Automatic T-shirt Folding Machine

Mukesh P. Mahajan
Assistant Professor
E&TC Dept.
Sandip Institute Of
Technology And
Research Centre, Nashik

Srishti Prasad
UG Student
E&TC Dept.
Sandip Institute Of
Technology And
Research Centre, Nashik

Tejal Binnar
UG Student
E&TC Dept.
Sandip Institute Of
Technology And
Research Centre, Nashik

Monika Tambe
UG Student
E&TC Dept.
Sandip Institute Of Technology
And Research Centre, Nashik

ABSTRACT
Easy T-Shirt Folding Machine is an automatic motor controlled t-shirt folding machine. The aim of this project is to fold t-shirts merely by pressing a button. The folding machine is fully automatic where one has to place the t-shirt on the folding tray and press the button. It will then fold the t-shirt by itself. This system uses four DC gear motors to control the motion of the folding part. Usually, a person uses conventional method to fold the clothes which by hand folding. Many problems usually faced by working women who is unable to manage time for house hold chores. The purpose of this project is to introduce an easy and fully automatic t-shirt folding machine. In this propose system, a DC gear motor controls the folding motion and rotates according to a program which uses microcontroller. The microcontroller controls the overall motion of the folding. Result shows that by using this system, the time for folding clothes by human can be reduced to great extent compared to conventional method.

Keywords
Flips, Folding Tray, Folding Flaps

1. INTRODUCTION
People nowadays have been living with tight schedule in their daily life. Household chorus despite gender discrepancy has been a burden for many. Among the entire chorus that are time and energy consuming is the part where laundries are concern. This work is a burden for many and sometimes tiring depending on the amount of clothing and number of people in a house. Clothes such as shirts, pants and undergarments are the usual and if multiplied by the number of person in a family, will consume a lot of time and energy. This is a predicament for an average person that needs to be resolved. The process flow of a laundry usually are, washing, drying and folding thus an idea of a machine that can fold clothes are presented in here, among many categories of clothing, the T-shirt is chosen as a test focus and the project is conducted based on the T-shirt folding flow based on Fig below.

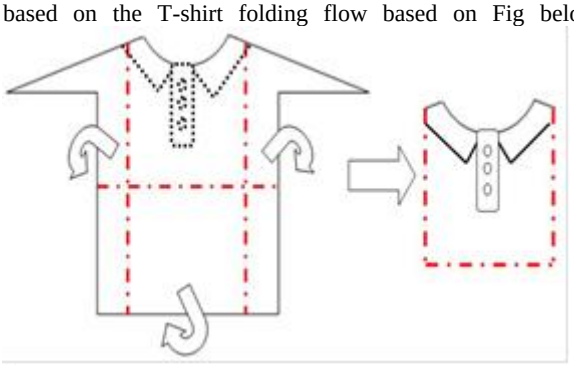

Figure 1: T-shirt folding Method [2]

Figure shows the idea on how the t-shirt folding machine will fold the t-shirt; the picture on the left shows the shirt is placed front to back (shows as the dotted line of the collar and buttons). The red dotted lines are the parts where the machine will fold the t-shirt and lastly becoming the one near the right. This idea is presented as an aid for people to speed up the folding process and proceeding with other chorus. This machine intends to aid those with tons of shirts are involved such as in the laundry service, hotels, hospitals and many more places that is associated with ample of clothing. This machine promises to deliver folded t-shirt with precise folding scale and speed up time as well as being unguided. In order to achieve the objective of the project, there are several scopes that have been outlined. The scope of this project includes using the usage of microcontroller AT89S52, build hardware for the system, and interface the hardware to a dc gear motor. 4 dc gear motors are used to control the motion of the folding material. The KEIL software is used to design the circuit and run the simulation. This project only focuses on folding t-shirts as the test focus.

Manually t-shirt folding flaps have already available in the market as shown in figure below. Manually t-shirt folding flaps have already available in the market as shown in figure.

