

# Cloth Folding Machine



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**Abstract:** The cloth folding machine is an easy and useful process in this world of tortoise and rabbit race. The machine's operation requires tiny human contribution, which is significantly useful for people who are not keen to arrange their clothes. The idea of this project is to fold up cloth by just pressing a switch. In this project, we used five separate plates with the center plate as fixed and the other four plates are movable. This plate follows a pattern that is programmed in the microcontroller. ATMEGA8 Microcontroller is used. Four servo motors are connected to the microcontroller. And these servo motors are connected to the four movable plates. 100KΩ preset is used to change the angle for servo motor. 100μF and 104 capacitors are used for charging. It will consist of two folding patterns for shirts and pants. Based on the purpose of design, a cloth folding machine is a household appliance.

**Keywords :** Arduino, ATmega8 microcontroller, Servo motor, Preset, LED, Flip, Folding.

## I. INTRODUCTION

Since the folding cloth is always a tedious process for most people, it is an idea to produce an automatic machine that can clothes. The project was intended to gather the needs of folding clothes for college students, housewives or anyone who has trouble in folding clothes [1]. Lots of college students are infuriated by spending time on folding clothes. The machine is entirely programmed when one has to just place the cloth on the board and push the start switch and within a fraction of seconds, the cloth will get folded. Also, the existing cloth folding machines in the market are either for industry use or too expensive. We are trying to make automatic clothes folding machines at a economical cost to serve most people, particularly for household purposes. It will work in a semi-automated process; the customer only needs

Manuscript received on March 15, 2020.

Revised Manuscript received on March 24, 2020.

Manuscript published on March 30, 2020.

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to lay the clothes flat on the board and the machine folds the clothes. It has two folding patterns for shirts and pants. Based on the design, it is developed for household purpose and safety is the first priority to be considered. In this project, both electrical hazards and noise hazards are avoided. In this proposed system, the servo motor controls the folding motion and rotates according to a human can be reduced to a great extent compared to the usual method.

## II. EXISTING SYSTEM

In recent years, most of the textile industry in India does not use automation for cloth folding. Now its time for folding machines to satisfy the laziness of human beings more over the folding machine has huge social benefits [2]. With a decreased number of workforce caused by aging of the population, the folding machine is sympathetic and reduces the human power in some industries such as hospitals, hotels and textiles stores. Currently, the Indian textile and clothing industry holds responsible for 16 percent of industrial production and 4 percent of gross domestic product. Based on a literature survey, only 89 percent of producers produce any kind of automation in India. In rushed Environment, most of the students, Office staff and Housewives or anyone who has difficulty in folding clothes. The cloth folding mechanism was introduced in foreign countries it is used in industries not as a household appliance because it is too expensive [3]. Artificial intelligence-powered machines which are used in foreign countries that were supposed to analyze each clothing item and figure out the best way to fold it using artificial intelligence. The cloth folding machine costs of rupees 71,000, which is still a pretty big investment for a home (especially if it does not have too much space), but the machine could be useful in retail spaces and cloth folding machines. The objective of a cloth folding machine is to design and develop a fully automatic that can perform folding clothes automatically. The design folding machine performs several functions that are essential for the cloth folding process [4]. The operation mechanism will be constructed using mechanical and electrical components such as a servomotor, a printed circuit board with a built-in microcontroller and different sensors such as ultrasonic sensor and pressure sensors. The distribution and sorting of the clothes is very time-consuming and this field will be error free for automation.

## III. DESCRIPTION

### A. Control Unit

The control unit is a single chip ATMEGA8, which includes a flash memory that stores the operation code. This chip can discontinue signals from other blocks and send corresponding commands to each module [5]. The code is written in the Arduino programming language.

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## B. User Interface

The user interface includes an RGB LED and a reset button. The LED can change colors (red and green) to indicate the operating status of the folding machine for the user [6]. The reset button permits the operator to reset the current action.

## C. Mechanical Unit

The mechanical unit consists of four servo motors, which provide high torques to flip the plywood material boards with the cloth during the folding process [6]. Each motor is connected with a 100KΩ Preset to control the angle of the same. Figure 1 shows that the circuit connection of a cloth folding machine.



Fig 1. Circuit connection

## D. Processed Unit

The folded cloth is at the centerpiece of the board. Users should take the folded cloth and then lay the new unfolded cloth and press the start button to continue the same process. Figure 2 shows the block diagram of a cloth folding machine.

