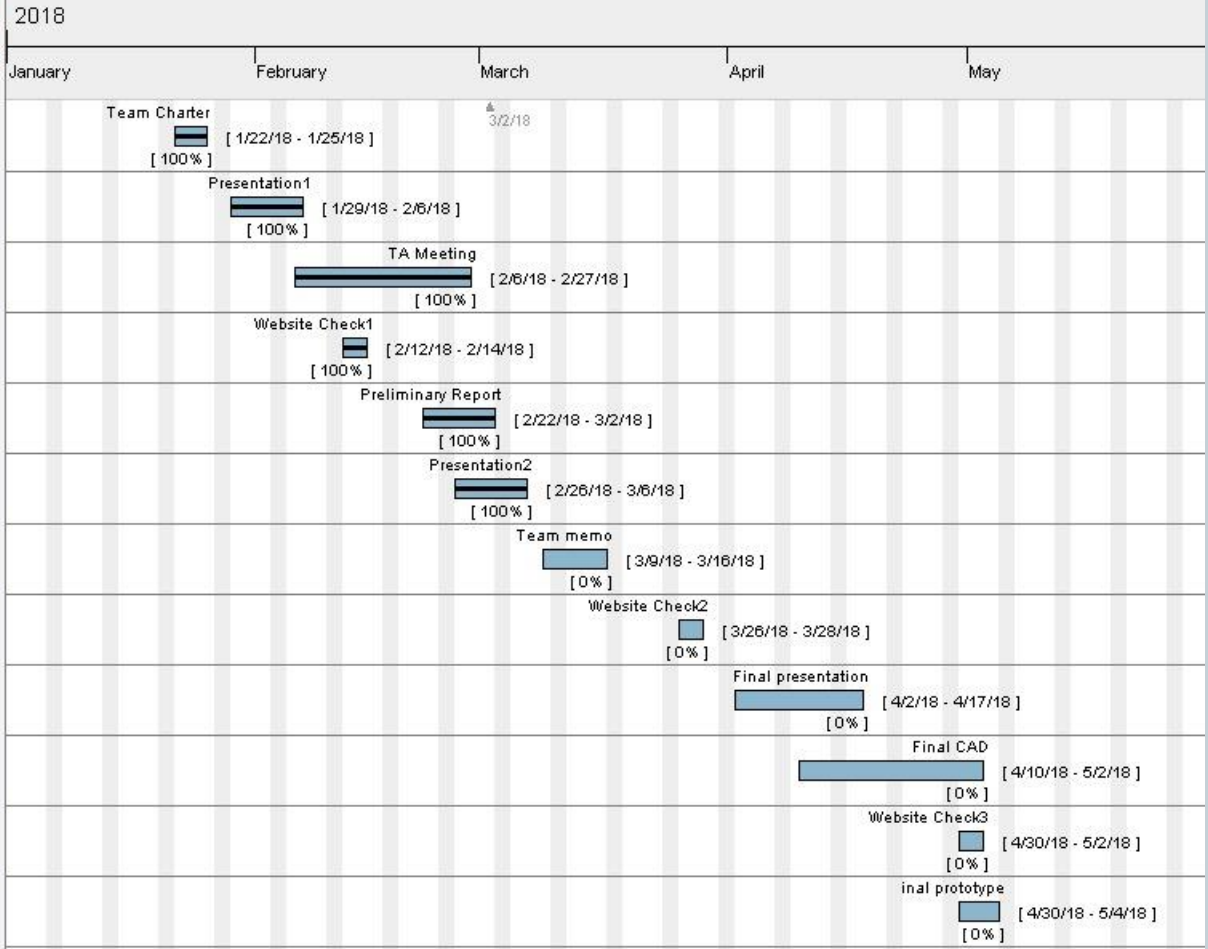
- It has light weight which didn't exceed 5kg.
- Contains comfort and convenience for the user.
- Affordable.
- Convenience cost for manufacturing and repair parts.

# Gantt Chart

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Name	Begin ...	End date
• Team Charter	1/22/18	1/25/18
• Presentation1	1/29/18	2/6/18
• TA Meeting	2/6/18	2/27/18
• Website Check1	2/12/18	2/14/18
• Preliminary Report	2/22/18	3/2/18
• Presentation2	2/26/18	3/6/18
• Team memo	3/9/18	3/16/18
• Website Check2	3/26/18	3/28/18
• Final presentation	4/2/18	4/17/18
• Final CAD	4/10/18	5/2/18
• Website Check3	4/30/18	5/2/18
• inal prototype	4/30/18	5/4/18



# Budget

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- Prototype (\$25 - \$100)
- Actual Device (\$200-\$400)