Technical Disclosure Commons

Defensive Publications Series

April 2020

Real-time Clothing Size Estimation Using Body Segmentation

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Real-time Clothing Size Estimation Using Body Segmentation

ABSTRACT

Users that shop for clothes online need to select the appropriate clothing size from available options. This can pose a problem since different brands define sizes (e.g., small, medium, large, etc.) differently. This disclosure describes techniques that enable a user to measure body dimensions relevant to clothing size, e.g., chest, waist, inseam, etc., based on capturing images of the user. The techniques can be implemented using the camera and the browser of the user's device, such that clothing-size measurement is frictionlessly integrated with the online shopping experience.

KEYWORDS

- E-commerce
- Online shopping
- Size measurement
- Body measurement
- Clothing fit
- Chest size
- Waist measurement
- Collar size
- Inseam
- Body segmentation

BACKGROUND

Users that shop for clothes online need to select the appropriate clothing size from available options. This is particularly a problem because different cloth brands define sizes (e.g.,

small, medium, large, etc.) differently. Many users struggle to estimate their size when they view a brand for the first time, while many other users have difficulties remembering their clothes size even after several purchases from a given brand. The effort for the user to find a measuring tape and manually perform measurements adds to the number of steps prior to finalizing a purchase, and at worst, can cause frustration such that the user abandons the purchase attempt.

The problem is less severe at physical stores where a user can easily request a measurement to be performed (or perform self-measurement by requesting the store clerks for a measuring tape). Nevertheless, even at a store, measuring the body size and matching it against a particular brand's definition of sizes adds to the number of steps needed to make a purchase decision and interrupts the purchase flow.

Although augmented reality (AR) measurement apps exist, the user has to be aware of the existence of such apps, which may not be the case when a purchase decision is about to be made. Also, such apps require installation, configuration, and activation by the user, which adds to and the number of steps needed to finalize a purchase. Although the website of a brand can, in theory, request user permission and upon permission, activate an available AR app on the user's device, doing so interrupts the purchase flow.

DESCRIPTION

Fig. 1 illustrates real-time clothing size estimation, per the techniques of this disclosure. A web browser (or other shopping application) on the user device, e.g., laptop, smartphone, etc., provides guidance to a user who wants to have their clothing size measured, as follows.