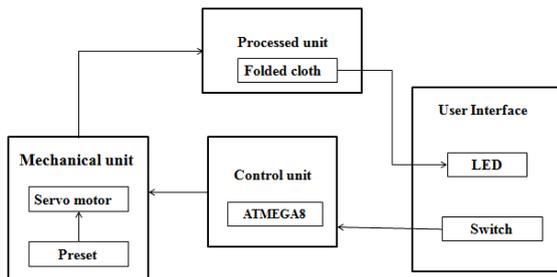


Fig.2. Block diagram of cloth folding machine

## IV. PROCESS CONTROL

The process of this cloth folding machine will start once the switch is pressed [4]. The process flow of this project is shown in Fig. 3. When the switch is pressed, servo motor 1 will rotate anti-clockwise. Once it reached the time set in the program, it will stop. Then servo motor 1 will return to the original position by rotating clockwise. The sequence of the motor will be the same for servo motor 2, 3 and motor 4. The folding motion of this machine is controlled by the motor which is attached with the folding material listed as Motor 1, 2, 3 and 4. Motor 1 is the first motor to rotate. Then follows by motor 2 will lift up and make flag A rotate from left to right. Then followed by motor 3 from bottom to top to finish up the folding mechanism and finally, motor 4 will move from top to bottom to slide the folded cloth on the center plate. Figure 3 shows the process flow of a cloth folding machine.

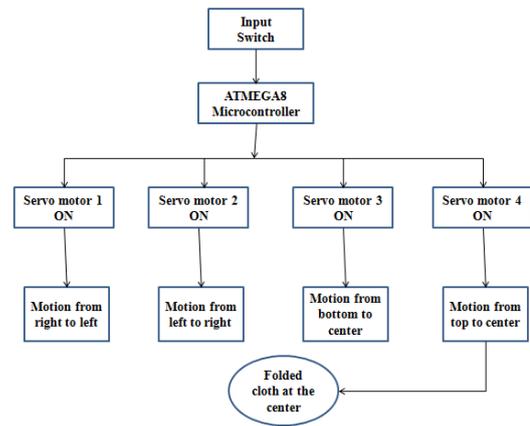


Fig. 3. Process flow

## V. DESIGN

The proposed project dimensions are given below, The total area of this project is (90X90X30) cm. The square-shaped folding board is divided into three parts. Again the centerboard is divided into 3 segments each with 30cm length which is square. The right and left side board is in rectangle shape with an area of (90X30) cm. Finally, the board is divided into 5 segments where the center board is fixed and the remaining 4 boards are movable.

## VI. WORKING

Here the connection is shown in Fig. 1. There are four servo motors connected with the preset unit which is used to adjust the angle of the servo motor. Each servo motor has one 100KΩ preset. There is one resistor and it is used to prevent the LED by resisting the current. Without resistor LED will melt by the overflow of current. We had to calculate the resistor for different colors of LEDs and it was 330 ohm for red and green color. 5 volts, 1A Supply is given to the control unit which is the ATMEGA8 microcontroller. The control unit controls the whole process of the machine. The program which is dumped in the control unit is fixed to control the mechanical unit. In this project, two capacitors are used. One is 104 Capacitor and another one is 100μF/25V the capacitor which is used to ensure smooth power delivery. Without the preset unit, the servo motor can work. But still, it is used only to adjust the angle of the servo motor till 120°. In the control unit, the operation code is developed in the Arduino programming language.

## VII. SOFTWARE USED

### Arduino 1.8.5

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

VIII. COMPONENTS

A. MG995 Servo Motor

MG995 is a servo motor providing precise rotation over the 180° range. The servo motor is suited for designing a robotic arm in which wear and tear of the motor are high. Being metal geared, the servo motor has long life and can be installed on system like robotic arm where servo motor work is huge. The servo motor is also suited to be used in loungers and toys planes. Having a satisfying torque which is enough to overcome air resistance and control wings of plane, the servo is preferred in toy panels, loungers which need precision control no matter the condition.

B. ATMEGA8 Microcontroller

This microcontroller has 28 pins AVR. Although we have many similar microcontrollers, ATMEGA8 is popular because it is one of the cheapest microcontrollers and provides many features in lesser pins with program memory 8KB, ATMEGA8 application is very versatile. With various power-saving modes, it can work on mobile embedded systems. With its compact size, it can be put on many small boards. With watchdog timer to reset under error, it can be used on a system with minimal human interference. These features added together in one microcontroller ATMEGA8 popular. This microcontroller such as ATMEGA32. Similarly, the microcontroller needs to be programmed and added appropriate peripherals to get the output. Without programming, the microcontroller is an empty chip. For working of ATMEGA8 first we need to burn the appropriate program file in the ATMEGA8 flash memory after dumping this program code, the controller executes this code and provides the appropriate response.

