Power grabber handle

Group Z-13

Agenda

- Initial project plan
- Prototype 1 + Client feedback 1
- Prototype 2
- Plan for client meeting 3

Problem statement

The client requires a powered device which attaches onto a sturdy, user friendly and lightweight grabber reacher, and would permit users with low grip strength to use it adequately.

Customer needs

- The handle can support the user to grab larger, heavier objects (water bottles) as well as smaller objects
- The handle can support gripper to hold on an object
- The force the handle provides can be controlled to prevent the gripper from destroying fragile objects.
- The handle must be properly fixed on the grabber handle
- The weight should be as light as possible
- Touch sensitive button or activation mechanism (does not need too much force to activate it)
- Wrist protection for user safety and support.
- The size should be between 16 and 20 inches (approximately 0.41m–0.51m)
- Buttons with adjustable positions (to meet users in different situations)
- Features like flashlight, audio control

Target specifications

The target specifications were determined after summarizing the client's needs following the first client meeting.

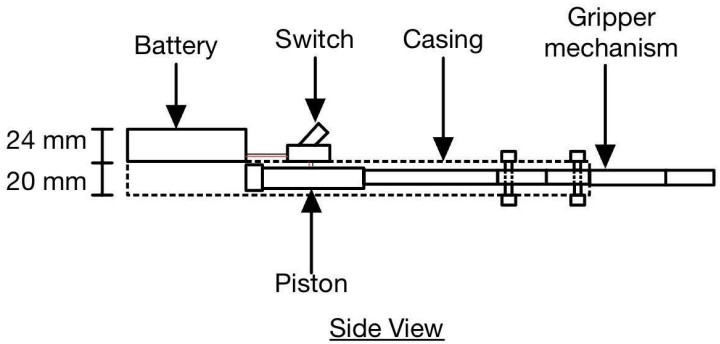
#	Metric	Units	Value
1	the length of handle	m	< 0.508
2	The weight of handle	kg	< 3
3	Maximum load of the grabber	kg	> 1
4	Gripper as a percentage of the entire handle	%	< 20
5	trigger angle to horizontal part	degree	> 30
6	The force needed to press the trigger	N	< 10
7	Budget	CAD	< 100
8	The size of wrist protection	m	< 0.3
9	The size of the object that can be held	m^3	<0.006

Benchmarking

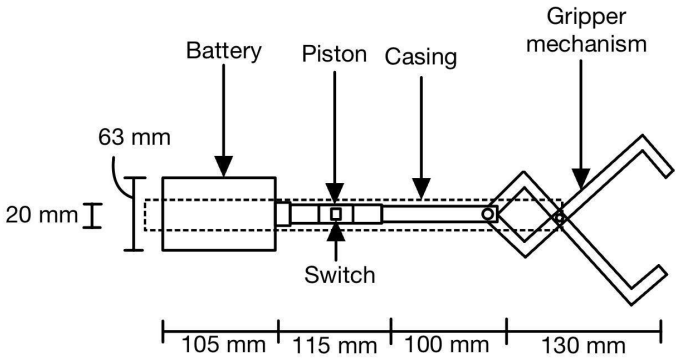
Three different existing grabber tools were benchmarked:

	Pro trash picker [1]	Jadd's grabber	Stainless Steel Grabber reacher [2]
Image			
Price ($)	130	20	60
Size (cm)	244	75	70 to 150
Weight (kg)	0.66	0.155	0.3
Gripper capacity (kg)	4.5	2	13
Gripper activation	Manual	Manual	Manual

