Figaro-tresses: a dataset for evaluating hair assembly features before and after cosmetic treatment

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Data Article

Article Title

Figaro-tresses: a dataset for evaluating hair assembly features before and after cosmetic treatment

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Abstract

The published database is composed of 1,080 images taken from 120 hair tresses made of medium blond, fine Caucasian hair with the aim to facilitate quantitative and qualitative studies about shampoo and conditioner efficacies. Two types of hair tresses were used: Caucasian hair which had not been subjected to oxidation with bleaching agents – *virgin* (60 tresses); and Caucasian hair, previously subjected to light oxidative bleaching – *lightly bleached* (remaining 60 tresses). Since cosmetic products such as shampoos and conditioners are often designed to subtly augment hair assembly features via the carefully balanced cumulative effects of deposited actives, each tress was subjected to consecutive washing+conditioning+drying cycles referred to as *cosmetic treatment*. The shampoo and conditioner used for this project were specifically selected for their suitability for fine hair. Each tress was photographed at three different time-points: before the cosmetic treatment; after two cosmetic treatments, and after an additional third cosmetic treatment. At each time-point, each tress was photographed from three different angles (-45, 0, and +45 degrees), resulting in a total number of nine images for each tress. For each image in the database, we also provide a corresponding hair segmentation mask, which identifies the hair location area in the original image.

Keywords

Hair, cosmetics, shampoo, conditioner, hair assembly, hair tresses, hair fibre

Specifications Table

Subject	Cosmetic Science, Hair science, Image Processing
Specific subject area	Quantitative analysis of hair tresses before and after cosmetic treatment
Type of data	Images
How data were acquired	Reflex camera at a fixed distance of approximately 30cm, from 3 different angles (-45, 0, 45 degrees)
Data format	JPG (raw) PNG (processed)
Parameters for data collection	Camera illumination, background colour, subject variety
Description of data collection	Hair images were collected from 120 hair tresses, each one photographed at 3 time-points (t0, t1, t2) from 3 different angles (-45, 0, 45 degrees), thus generating a total of 120x3x3=1,080 hair photographs. For the purpose of this project, the term “cosmetic treatment” refers to a cycle of washing +conditioning+ drying a hair tress using a duo of shampoo and conditioner, performed under controlled conditions. t0 = no cosmetic treatment has been applied; t1 = two consecutive cosmetic treatments have been applied t2 = three consecutive cosmetic treatments have been applied. The corresponding 1,080 hair segmentation masks have been automatically extracted as described in [4,5]
Data source location	Institution: Cosmetic Science Research Group, London College of Fashion City/Town/Region: W1G 0BJ London, 51°30'57.4"N 0°08'36.8"W

	Country: UK
Data accessibility	Repository name: Mendeley Data Data identification number: Reserved DOI: 10.17632/37dkygd6sm.2 Direct URL to data: https://data.mendeley.com/datasets/37dkygd6sm/2

Value of the Data

- To give further insight into how to develop quantitative and qualitative studies about shampoo and conditioner efficacies.
- To develop models and classification strategies to predict the objective hair assembly features after a cosmetic treatment.
- By evaluating the prediction of automatic models, suggestions can be provided to consumers and fashion practitioners.
- To deepen the knowledge on how different hair interacts differently with the compounds in the products.

Data

All 120 tresses were prefabricated from human hair acquired from multiple donors matching the specification for hair colour and fineness. The donors were individuals from European dissent (Caucasian hair). This fibre is often elliptical, but a mean diameter = 70µm has been reported [1], which corresponds to a perception of *fine hair* as defined by a study dedicated to fine hair evaluation [2]. Furthermore, approximately 50% of Caucasian hair can be classified as straight and wavy [3], which in combination with the mean diameter, may generate visual impression of a flat, limp hair.

Each tress was made to the same specification: length=10cm, weight=3g and held together by wax. The hair was not previously bleached or coloured. Half of the tresses (n=60) were then

subjected to oxidative bleaching under controlled conditions and using a commercial bleaching kit, whilst the other half (n=60) remained in its original state. The alterations in the hair structure due to oxidation caused by bleaching are known to modify hair's capacity to interact with the ingredients in cosmetic products such as shampoos and conditioners. Hence, this dataset was created with the aim to explore and compare how the two types of Caucasian hair (virgin and bleached) would change as a result of the same cosmetic treatment.

