



Improved Dog Grooming Tool

Team 17

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ETG
Engineering To Go

Background

The current process used to brush and remove mats from a dog's fur is difficult, time consuming, and stressful for both human and dog.



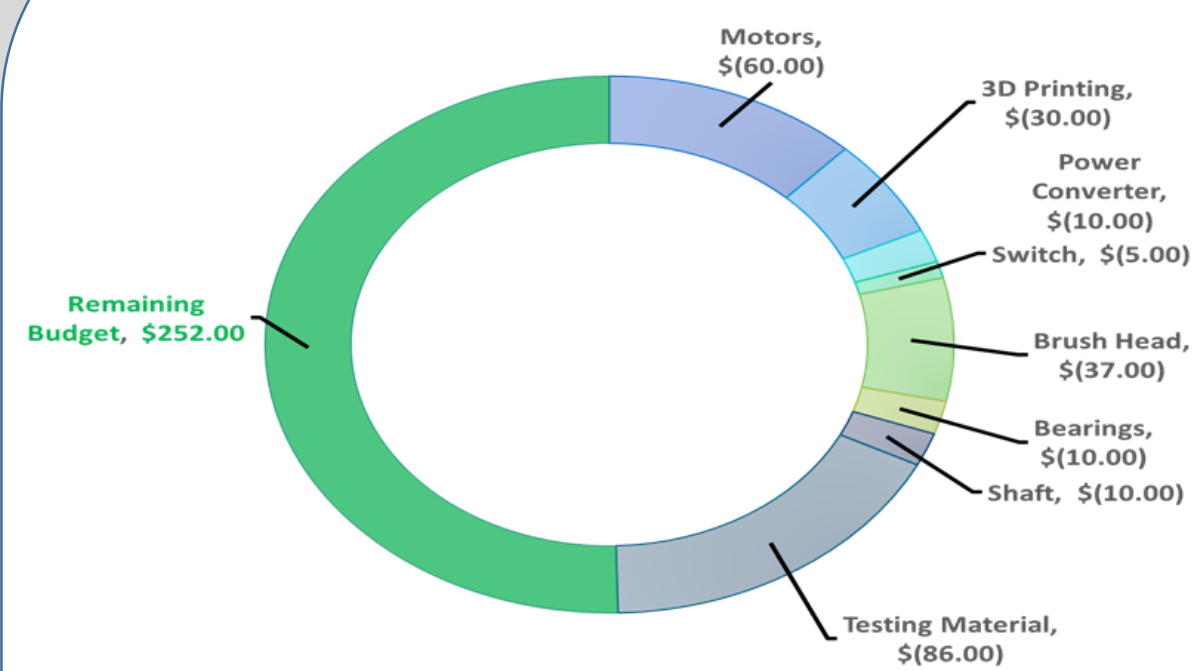
Objective

To design a rotary grooming tool for dog groomers and owners that will untangle, de-mat, and smooth dog fur. The tool must be stress-free for the dog and for the user

Design Constraints

- Tool must be hand-held and ergonomic
- Tool must be easy to clean and sterilize
- Total weight must be ≤ 1 lb
- Must be able to operate at least 2 hours
- Tool must be quiet when used