Initial chosen Concept



Side View



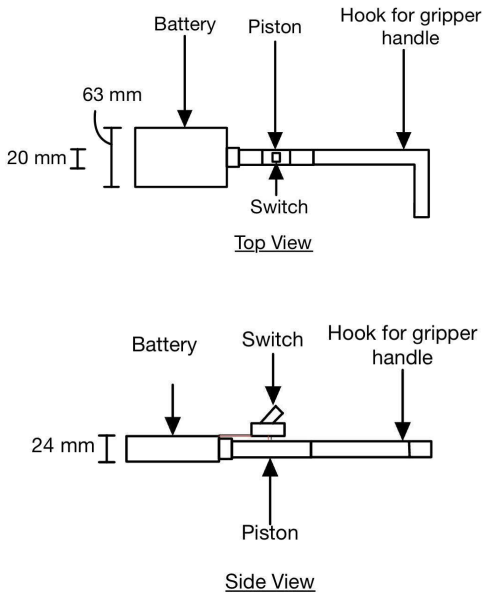
Top View

First prototype

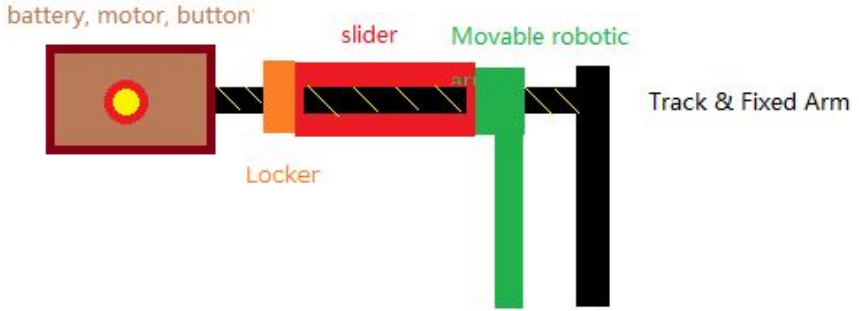
Client feedback

- Agrees with the functional decomposition
- More looking for a device that assist the user pressing an existing gripper
- Make adjustments based on current existing concept/prototype

Revised concept



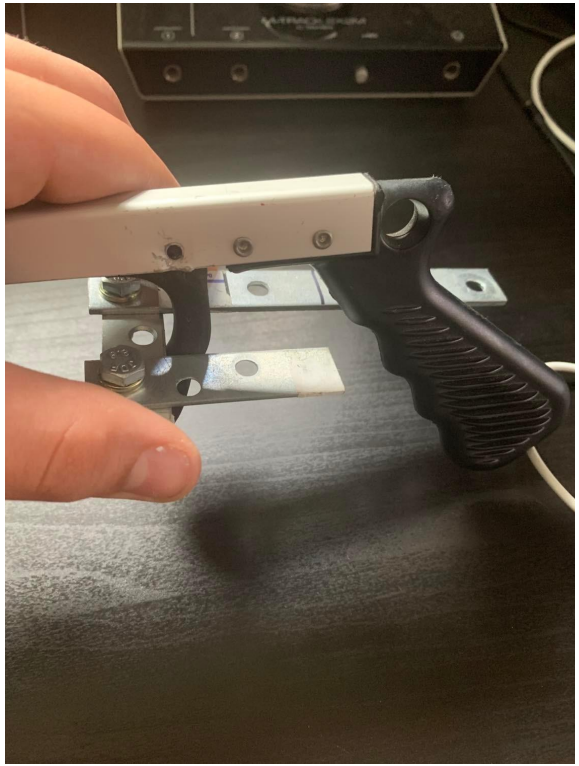
Updated concept



New possible concept

Revised hook prototype

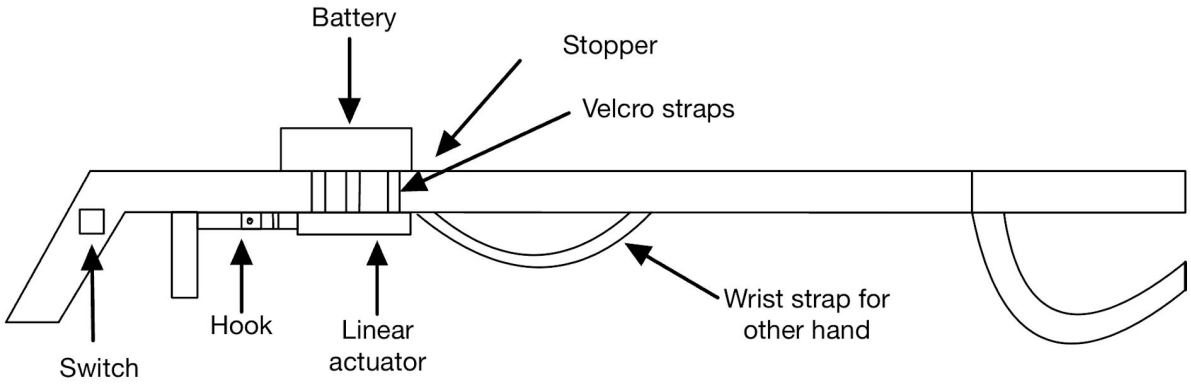
- Problem
  - Mechanism would need to fit behind handle
    - Isn’t optimal positioning - Takes away gripper handle
    - Not enough mounting points behind gripper handle
  - Metal/bolts is heavy
- Solution
  - Repositioning of mechanism
  - 3D printed hook made of plastic (lighter)
  - Gripper handle is free



Decision matrix

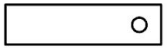
Criteria	Weight	Updated concept		New concept	
Length of grabber	3	2	6	2	6
Weight of handle	2	2	4	1	2
Maximum load of the grabber	5	2	10	2	10
Gripper as a percentage of the entire handle	2	2	4	1	2
Adjustability	4	2	8	1	4
The force needed to press the trigger	5	2	10	2	10
Budget	2	2	4	2	4
Universality of design on different grippers	4	2	8	1	4
The size of the object that can be held	5	2	10	1	5
Total			**64**		**47**
Rank		**1**		2	

