Final Year Project Showcase Batch-2019
Year 2023

Department: Electronics Engineering

Programme: Electronics Engineering

1

Project Idea

Washing and drying have been made easy since the introduction of automatic washing machines. Automation of tasks not only reduce human efforts but provides cost savings, increased efficiency, scalability and flexibility. Another step towards a modern and easy lifestyle in todays world of technology is the **automation of cloth folding process**. This product is equally important for domestic and industrial use. We name our product as "**FOLDIFY",** the automatic cloth folding machine.

2

Process

The working process of the automatic cloth folding machine is illustrated below in **Figure 1**.

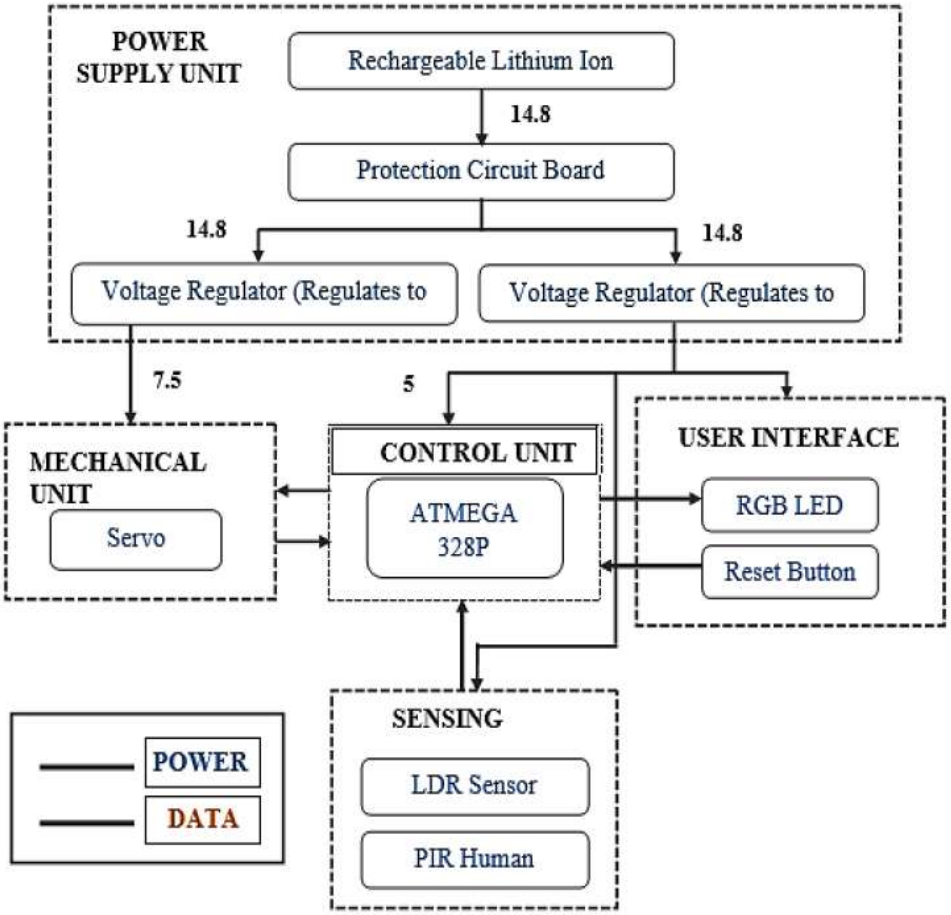


Figure: 1

Total five boards have been used. The material of boards is chosen to be acrylic for a presentable finished product. All of the five boards are clipped to the main board. The main board is of 39" x 30" on which all other boards are clipped. The dimensions of other boards are

mentioned in **Figure 2**. The boards will move in this sequence: 1)Upwards flip (board01), 2)Left flip (board02), 3) Rightflip (board03), 4)Upwards flip(board04) while board5 will remain fixed.

The power supply unit consists of four 3.7V Li-ion batteries which are connected in series to provide an output voltage of 14.8V. The purpose of protection circuit board is to protect the circuit by cutting off the path of power supply. Two voltage regulator circuits are build in order to regulate the voltage provided by the batteries to 5V and 7.5V.

For the control unit, micro-controller Arduino UNO ATmega328P is used. The control unit is responsible for accepting the signals from sensor and sends it to servo motors and RGB led. Servo motors after recievingsignals will flip the boards. Whereas, RGB led will change colors.