Budget Breakdown



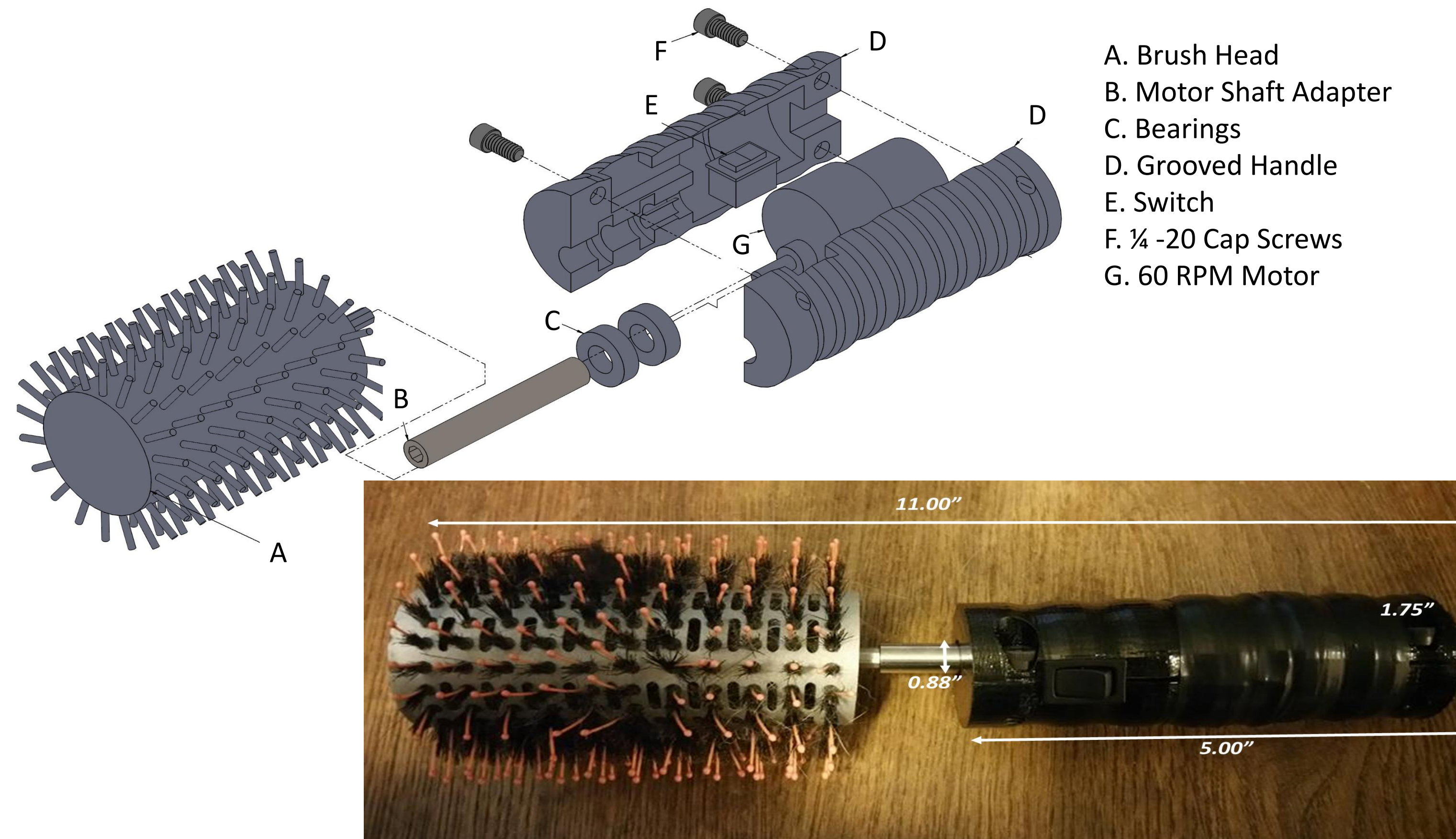
Prototype Cost

BRUSH COMPONENT	COST
MOTOR	\$16
SHAFT	\$10
BEARINGS (2)	\$10
BRUSH HEAD	\$9
HANDLE	\$30
POWER CONVERTER	\$10
SWITCH	\$5
TOTAL	\$90

Acknowledgements

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- Dr. Hrua has been helpful with advice and council to gain a better understanding of what tasks need to be accomplished
- Team 17 would like to express in gratitude to its team sponsors, William Bilbow and Todd Hopwood, for their support both financially and throughout the preliminary design and planning process.

Final Design



- A. Brush Head
- B. Motor Shaft Adapter
- C. Bearings
- D. Grooved Handle
- E. Switch
- F. ¼ -20 Cap Screws
- G. 60 RPM Motor

Brush Component Specifications

Brush Motor

- Hossen 12 V DC
- Torque: 2.66 in-lbs
 - Voltage: 12 V
 - Diameter: 1.46 in
 - Length (excluding shaft): 1.85 in
 - Shaft Length: 0.827 in
 - Shaft Diameter: 0.236 in
 - Weight: 4.87 oz