Figure 2: Traditional Flaps

2. LITERATURE SURVEY

The textile industry in INDIA currently doesn't use the automation in cloth folding. It is very necessary to bring automation according to the literature survey only 89% of manufacturers use any kind of automation in INDIA. The Indian textile and clothing industry currently accounts for about 16 percent of industrial production and about 4 percent of GDP. It employs close to 82 million people, 35 million and 47 million in the textile and allied sectors respectively. The total employment in future will be close to 99 million people, 42 million and 57 million in the textile and allied sectors respectively.[1] There is very high demand to bring in automation in the cloth folding as well as in the sorting mechanism in the manufacturing industry and also in high maintained mechanically operated laundries. Currently in laundries mechanism used is only limited to cleaning and ironing of cloths and not on the distribution or sorting of the cloth in INDIA. But cloth folding mechanism majorly found in U.S and CHINA. The distribution and sorting of the cloths is a very time consuming effort and prone to error manually, the automation in this field will save time and error free distribution or sorting of cloth can be achieved.[2]

2.1 Analysis of different papers

In [1] According to author, in this paper the proposed work were done by using PLC and pneumatic cylinders where the advantage of using PLC is that it will not need maintenance and it will not affect by the external environment in industries but it leads the project to a very high cost and made the project more complex to handle.

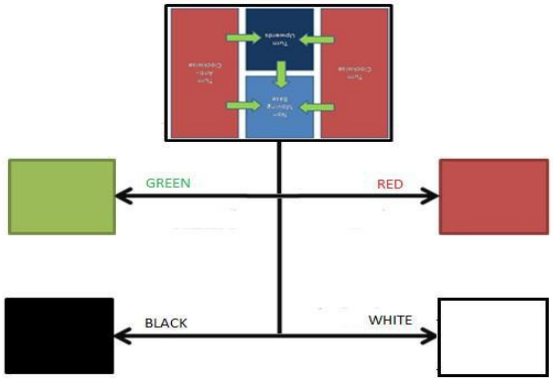

Figure 3: Color sorting mechanism of t- shirt folding machine using arduino. [1]

In [2] According to author in this paper the proposed work was based on folding and color based sorting mechanism that used Arduino UNO, DC motors, Ultrasonic Sensors and IR sensors. In this project they use specific colors which will be limited and also time consuming and will lead to many drawbacks.

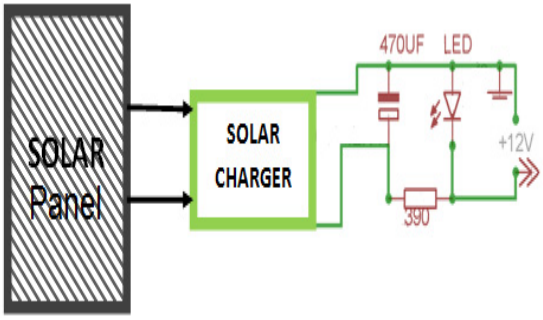

Figure 4: Photovoltaic power t- shirt folding machine. [2]

In[3]According to author, in this paper the proposed work was based on micro-controller and pneumatic cylinder where it includes pneumatic valves and many components related to it that makes the circuitry more complex and more towards to mechanical project.

3. PROJECT DEVELOPMENT

Figure shows the project phase that is planned accordingly. The system will be divided with two common parts which consists of hardware and software. The software designed in this early level is only for testing purpose. In hardware part, consideration from many aspects is very important in terms of size, electrical characteristic, purpose, and rating of current, voltage and power. After completing these two important parts, and before integrating both of them, several testing must be conducted on each component that used. After confirming the circuit is perfectly functioning, simple program will be burned into the microcontroller. All ports are tested and verified.