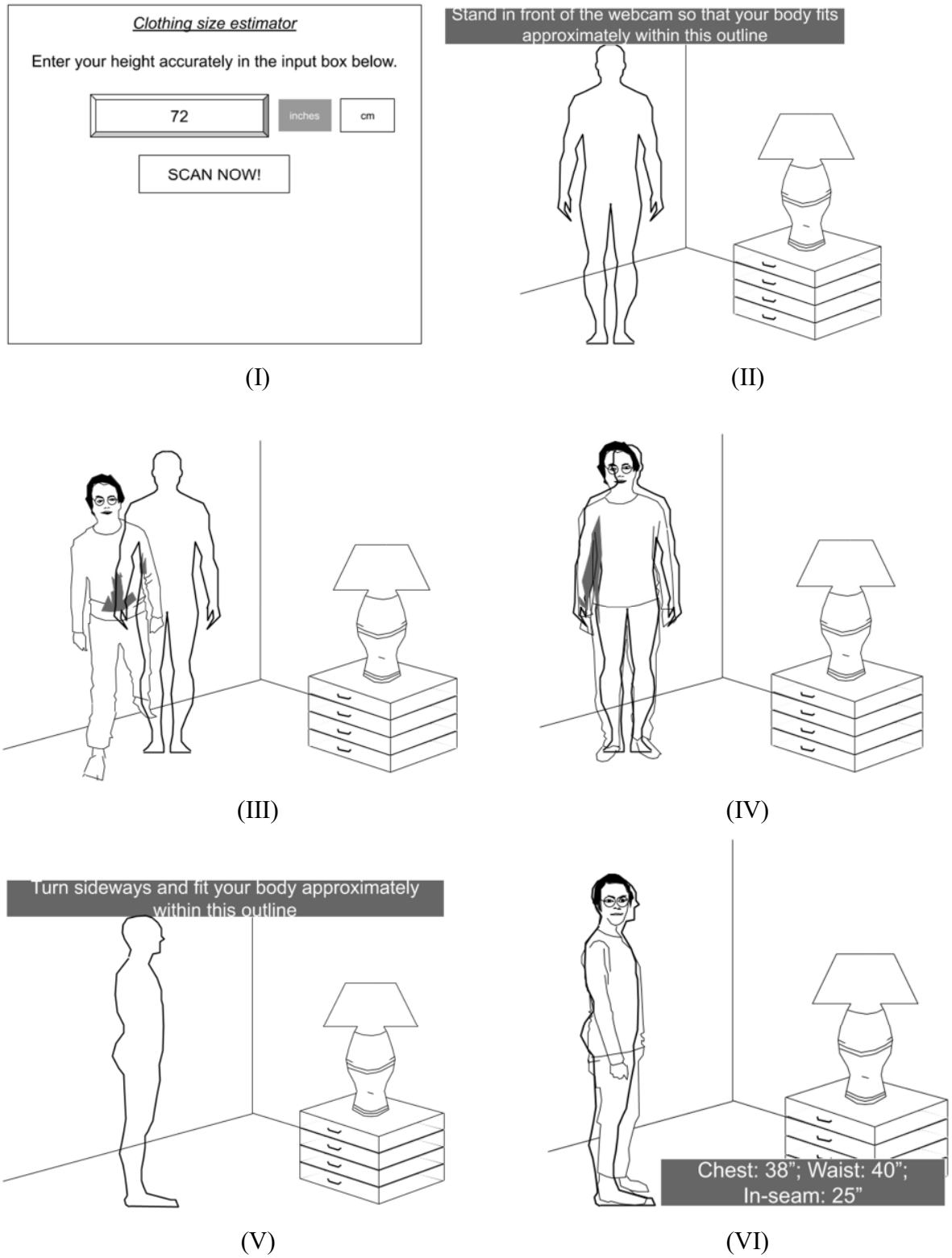

Fig. 1: Real-time clothing size estimation

In (I), the user is requested to enter their height. In (II), the camera feed captured by the device is shown on the screen, with an outline of a human body projected therein. A request is made to the user to stand in a manner such that they fit approximately within the outline. In (III), the user is illustrated stepping in to fit into the outline. (IV) illustrates the user fitting almost entirely into the outline, upon which a measurement of their clothing size is initiated. In (V), a follow-up request is provided to the user to stand within a side-profile outline. In (VI), upon the user standing in a manner such that they fit in the sideways outline, clothing-size measurements are finalized and reported.

In this manner, the user is provided with on-screen guidance to perform clothing-size measurements. The measurement can be completed quickly, e.g., in under a minute, and without the need for a measuring tape or physical contact. Upon user request, the online shopping provider can initiate the measurement process from within the web browser (or other app) of the user device. Since the measurements are performed from within the browser or app, the user can frictionlessly, e.g., with nearly no intervening steps, move between measurement and purchase (or continued browsing). The measurement operations run entirely on the client-side of the web browser such that no data is sent to the server. Further, the measurement data is removed from the client once submitted to the shopping website, e.g., when the order is placed and the browser tab is closed or the browser is switched to another website.

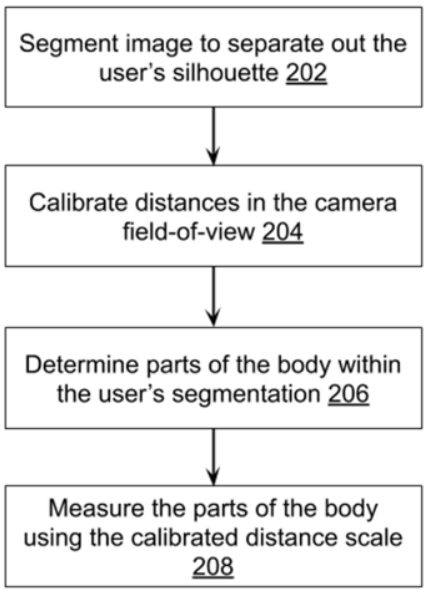

Fig. 2: Real-time clothing size estimation using body segmentation

Fig. 2 illustrates real-time clothing size estimation using body segmentation, per the techniques of this disclosure. Prior to launching the measurement user interface, the user is provided with options to use computer-aided measurement, to provide measurements via data entry, or to skip measurements altogether. The described measurement techniques are implemented with specific user permission. Once a user steps into the displayed outline, image segmentation techniques, e.g., that utilize trained machine-learning models, separate out the user's silhouette from the remaining parts of the image (202). The user's height, as entered, is used to calibrate distances in the camera field-of-view (204).

Parts of the user's body are identified within the segmentation using various techniques (206). In one example, a machine learning model trained with images of humans with labeled body parts is used to segment the captured image into body parts. In another example technique, known body ratios, e.g., head-to-height ratio, waist-level-to-height ratio, inseam-to-height ratio, etc., are used to approximately identify parts of the body such as chest, waist, leg, etc. A

combination of body-part identification techniques can be used. For example, machine-learning based body segmentation can be used to identify the shoulder region, and a chest-to-shoulder ratio can be used to determine the boundary of the chest. Once the rough position of each part has been determined, a scan is performed in the region to find the maximum width/height (as appropriate) around the region. The maximum value thus determined is taken as the value for the measurement. This accounts for the variations of human bodies.

Once parts of the user's body are identified, the calibrated (virtual) scale is used to measure distances between key points of the body part to determine dimensions of relevance to clothing size (208), e.g., chest, waist, inseam, leg, collar, etc.

The described techniques enable a user to make online purchases of clothing items with greater confidence that the fit of the clothes is right. The described techniques can be used by clothing brands, online vendors of clothing, physical clothing stores, etc. For example, the techniques can be implemented in self-help kiosks that are provided in a retail outlet, such that customers can quickly measure themselves to determine their clothing sizes.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's height and body measurements, a user's preferences), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques that enable a user to measure body dimensions relevant to clothing size, e.g., chest, waist, inseam, etc., based on capturing images of the user. The techniques can be implemented using the camera and the browser of the user's device, such that clothing-size measurement is frictionlessly integrated with the online shopping experience.

REFERENCES

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