C. 100 KΩ Preset

This variable resistor is PCB mountable and has three terminals the voltage between the terminal varies as the preset is rotated. The resistor is used for adjustable voltage as per the need in the circuit the outer two pins are connected to supply voltage and ground, and center pin outputs are adjustable voltage between ground and supply voltage as the rotary center is rotated. Variable resistors are a miniature version of standard variable resistor. They are designed to be mounted directly on to circuit boards and adjust only when the circuit is built. For example, they may be used to set the frequency of an alarm tone or the sensitivity of a light-sensitive circuit a small screwdriver is a similar tool is usually required to adjust the sensitivity of a light-sensitive circuit a small screwdriver is similar tool is usually required to adjust variable resistor. The variable is available in vertical and horizontal styles, they are electrically identical but make sure you buy the correct type for your circuit board layout. A horizontal preset provides better mechanical strength on a circuit board. The variable resistor may be open or enclosed within a plastic case to protect them from dust and dirt. The variable resistor is cheaper than standard preset so they are often used in educational and projects. Figure 4 shows the square shaped folding board. Figure 5 shows the connection for servo motor and the folding board.

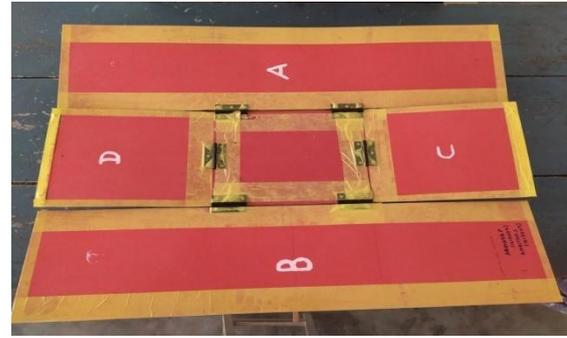


Fig.4. Folding board

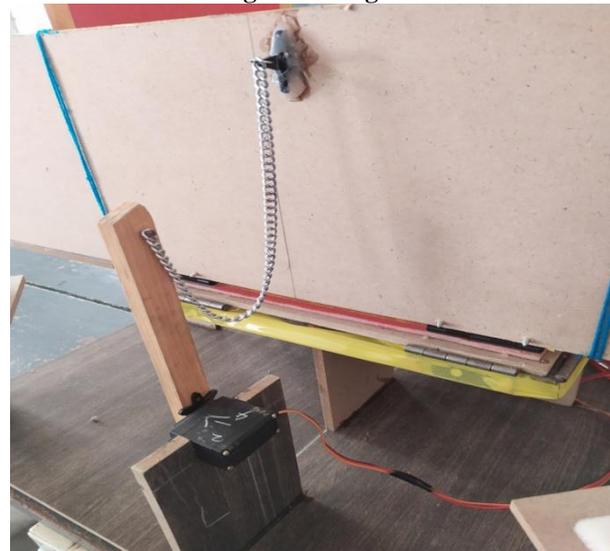


Fig.5. Connection for servo motor and board

Result analysis:

The main objective of this project is to fold the cloths (dresses) automatically. User have to lying the cloth on the machine surface. In our project we have two patterns. User have to select the pattern whether the cloth is a pant or kurti. Once user selects the pattern, switch on the machine. It will be working according to our Arduino program. There is four separate pieces connect together in the surface board which is connected with separate servo motors. When the motor gets supply, it moves the surface board along with cloth from floor (0 deg) to 90 deg upwards. It happens with all the motors and surface boards. And each motor has run one by one. By this way, the cloth has been folded.

The Folded cloth will be in the centre of surface board. User have to take that. By our analysis, machine works fine automatically and human involvement also very less with the product.

IX. CONCLUSION

When a person manually folds a cloth-like pant, Kurti or towel, it takes roughly 4 seconds to fold that piece of cloth. when the cloth folding machine is used the time required to fold the cloth is reduced to just 2 seconds. The time to fold 1000 shirts by using this machine will only take 33 min compared to manually folding the shirts which take up to an hour and 7 min.

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This clearly shows that the time saved by using the machine is approximately half an hour compared to manually folding 1000 shirts. Servo motors are used to move the four panels in the machine and it was programmed to make it move in a certain time. The side panel would flip and get pulled back by a chain that is tied to the base of the machine. We finally completed the product and it was a success. The product exceeded expectations and folded cloth every effectively. This will help people to fold the clothes faster and without them having to put effort into it.

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