University of Moratuwa

Faculty of Engineering

Department of Electronic & Telecommunication Engineering

EN 1190 Engineering Design Project

PulseCraft

Shoe Cleaning and Drying Machine

Group Members

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ABSTRACT

This project focuses on the design and development of a shoe cleaning and drying machine, aimed at providing a convenient solution for maintaining footwear. The device integrates several electronic components, sensors, and mechanical parts to offer three distinct operational modes: quick drying, regular drying, and a combined cleaning and drying mode. Users can easily select the desired mode through an intuitive screen interface. To ensure safety and product longevity, the machine continuously monitors the internal temperature to prevent overheating. This innovation addresses a common consumer need and demonstrates significant market potential, providing an effective and user-friendly solution for shoe care.

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1. Problem Description

1.1 Problem Identification

During the peak of the month's rainfall, everyone faces challenges drying their shoes. it's tough for people to dry their shoes overnight for the next day's use. Drying their shoes is a main problem specifically for the people who engage in outdoor activities or sports as their shoes get wet and dirty frequently.

Wet and dirty shoes are uncomfortable and can cause bad smells, wear down faster, and lead to foot health Issues. Therefore It is important to clean and dry shoes when it gets wet or dirty in order to maintain foot health and Increase the lifespan of shoes.

1.2 Arriving at a solution

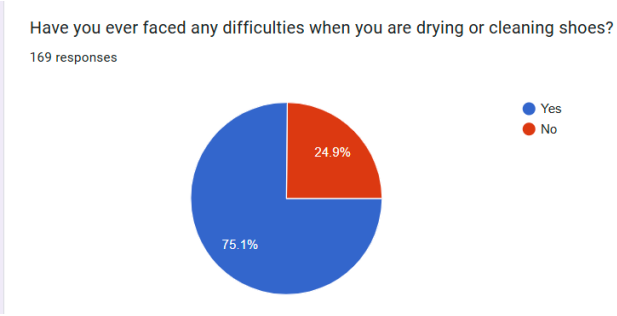
The shoe cleaning and drying machine rapidly dries shoes, ideal for athletes, outdoor fans, or rainy days. It has a user-friendly display that shows options and status, drying shoes in minutes instead of overnight.

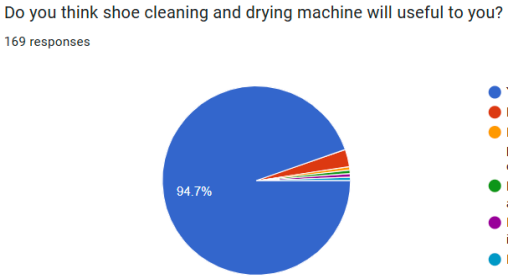
The shoe cleaning and drying machine features three main modes to suit different needs. The first mode, quick drying, is designed for rapid drying of shoes by using higher temperature hot air, making it ideal for when time is of the essence. The second mode, regular drying, uses low heated air for a slower drying process. While it takes more time than quick drying, it is gentler on the shoes, ensuring that the drying process is done carefully and effectively. The third mode, cleaning and drying, combines mechanical cleaning with drying, allowing users to clean their shoes thoroughly while also drying them. These modes provide flexibility and efficiency, catering to different shoe care requirements.

1.3 Justification for Selection

We have done a survey to validate our problem. We got responses from the various people. school students, university students and people who are currently working. We asked several questions from them.

