

Detangulator 5000

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Problem Statement

Our client with cerebral palsy has trouble applying hair detangling spray across all her hair, from a proper length, when getting ready in her room. Our solution should provide her with a greater sense of independence and agency from her mother who usually helps her in this procedure, allowing her to dictate the flow of her morning routine.

Market Research



Battery
Powered
Sprayer



Remote
Trigger
Sprayer



Litter
Picker

Our group conducted market research by exploring electronic and mechanical solutions that help users reach hard-to-reach areas and improve button actuation. We examined battery-powered sprayers for efficiency, extension tubes for expanding spray reach, and litter pickers for mechanical extension.

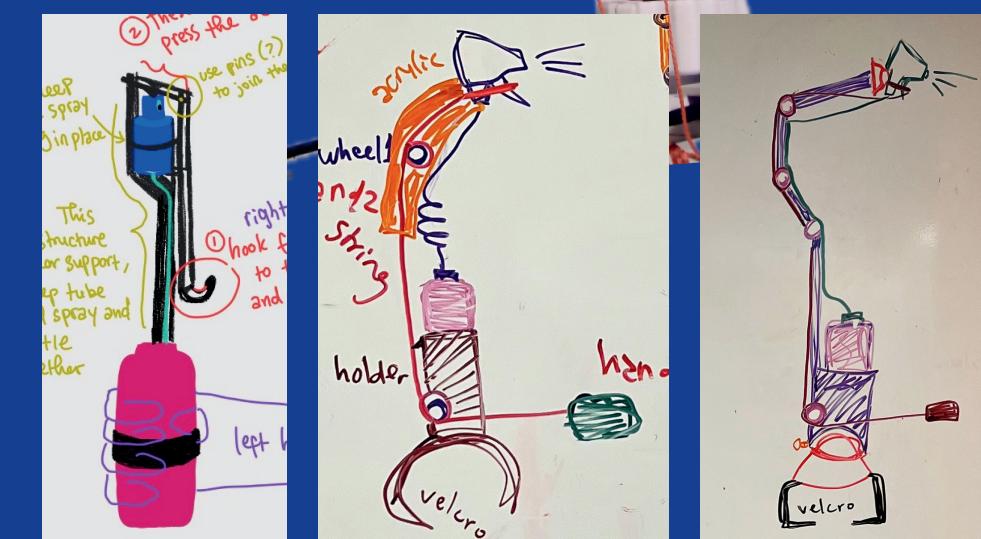
User Needs & Engineering Requirements

User Need	Metric	Units	Marginal value	Ideal value
Low force actuation	Actuation force	N	3N (~ 0.7lbf)	1N (~ 0.3lbf)
Nozzle maneuverability	Nozzle distance from chair	m	0.08m (~ 3in)	0.15m (~ 6in)
Lightweight	Weight	kg	3kg (~ 6.6lb)	1.5kg (~ 3.3lb)
Good spray coverage	Area per Spray	m ²	0.002 m ² (~ 4 in ²)	0.003 m ² (~ 5 in ²)
Simple operation & Legibility & Easy to assemble and store away	Time to setup and use (first use)	seconds	120s	30s
	Number of Steps for Use	steps	3	1
No leakage	Volume leaked	mL	0	0



From the start, our general idea was to keep the spray bottle as close to the client's body as possible by using extension tubes to transport the spray fluid to a targeted area and have the trigger mechanism can be operated from close to her body due to her limited arm strength.

As shown in the sketches, our group was examining different nozzles and support structures to extend reach and reduce the force of actuation.



Sketches

Prototypes



First Prototype



Second Prototype

- Battery-powered
- Ball & Socket joint base
- String pulling mechanism
- Tube extension
- Velcro strap

Future Directions

- Compact, lightweight assembly: Easier to move and adjust.
- User-friendly nozzle: Less mechanical, friendlier appearance.
- Better fabrication tolerances: Smoother, more durable operation.
- Flexible mounting: Attach to chair frame or table edge.
- Remote/button actuation: More intuitive and accessible.