Proceedings of International Conference on Technology and Social Science 2017
Invited Paper

Improvement the System to Fold and Separate Laundry

Takumi Saruhashi[1, a], Takaaki Akimoto[1, b],
Seiichi Serikawa[2, c], Yuhki Kitazono[1, d]

[1]National Institute of Technology, Kitakyushu College, 5-20-1 Shii, Kokuraminami-ku, Kitakyushu-city, Fukuoka, 802-0985, Japan

[2]Kyushu Institute of Technology, 1-1 Sensuicho, Tobata-ku, Kitakyushu-city, Fukuoka, 804-8550, Japan

[a]ad1613ts@apps.kct.ac.jp, [b]akimoto@kct.ac.jp, [c]serikawa@elcs.kyutech.ac.jp, [d]kitazono@kct.ac.jp

Keywords: housework, folding laundries, robot, Arduino, motor.

Abstract. In this paper, we discuss the laundry folding system that we have developed. This system can take laundry off the hanger from laundry and fold laundry in automatically. After you take the laundry out of washing machine and put it on a hanger rack with the hanger, our system takes each hanger from the hanger rack, moreover detects whether the laundry is dry or not. If laundry is dry, the system removes hanger from laundry. Thereafter system folds laundry. Therefore, all things that user have to do is only hanging washed laundry on a hanger.

1. Introduction

Housework is one of tough jobs. Not only that, we must do it every day. We can't live comfortably without doing housework. In the case of a single life, you have to do that as well as your work. On the other hand, if you have a large family, amount of housework becomes enormous. There are a great number of household tasks such as cleaning the room, washing the dishes, and doing the washing. Previously, housework has been done manually. However, as a result of appearance of Dishwasher, Vacuum cleaner, and Washing machine, we can conveniently save trouble. Nevertheless, the machine which folds the laundry automatically has not prevailed among the ordinary homes. Even today, folding the laundry is a manual labor.

Folding laundry in automatically has been studied by some researcher. In 2015, the laundry folding robot: "Laundroid" was developed by Seven Dreamers Laboratories, Inc., Panasonic Corporation, and Daiwa House Industry Co.,Ltd. Although the Laundroid has ability to fold many kinds of clothes, it doesn't consider whether the laundry has already dried or not. Due to that, user should check whether the laundry is dry when he takes the laundry in. Folding laundry in automatically has been studied by some researcher [1, 2]. However, the laundry is dried in the laundry dryer, so hanging the laundry to dry process is ignored in previous studies. When we take in account the percentage of households owning a laundry dryer, hanging out the laundry to dry is yet main means to dry the laundry [3, 4]. Addition to this, some clothes can't be dried in the laundry dryer because they shrink in the heat of the dryer. If we hanged the laundry out to dry, we have to detect whether the laundry is dried or not when we take the laundry in. After that, we have to remove the hanger from laundry to fold laundry. However, these processes of folding laundry are not much studied.

From such background, we had developed the system to fold laundry that state hang out [5]. The developed system could detect whether the laundry is dry or not. After detecting that the laundry is already dry, the system removes the hanger from the laundry and folds the laundry. It took time about 1 minute and 30 seconds to fold a laundry. However, the system can discriminate laundry only whether it has sleeve or not.

In this study, we improved the system to discriminate the kind of the laundry for the system can fold the laundry neat and the user can put laundry away easily.

2. Construction of the System

The overall view of the system is shown in Fig. 1. The hanger rack part is shown in right side in the Fig. 1. The user hangs laundry on the hanger rack. Folding laundry device part is shown the left side in the Fig. 1. This device is the main part of the system. It detects dryness of laundry, removes hanger from laundry, and folds laundry.

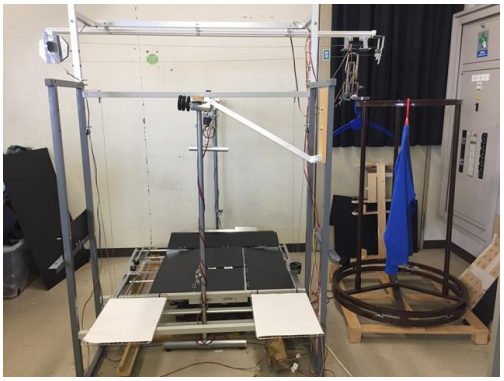

Fig. 1. Folding laundry system.

The behavior of the system is shown in Fig. 2. First, the system carries the laundry from the hanger rack. We use the lift to carry the laundry. The lift can move along the rail that is lay above the folding device part. During the lift carries the laundry, the system distinguishes the kind of the laundry. We use a web camera to take the picture of the laundry. The system does the image processing for the image data from web camera. After the lift carrying the laundry, the system checks whether the laundry is dry. After detecting that the laundry is already dry, the system removes the hanger from the laundry and folds the laundry. The folding laundry device uses panels for folding the laundry. The way of using panels depends on the kind of the laundry. The folding laundry device folds the laundry refers to result of image processing. Finally, the system separates folded laundry and puts the place.

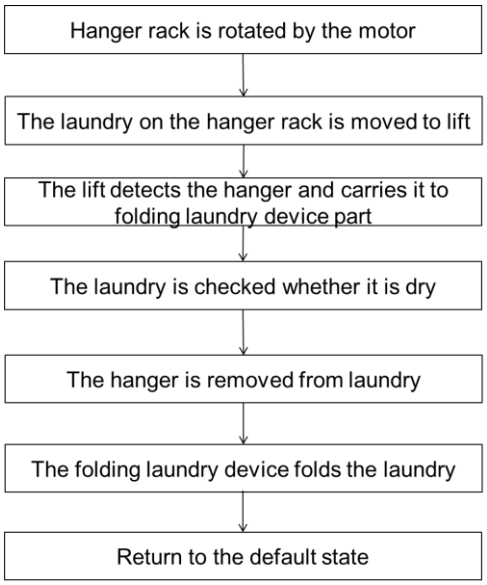

Fig. 2. The flowchart of folding laundry.

3. Conclusion

Although the folding device is improved and it can fold some kind of laundry, we still have problems. Future issue of our study is folding the small size laundry, for example, socks, handkerchief, and so on.

References

[1] Hamajima Kyoko, Kakikura Masayoshi : “Planning Strategy for Task of Utangling Laundry – Isolation of Clothes from Washed Mass -”, JRM, Vol. 10, No. 3, pp. 244-251, 1998.

[2] Kaneko Manabu, Kakikura Masayoshi : “Study on Handling Clothes (Task Planning of Deformation for Unfolding Laundry)” JRM, Vol. 15, No. 4, pp. 406-415, 2003.

[3] Fukuda Eiko : “Survey of Home Washing”, The journal of Wayo Women’s University, Vol. 43, pp. 85-98, 2003.

[4] Koitabashi Emiko, Okita Fumiko : “The Actual Conditions of Washing Work/Working Space and Problems to Be Solved : From an Investigation Carried Out in 2000 and in 2008”, Memoirs of the Japan Women’s University. Faculty of Home Economics, Vol. 57, pp. 95-106, 2010.

[5] Takumi Saruhashi, Ryunosuke Miyamoto, Shenglin Mu, Takaaki Akimoto, and Yuhki Kitazono: “Speedup of System to Fold T-shirt in the State of Hanging”, Proceedings of the 4th IIAE International Conference on Industrial Application Engineering 2016, pp.11-14, 2016.