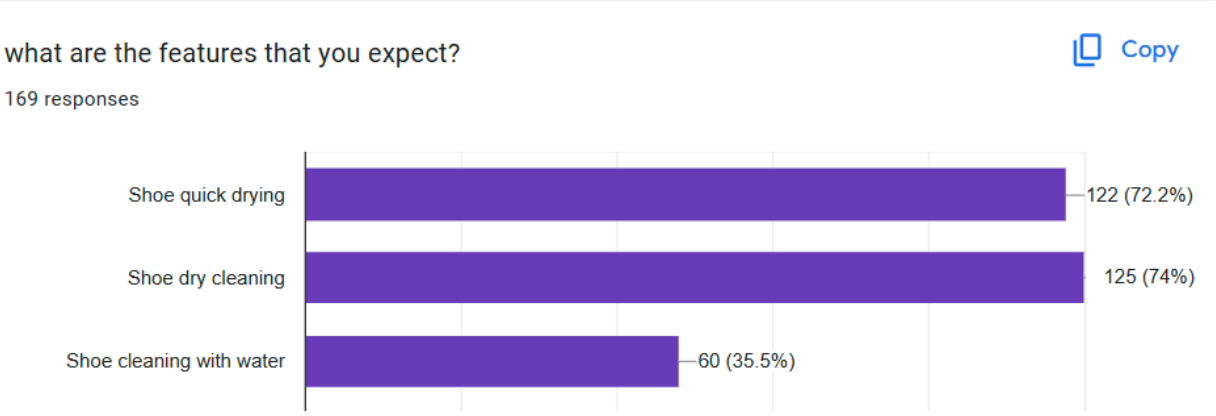
According to the survey 75% of people are facing this problem, and 94.7% people said that they need this product. Additionally, people who are doing sports and outdoor activities mentioned that they actually need this kind of product because they are frequently facing this issue.





Additionally we asked that what are the facilities that they need ?

Most of them mentioned that they need quick drying and dry cleaning facilities.



2. Key Features

- ***Versatile Modes***
  - **Normal Drying Mode**: Dries shoes at a moderate temperature, ideal for regular use and most shoe types.
  - **Quick Drying Mode**: Uses a higher temperature for faster drying, suitable for time-pressed users, while considering potential risks to delicate materials.
  - **Cleaning and Drying Mode**: Combines cleaning and drying, with air jets and roller brushes to remove dirt while drying

- ***Safety and Protection***
  - To ensure the safety of the users, we have implemented proper earthing for the device, as the enclosure is made of metal. This precaution minimizes the risk of electrical hazards, ensuring that the machine operates safely under all conditions.

- ***Humidity Detection/Optimal time***
  - Continues drying until humidity levels are low enough
  - Or using a optimal time according to the function
  - Prevents overheating to protect shoe materials.

- ***Intelligent Temperature Control***
    - Monitors internal temperature and activates heated air when needed.
    - Customizable temperature threshold for different shoe types.

3. Feasibility

3.1 Technical Feasibility

- Motor Drive with Back EMF Protection

- The machine uses a motor drive to power the DC motors. This drive includes protection against back electromotive force (EMF), which helps prevent damage to the electronic components and ensures smooth motor operation.

- Voltage Regulation with 7805 Regulator

- To ensure stable power supply to the integrated circuits (IC), the machine uses a 7805 voltage regulator. This component regulates the voltage to a consistent 5V, providing reliable power to the Atmega chip and other electronic components.

3.2 Hardware Feasibility

The hardware components which we used are,

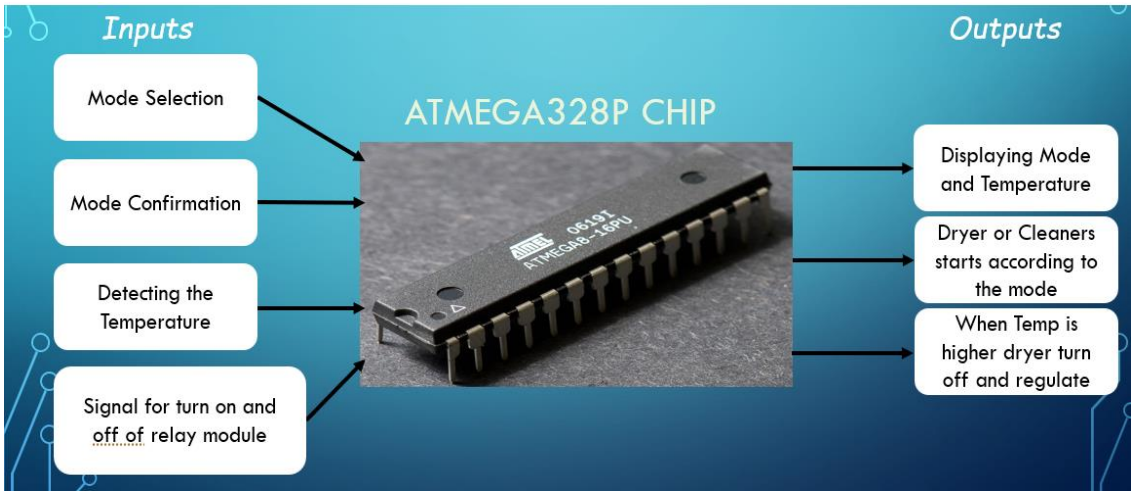
- ATMEGA328P
- OLED Display
- Motor Driver
- Temperature and Humidity Sensor
- Heating Element
- Two push buttons

- Relay module
- Main PCB

With all the available resources we manage to build the product to fulfill all the needs of users.