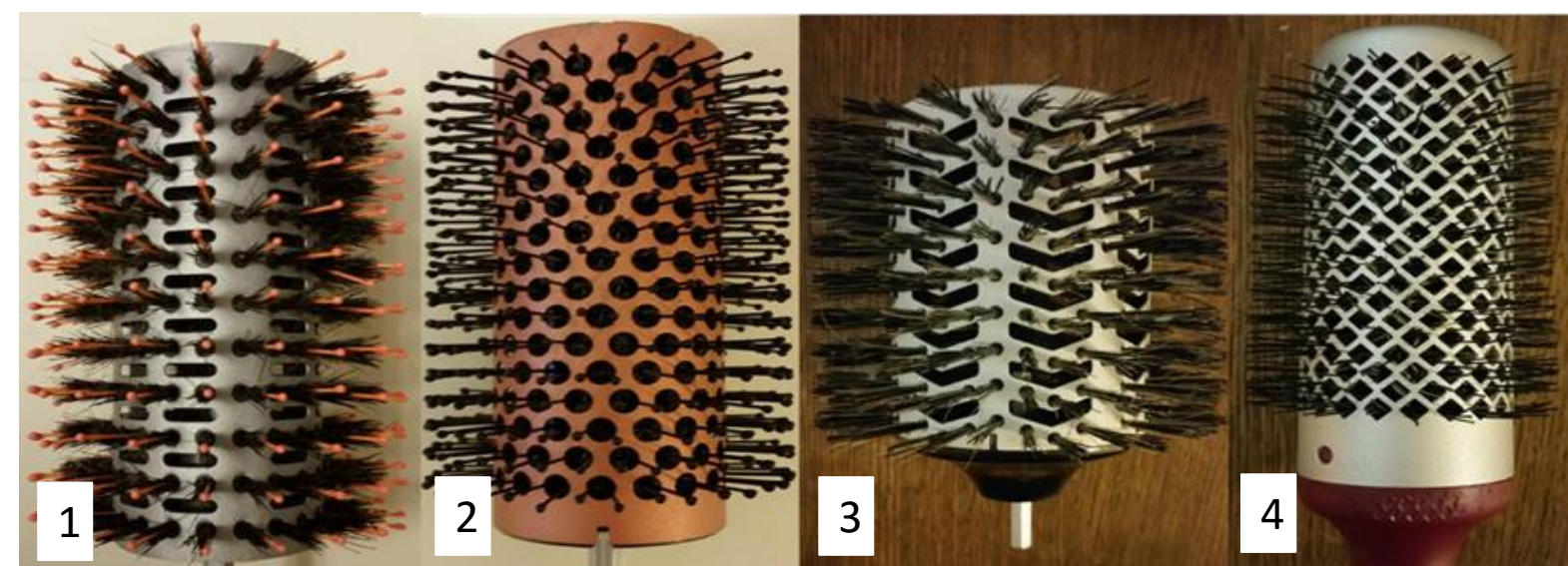


Brush Handle



- 3D Printed ABS Plastic
- Houses all internal electrical components
- Length = 5.00 in
- Diameter = 1.75 in