The sensing consist of two sensors LDR sensor and PIR sensor. LDR stands for Light Dependent Resistance. In dark LDR provides High resistance and low voltage which helps in the detection of cloth. PIR sensor is used to detect human hands. This feature of aims to prioritize the of the user.

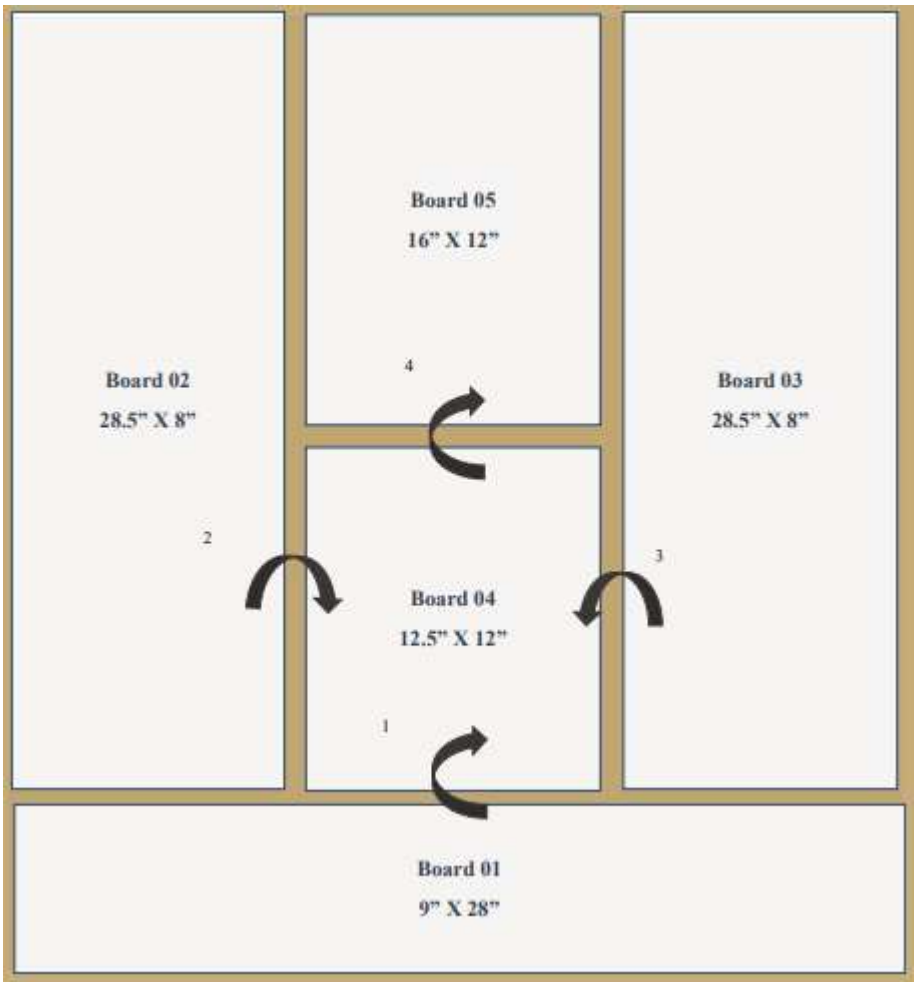
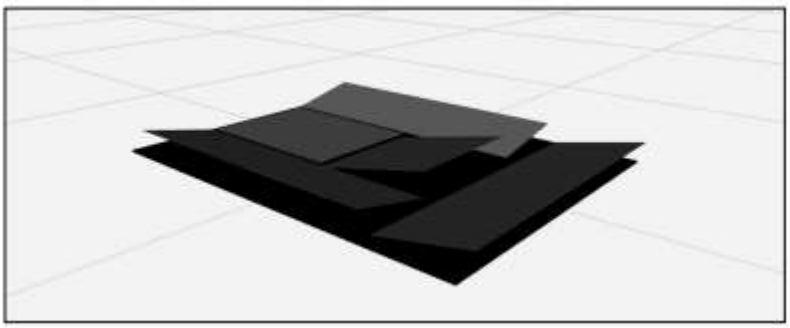


Figure: 2

The mechanical unit consist of Servo motors. Servo motors will provide high torques to flip the acrylic folding boards during the folding process. The selection of servo motors was done for a torque value of 21.8 kg-cm. The servo motors have the analog feedback so that it can read the position.