4. Product Architecture

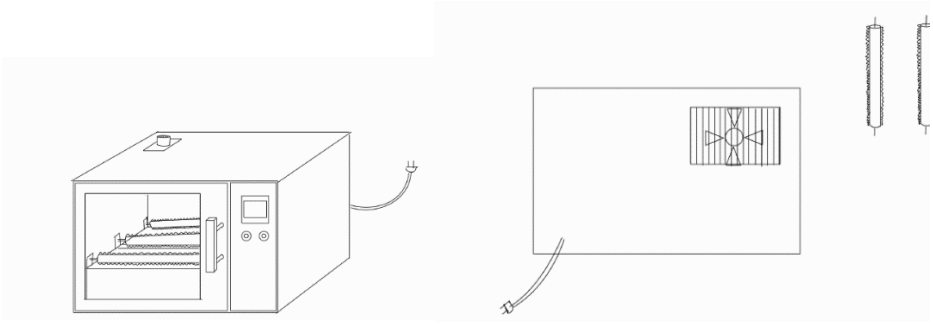
- ❖ Power supply-The 230v to 12v power step down module provide power to all sub systems while supplying 230v to the heating element.
- ❖ Main PCB- all the other sensors and models connected to main pcb. We used ATMEGA328P CHIP as the microcontroller.



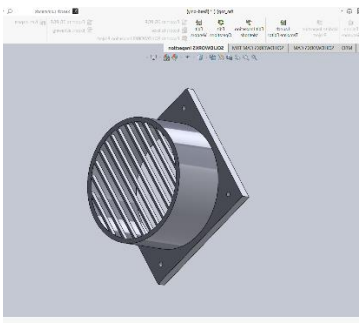
220381M – MANAWADU M.D./220148G – EASHAN S.G.S/220533H – RAVISHAN B.B.N./220701X – WICKRAMASINGHE S.D.