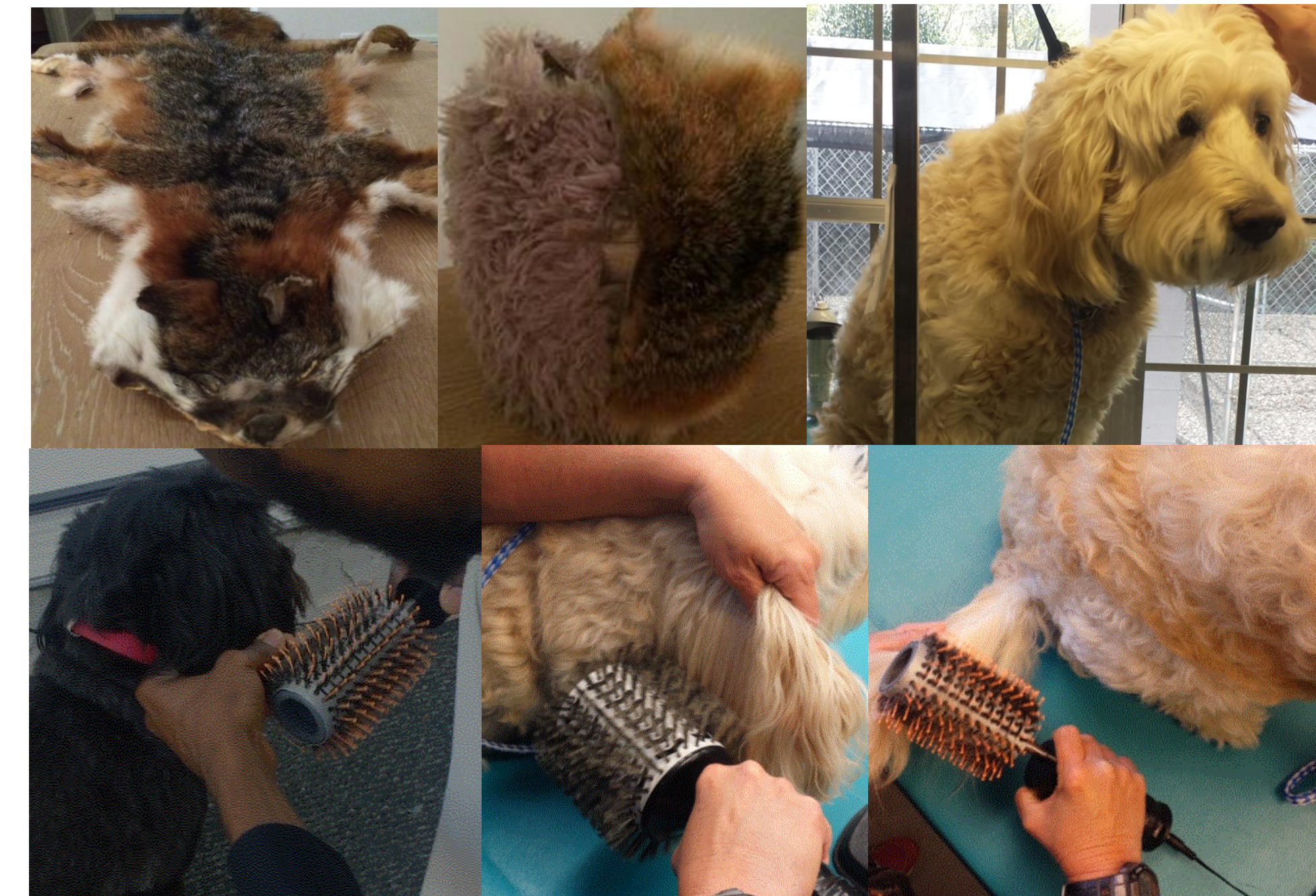
Brush Head



Brushes	1	2	3	4
Diameter (inches)	1.9	1.7	3.2	1.7
Length (inches)	5	4.8	4.2	4.5
Weight (ounces)	4.7	3.7	7.17	1.8
Bristle Material	Hog Hair Plastic	Plastic	Hog Hair	Plastic

Testing/Analysis

Testing Material/Process



Test Conducted	Purpose	Results
Motor Stall Force	Calculate max applied tangential force where motor stalls	22.5 lbs
Required Brushing Force	Determine the approx. force used to pull manual brush through fur	≤ 1 lbs
Shaft Bending Moment	Calculate max applied bending force that shaft would encounter	Static: 8.4 lbs Dynamic: 25.7 lbs
Brush Head Dimensions	Determine optimal brush head diameter and length	3 in. \leq Length \leq 6 in 1.75 in. \leq Length \leq 4 in
Bristle Deflection	Calculate how much each bristle would deflect when force applied	Displacement = 0.183 in Angle = 15.6 deg
Bristle Design	Determine how well stiffer metal bristles handled fur	Bristles tend to grab and pull hair without release
Brushing Effectiveness	Compare prototype and manual dog brush to determine the more effective	Brush successfully smoothed and straightened dog fur
De-Matting Effectiveness	Determine how effective the rotating brush head is at removing mats from fur	Brush could not break up deep mats, but was successful at removing mats on fur surface

Future Work

- Build three additional final prototypes for distribution
- Distribute final improved brush final prototypes to select groomers and dog owners
- Develop business model and marketing strategy
- Develop method for improved de-matting tool