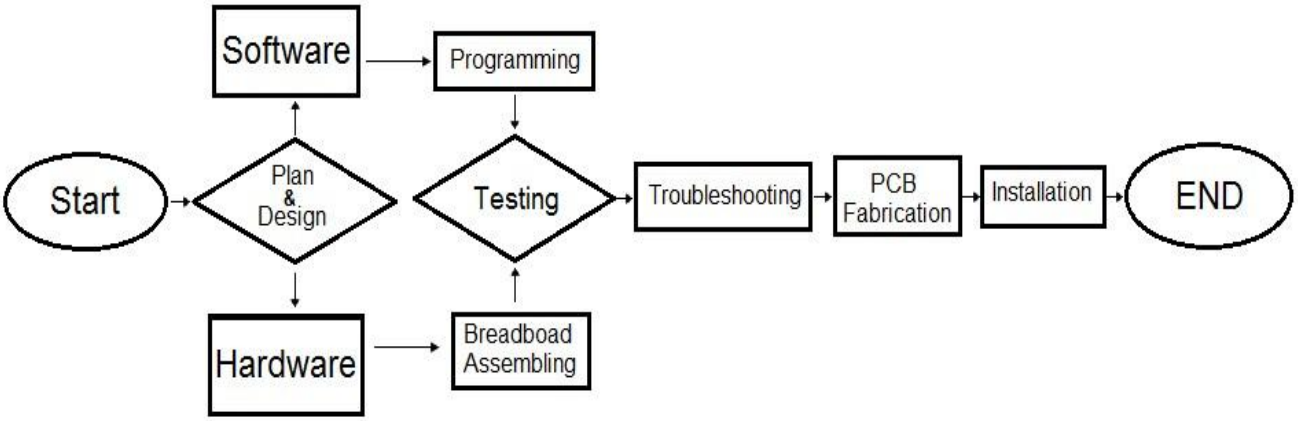

Figure 5: Flow Chart of Project Development

4. PROCESS FLOW

Process of this easy t-shirt folding machine will start once the push button is pressed. When the push button is pressed, motor B will rotate anti-clock wise. Once it reached the time set in the program, it will stop. Then motor B will return to the original position by rotating clockwise. The sequence of the motor will be same for motor A, C and motor D. This process is simplified in Figure below. The folding motion of this machine is controlled by the motor which is attached with the folding material listed as Motor A, B, C and D as shown in Figure. Motor B is the first motor to rotate where it will make the B flag of the polystyrene to rotate to the left. Then follows by motor A will lift up and make flag A to rotate from left to right. Then followed by motor C from bottom to top to finish up the folding mechanism and finally motor D will move from top to bottom to slide the folded t-shirt on a tray that will stacked the folded t-shirt. This motion continues until the shirts are finish.