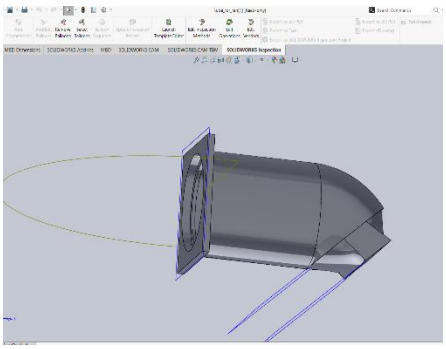
5. Sketch of the Product Enclosures

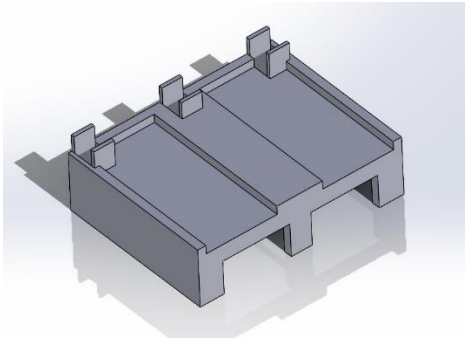
Initial Sketch



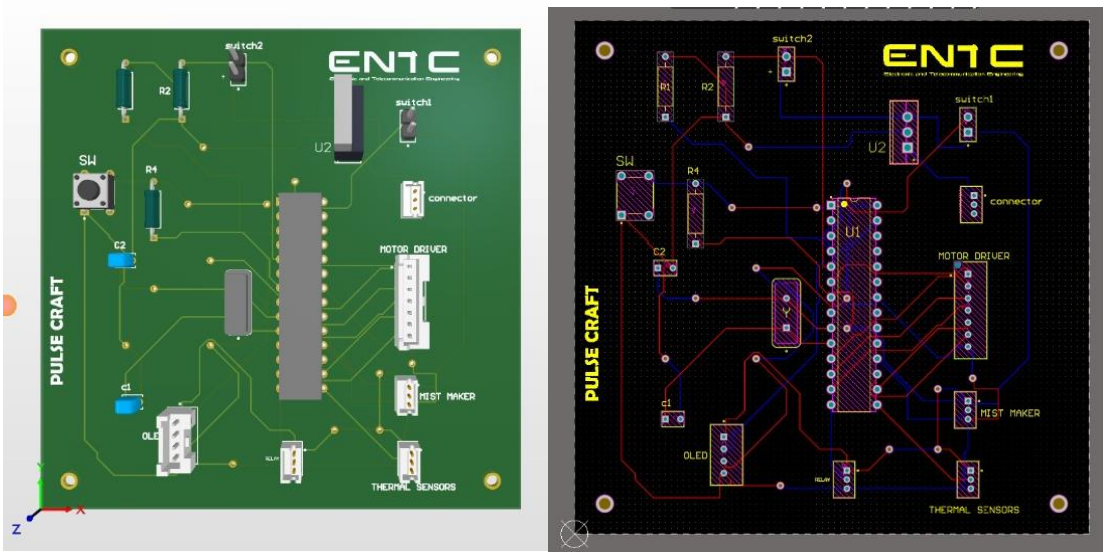
Final enclosures



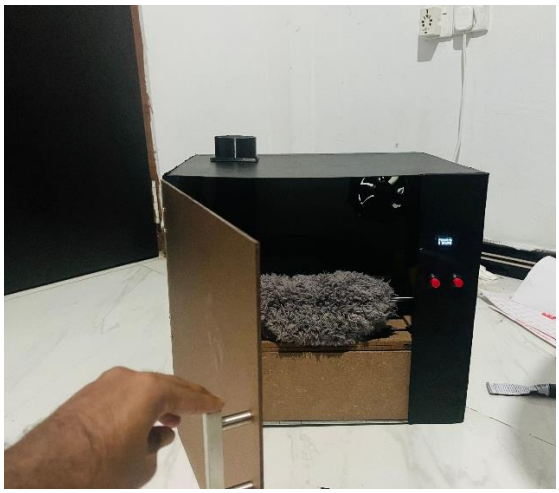




6. PCB Design



7.Final Product



8. Marketing Sales and After -Sale Service Considerations

Targeted campaigns

- **Busy Professionals:** Promote the Quick Drying Mode as a time-saving solution, ensuring shoes are dry and ready by morning. Target messaging through LinkedIn and office supply partnerships to highlight the convenience of starting the day with perfectly dry shoes.
- **Athletes & Outdoor Enthusiasts:** Emphasize the Normal and Cleaning Modes, which cater to the need for clean and dry shoes after intense physical activities. Market these features through sports brands, outdoor retailers, and social media platforms such as Instagram and YouTube to reach an active audience

Seasonal and niche campaigns

- **Rainy Season & Back-to-School:** Focus on how our machine helps maintain shoe quality during challenging weather and busy school periods. Implement special promotions to attract customers during these times.
- **Eco-Conscious Consumers:** Highlight the machine's benefits for extending shoe life and reducing waste, along with its eco-friendly packaging. Craft messaging around sustainability and environmental impact, using green living blogs, eco-product platforms, and collaborations with environmental influencers to resonate with this audience.

9. Task Allocation

we allocate tasks for each member in such a way that the workload is equally distributed amoung the members.

Manawadu M.D (220381M) - Altium PCB Design and soldering.

Eashan S.G.S (220148G) - Circuit Designing ,Coding and soldering.

Ravishan B.B.N(220533H) - Metal Enclosure Design and solidworks design and wire harnessing

Wickramasinghe S.D(220701X) - Metal Enclosure Design and solidworks design and wire harnessing

10. Project Budget

Item	Price
PCB printing	Rs 2300
Coil	Rs 200
AC motor with propeller	Rs 300
Motor Driver	Rs 330
Temperature and Humidity sensor	Rs 230
JST connectors	Rs 300
3 Dc motors	Rs 300
Push buttons and switches	Rs 200
OLED display	Rs 300
Metal enclosure	Rs 3700
3D printings	Rs 2000
Wooden parts	Rs 500
Total	Rs 10 660/=