In Figure 1 an example of virgin and bleached hair is reported, showing a part of the fixed support that keeps each tress in the same position.

Figure 1. A sample from the dataset. Left: virgin hair. Right: bleached hair.

The hair tresses were washed, conditioned and dried repetitively, under controlled conditions, using the combination of commercial shampoo and conditioner aimed at consumers with fine hair. To analyse the effect of these cosmetic products over their consecutive use, data was acquired at three different time-points:

- *Time-point 0 acquisition (t0):* photograph of the original hair tress, without any treatment.
- *Time-point 1 acquisition (t1)*: photograph of the tress after t0 undergoes two consecutive wash+condition+dry treatment cycles.
- *Time-point 2 acquisition (t2)*: photograph of the tress after t1 undergoes another wash+condition+dry treatment cycle.

Hair tresses and all raw image data are property of London College of Fashion.

Experimental Design, Materials, and Methods

Tress original files

The 120 hair tresses are acquired with a reflex camera fixed on a support. This data is acquired from three different angles (about -45, 0, +45 degrees), without moving the tress that is kept in position by the support.

The acquisition procedure is repeated for each hair tress at each washing step, thus acquiring *t0*, *t1*, and *t2*. The total number of pictures are 2x60x3x3=1080 ({virgin+bleached}x{#tresses}x{#angles}x{#treatments}).

(a) (b) (c)

Figure 2. A sample from the dataset. First row: virgin hair. Second row: bleached hair. In columns a), b), c) the acquisition angle -45, 0, 45 degrees.

Extracted hair segmentation masks

We also make available the extracted segmentation mask that subdivides the image in two sets of pixels (background, tress). Thus, the segmentation mask can be used as a way to directly refer to the region of interest only. To this purpose we exploit Figaro [4, 5], an automatic method able to achieve a segmentation accuracy of 85% on the wild. Moreover, for the sake of completeness, we revise all automatically extracted masks, correcting those with errors.

An example of the segmentation mask is given in Figure 3. In particular, the chosen algorithm returns either the region that contains hair or the region that contains background. The

difference between the two is a portion of the image that is likely to contain some individual hair fibres, spreading away from the main hair tress.

All segmentation masks (processed data) are co-owned by London College of Fashion and University of Brescia.

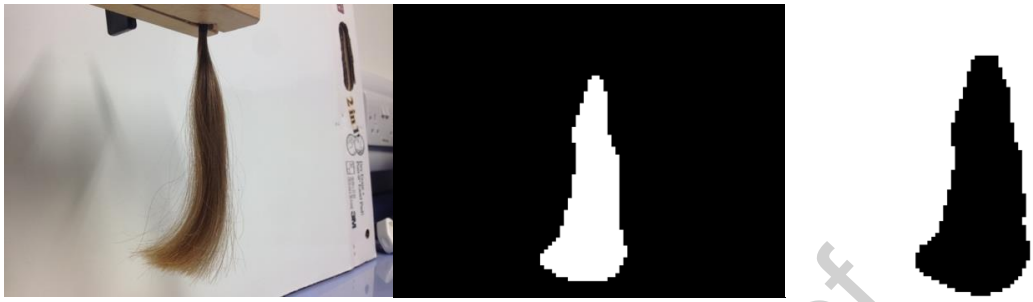

Figure 3. Output of the used segmentation algorithm. From left to right: the original image; the extracted hair mask; the background mask (on same tress as the top-left picture in Figure 1).

CRediT author statement

Mattia Savardi: Data curation; Formal analysis; Methodology; Software; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing.
Gabriela Daniels: Conceptualization; Data curation; Funding acquisition; Investigation; Methodology; Resources; Supervision; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing.
Slobodanka Tamburic: Conceptualization; Methodology; Resources.
Umar Riaz Muhammad: Data curation; Formal analysis; Investigation; Methodology; Software; Writing - review & editing.
Sergio Benini: Conceptualization; Data curation; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Roles/Writing - original draft; Writing - review & editing.

Ethics statement

No human subjects were involved in this work.

Acknowledgments

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