Updated concept

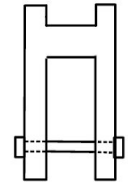


Side view

Hook

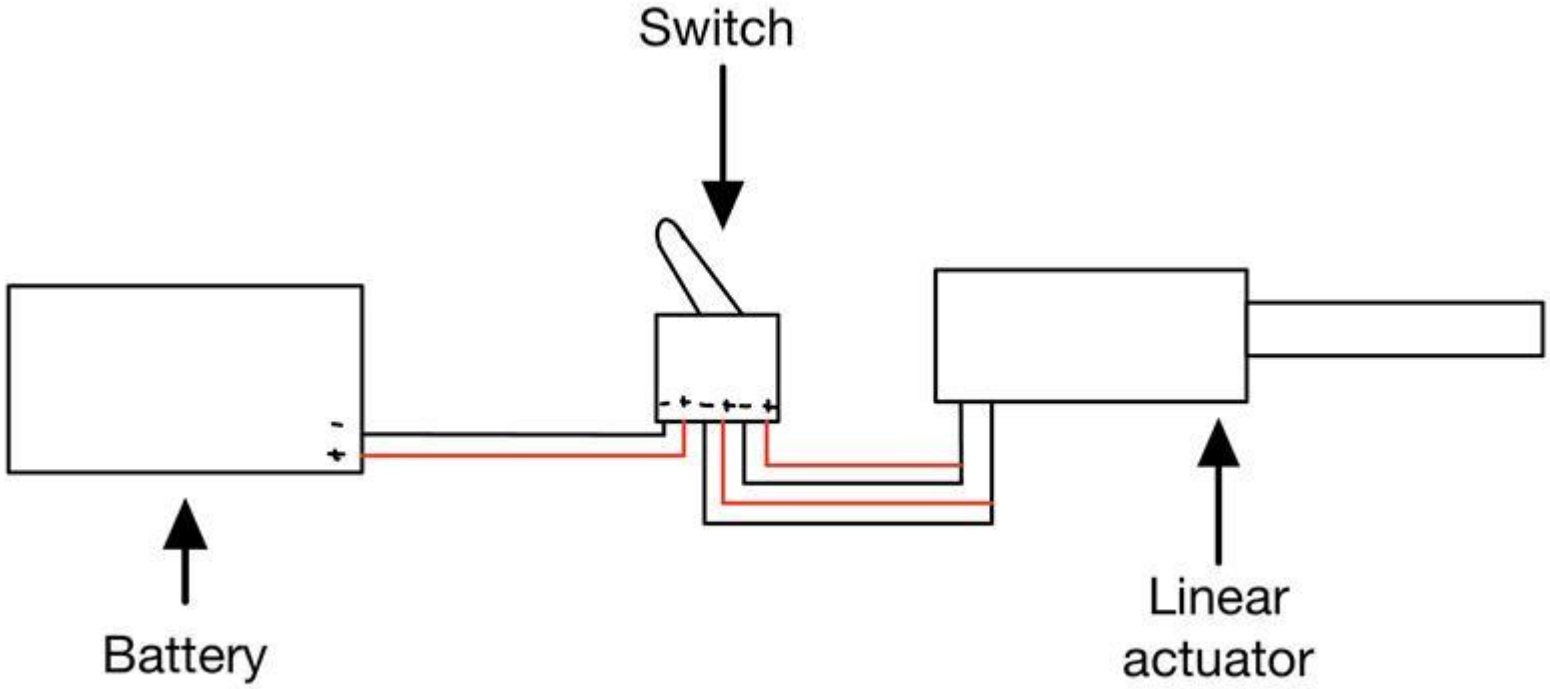


Side view



Front view

Wiring diagram



Bill of material

Item number	Part name	Description	Quantity	Unit cost ($)	Extended cost ($)
1	Micro Linear Actuator	Linear actuator	1	38.55	38.55
2	12V Battery	12V battery	1	48.00	48.00
3	Motor toggle switch	DPDT switch	1	19.98	19.98
4	Plastic	3D printed hook 3D printed mounts (Battery + Linear actuator)	1	N/A	N/A
5	Velcro All-Purpose Straps	Velcro straps	3	11.26/2 straps	11.26
6	Velcro All-Purpose Straps	Wrist strap	1	11.26/2 straps	11.26
				Total	129.05

Prototype plan

- Get parts from bill of materials
- Test the wiring and make sure it works properly
- Get measurements of the gripper and the different components
  - 3D print the mounts and the hook
- Attach prototype on chosen gripper
- Analyse, test and re-adjust our prototype

Next client meeting plan

- Show customers our updated concepts and collect customers' feelings and suggestions

- Ask the client these questions
  - Does this design meet your requirements?
  - Do you like our design?
  - Does the idea needs to be improved on?