	The Single RGB LED is used to indicate the current status of the machine. For example, White indicates that the machine is idle. Blue indicates that clothes are ready to get folded. Red indicates that folding is in progress. Green will indicate that clothes are folded. This will make the machine user-friendly. Once the cloth is placed on the folding boards, the LDR (Light Dependent Resistor) beneath the folding board04 will detect the cloth and the PIR (Passive Infra Red) sensor will check for any obstacle. If a moving body is detected within the range of the sensor, it will signal the microcontroller to not to rotate the servos attached to the folding boards i.e. the machine will not start operation unless no human motion is detected by the sensor. Once the board is clear folding process will began. Side by side RGB Led will change its color in order to indicate the current operation.
3	**Outcome** Designing the hardware of automatic cloth folding machine is done using an open-source framework, the Robot Operating System (ROS). The physical design of the cloth folding machine as designed on ROS is presented in **Figure 3**.  **Figure :3** Proteus Professional 8 version 8.13 is used to the design circuitschematic and PCB layout.The PCB is single layer that is, it is single-sided PCB having one side with layer of conducting material and another side used for integration of electronic components. The layout of the PCB is shown in Figure 4 while the actual PCB is presented in **Figure 5**. The various design elements including the control unit consisting of the Arduino Board, sensing unit and user interface have been assembled on the PCB board while the power supply unit is off board. The final picture is shown in **Figure 5.** The servomotors have been attached to the acrylic boards at one end for providing the desired rotations and at the Arduino pins for desired command signals.

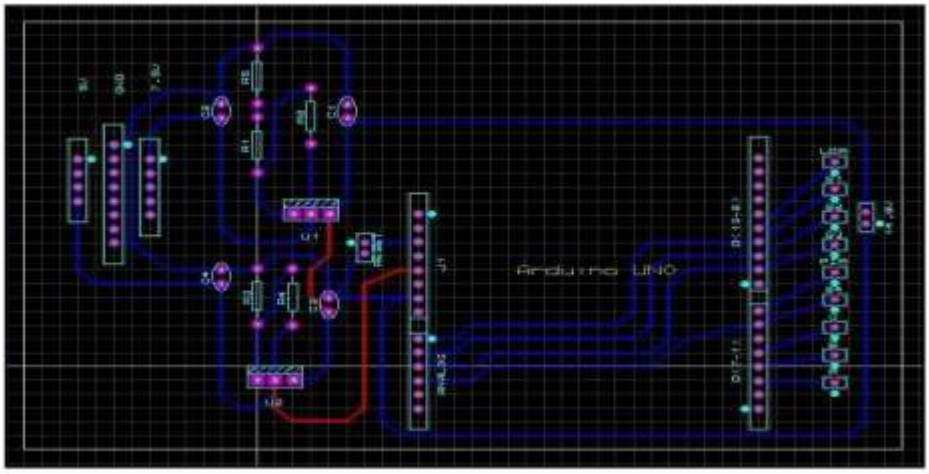


Figure : 4

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Evidence (Theoretical Basis)

The fast-paced nature of today's lifestyle has made folding of laundry clothes, a daunting and time-consuming task. Surprisingly, many textile industries in Pakistan still rely on manual folding methods, employing a large number of workers to spend an average of 20-25 seconds per garment. These workers have to be paid a reasonable amount of salary. Thus hand folding of clothes not only requires manpower, it needs time as well as money. To address this challenge, the introduction of an automatic clothes folding machine presents a cost-effective and efficient solution as it can be implemented once and provides time and cost effectiveness. This innovative technology can be implemented in both industrial and residential settings.

By integrating automated folding machines, textile industries can significantly reduce costs, save time, and enhance overall efficiency. The reliance on manual labor can be minimized, leading to decreased labor expenses and increased productivity. Additionally, the seamless integration of these machines into existing industry infrastructure ensures a smooth transition without major modifications.

The advantages of automatic clothes folding machines extend beyond efficiency gains. In homes, individuals can enjoy the convenience of time saved and the relief of avoiding the labor-intensive folding process. Moreover, these machines improve the quality and consistency of folding. In industrial contexts, they optimize resources by reallocating the workforce to more skilled tasks, fostering a more engaging work environment.

Embracing automatic clothes folding machines revolutionizes the textile industry, offering time and cost savings. Simultaneously, it simplifies household chores, providing convenience and efficiency. The incorporation of automation not only enhances operational processes but also contributes to an improved quality of life. By streamlining operations, reducing costs, and increasing productivity, the adoption of automatic clothes folding machines represents a significant advancement in meeting the demands of modern lifestyles.

Please provide the summary of the FYP instead of attaching the FYP report.