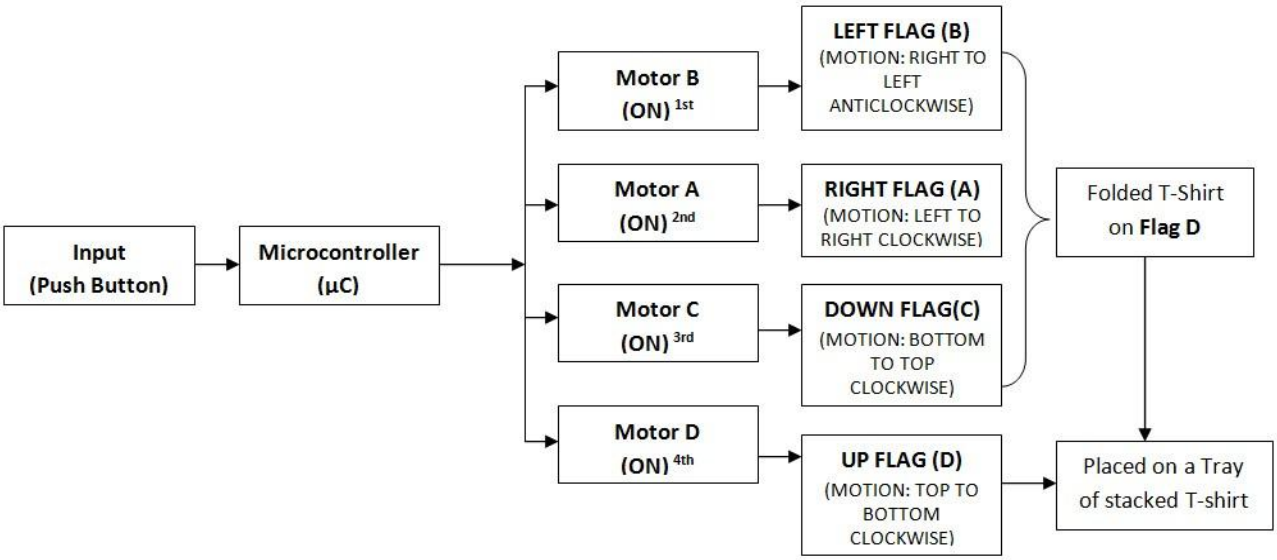

Figure 6: Process Flow of T-Shirt Folding Machine

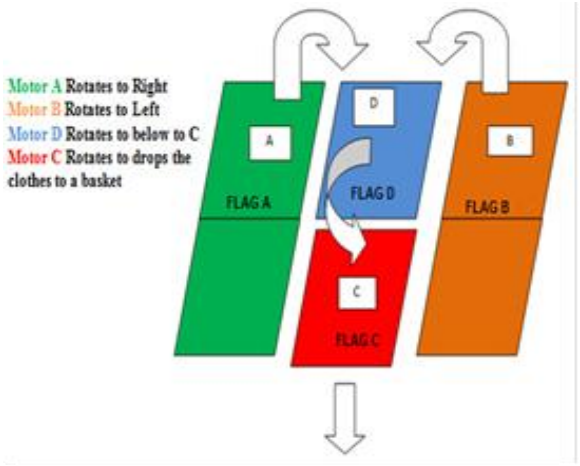

Figure 7: T-shirt Folding motion

5. PROBLEM STATEMENT

The textile industry hasn't witnessed the growth in the field of technology aiding the industry to the most optimum of the availability of the mechanism in towards world; that mainly being altogether automation in the manufacturing sector of the textile industry. Our main aim is bringing Automation in the Cloth Folding Technique used in Textile Manufacturing Industry. In addition to the automatic folding mechanism of the cloth, we also intend to introduce more automation. This will ensure the full automation in textile industry which it has been lacking. The system will be designed with the present available materials and components so as to bring simplicity and more importantly cost effectiveness in the system. The Implementation of the entire assembly can be easily incorporated with the current system being used in the industry without any high volume changes.

6. RESULT AND CONCLUSION

6.1 Result

When human manually fold a shirt, it will take roughly 4 second to complete one t-shirt but with using this easy t-shirt folding machine that time is reduced to just 2 seconds. So shows time to complete 1000 shirts. From the table it shows that by using the easy t-shirt folding machine, the time to fold 1000 pieces of shirt will only take 33 min compare to manually folding the t-shirt which takes up to an hour and 7 min. This clearly shows that the time saved by using the machine is approximately half an hour compare to manually folding 1000 t-shirts. It shows the actually prototype of easy t-shirt folding machine. In top left corner we can see the flag B starts to rotate and folds the left part of the shirt as the button is pushed and then followed by flag A which folds the right part of the shirt and then finally flag C which lift up the shirt and complete the folding process. In bottom right is the complete folded t-shirt.

6.2 Discussion

Initially there are few problems faced when first creating the prototype model of easy t-shirt folding machine. The most difficult part is the selection of the suitable motor. The motor must be powerful enough to lift the folding material. The weight after the shirt is placed on the folding material also must be considered when selecting the motor. The motor also must not be high in price at the same time easy to control by the micro controller. Problem also occurred when selecting the folding material. The material should not be heavy because motor will face difficulty in lifting it up. The material surface must also be slightly rough so that the shirt won't slip away from it once the wing is turned. So after testing with few materials, finally the polystyrene has been selected as the suitable material because it is very light in weight and also have a rough surface area that can make the shirt stay without falling. Another problem faced is how to attach the folding material with the motors because motor needs something attached on the shaft like a gear system so it can be joined with the polystyrene. So the motor has been welded with a steel rod and then attached with the polystyrene with using a t-shaped flap made of PVC.

7. CONCLUSION

Thus with the help of AT89S52 and DC gear motor proposed model is developed with the aim of automation in textile industry. The drawbacks of previous systems are overcome with features of low manufacturing cost and minimum complication in the design. The proposed model provides the better speed, maximum throughput, consistency in output and low cost solution to textile industry.

8. REFERENCES

[1] Suraj Shah, Utkarsha Mahajan," Automatic cloth folding and colour based sorting mechanism" IJTRE,Volume 2, Issue 7, March-2015 .

[2] N.Gomesh, Y.M.Irwan," Photovoltaic powered T-shirt folding machine" Conference Paper in Energy Procedia · February 2013.

[3] Deepak Shroff, Paresh Somani." Automatic T-shirt folding machine".

[4] *how stuff works*. (n.d.). Retrieved March 15, 2012, from http://electronics.howstuffworks.com/motor2.html

[5] pcbheaven. (n.d.). Retrieved April 12, 2012, from http://pcbheaven.com/wikipages/How DC Motor Work/

[6] http://autogarment.com/folding-machine-works-as-fabric-folders-in-textile-mills/

[7] http://www.mrprint.com/equipment/t-shirt-folding-packaging-machines

[8] https://en.wikipedia.org/wiki/Textile_manufacturing