

Smart Iron Rack: Image Processing Approach to Iron Clothes Remotely

Y. W. Thilini M.Yatanwala^a, D. S. G. L. D Liyanaarachchi^{b,1}

^aDepartment of Computer Systems Engineeirng, University of Kelaniya, Kelaniya, Sri Lanka

^b Department of Information Technology, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka

Ironing process is a repeated manual task carried out by people daily. Conventional ironing methods always require significant amount of physical user interaction which is time consuming. As a solution, a research has been carried out to implement a smart iron rack with a mobile application that enables user to remotely perform the ironing process. As illustrated in figure below, the device connects with the mobile application through Wi-Fi and performs many tasks including hanger detection, wrinkle detection in cloths, identification of steam irons' water levels and sending notifications to user. Iron rack consists of 5 hangers and a wide angle camera that moves along the horizontal beam to detect the clothes. When the user specifies a hanger number, the camera moves to the hanger position to check the availability of the cloth. Afterwards, the steam irons attached to the beam move vertically to iron the both sides of clothes. If the hanger number is not specified, the clothes on all five hangers will be ironed. The availability of the cloth on a particular hanger is detected using template matching algorithms in image processing. SIFT (scale-invariant feature transform) algorithm captures all interesting points of the hanger and shape of the hanger is taken as a key measure to decide the existence of the cloth. Raspberry-pi device which is mounted to micro controller, processes the images in order to determine the level of wrinkles in the outfit before and after the ironing process. "Grabcut" algorithm with localize Gaussian Mixture Model(GMM) is used to classify the foreground and background pixels in order to extract only the cloth from its background. Canny edge detection algorithm is used with (100,200) double thresholds to determine the number of wrinkle pixels in the cloth. The system was tested with 100 outfits made in cotton and silk materials. The accuracy of the system was tested in two stages. System could be able to achieve 0.80 F1 score for detecting clothes on hangers and 0.71 F1 score for detecting wrinkles in the clothes. "Smart iron rack" is a cost effective solution which is capable of remotely ironing 5 clothes at a time.

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¹ Corresponding author: D.S.G.L.D Liyanaarachchi; Tel.: +94-71-159-4436
E-mail address: tmyatanwala@kln.ac.lk