5

Competitive Advantage or Unique Selling Proposition (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence

a	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region) The Sustainable Development Goals (SDGs) provides a comprehensive roadmap for realizing a more supportable and better future for everyone. They hold against the pressing universal issues we come across such as the deficiency of basic necessities, disproportions, environment change, ecological deterioration, as well as peace and justice. The proposed product "FOLDIFY", which automates the folding mechanism, contributes to decent work and economic growth, and is greatly linked to industry, infrastructure and innovation. It is a useful product for domestic and industrial applications with affordability and environment safety.	
b	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.) The product presents an eco-firendly solution for the automation of home and business tasks. It doesn't contribute to carbon footprints while providing easiness, comfort, cost effectiveness and efficiency.	
c	**Any Other Aspect** The growing economies in Asia are undergoing fast mechanization and development. These areas are observing improved investments in structure development, leading to a considerable demand for cloth folding machines.	
6	**Target Market** (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service. The product has been designed to attract both domestic cutomers and industrialists. It provides benefits of reduced human efforts and time saving to domestic users, clothing manufacturers, industrial launderers, hospitals etc.	
7	**Team Members** (Names along with email address)	Hamna Sajjad EL-19004 Hafsa Qureshi EL-19007 Habiba Fayyaz EL-19021 Syeda Insia Nusrat EL-19083
8	**Supervisor Name** (along with email address)	Dr. Sana Arshad (Supervisor) sana@neduet.edu.pk Mr.Talal Alam Bhatti (Co-Supervisor)
9	**Pictures (If any)**	

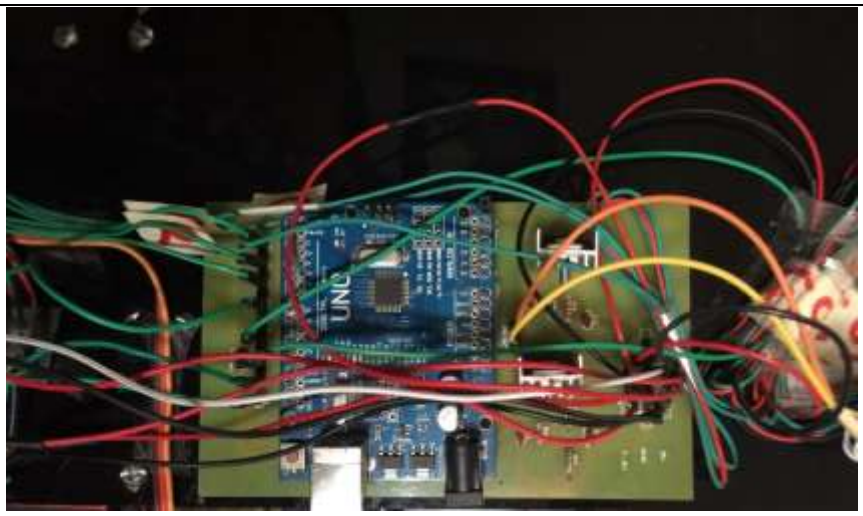

Figure : 5

The original PCB containing all the design components are presented in Figure 5 . This PCB is placed at the back portion of the product.

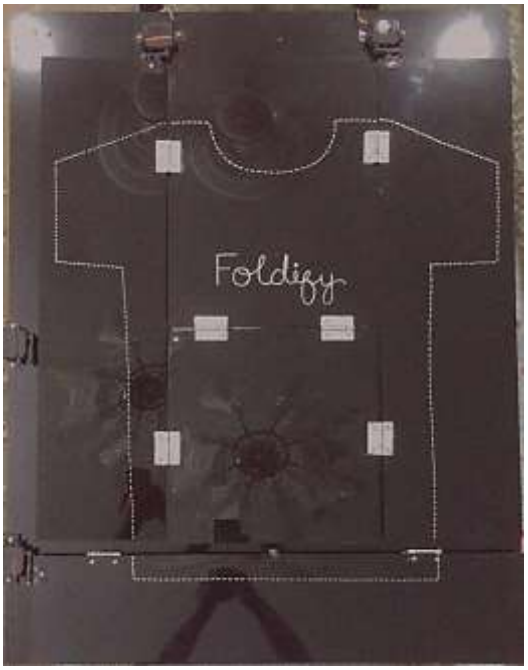

Figure: 6

Figure 6 shows the final look of the automatic cloth folding machine.

10	**Video (If any)**	Demo video Cloth Folding Machine.mp4