University of Moratuwa

Faculty of Engineering

Department of Electronic & Telecommunication Engineering

EN1190 : Engineering Design Project

Detailed Final Report

Group Vanguard Silicon

Tracker for analyzing consumption of salt, sugar and oil

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ABSTRACT

Food Focus: Food Focus is a device equipped with load sensors to measure the weight changes in salt, sugar and oil containers. It provides a detailed report on the consumption of salt, sugar and oil of a household. The device is designed synchronized with local time and has user inputs for the number of family members. User can use this device as a clock as well as a timer at the same time while using it as a tracker. Currently, the prototype is successfully made and consist of three primary sections: Arduino board implementation, circuit implementation utilizing the standalone ATmega328P and the designed PCB, and enclosure design. The device is also equipped with an LCD display for user outputs. The data collected from the load sensors is stored and analyzed to provide a detailed report on the usage of the ingredients. This Food Focus will be a useful tool for households looking to monitor their salt, sugar and oil consumption and also to minimize waste. The enclosure of the device has designed using SOLIDWORKS and a special attention is providing for proper maintenance during the design phase. The PCB has designed using Altium Designer in a manner to optimize the use of space.

Contents

1.0 Problem Description

1.1 Raise of the Problem

This is a problem that all of our team members encountered when talking with relations, neighbors and even with our friends. Since many people have a concern on over-consumption of salt, sugar and cooking oil, we realized that this is a problem for many people. Even some people are facing health issues like diabetes, cholesterol, heart disease, high blood pressure and different kind of cancers. According to them over-consumption of salt, sugar and cooking oil is the main reason for those diseases and they were advised to control the consumption of salt, sugar and oil. But most of them did not have an idea on how to control the consumption by taking only the daily requirement.

1.2 Why does this problem need a solution?

If people are in good health, they can contribute to the economy with their full potential. Also, the happiness of a family depends on the health of the family members. If a family member falls sick and require medical attention, it will be an additional cost to the family and also it will be a significant portion of the household budget. If the number of sick people increased, that country needs to invest more money on the health care and it will affect the economy as well. Therefore, by developing a device to track and analyze the consumption of the cooking spices we can help the people while contributing to the economy.

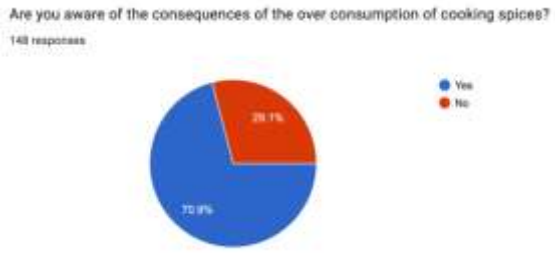
1.3 Who are benefited from our product?

Since we address a problem that is faced by every individual regardless of their age and other social factors, anyone who is interested in taking care of the personal health by reducing the consumption of the salt, sugar and oil will be benefitted from our device.

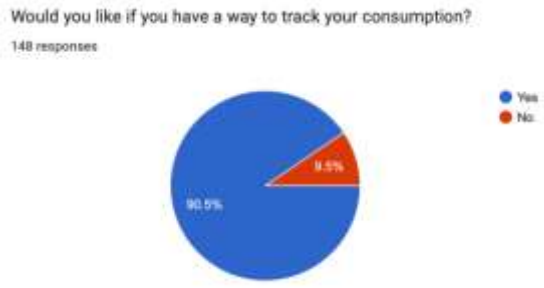
1.4 Solution Validation

In order to validate our product idea, we conducted an online survey. It was distributed among many age groups, and here is the summery.

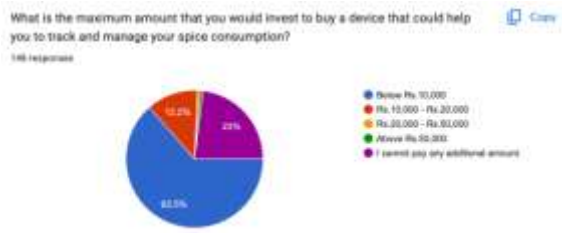
1. Awareness of the people of the consequences of over-consumption of cooking spices



2. Whether they want to have a way to track their consumption



3. Maximum amount they are willing to pay for a consumption tracker



The conclusion taken from the observation of the survey results;

- Most of the people are aware of the consequences of the over-consumption of salt, sugar and cooking oil and they expect to have a tracker to track the consumption.
- They need the product for an affordable price.

2.0 Technical Feasibility

2.1 Technical Specification

- Dimensions: 430mmX155mmX82mm
- Platform diameter: 120mm
- Weight: 1000g (Approximately)
- Power Consumption: <0.5W
- Accuracy: Estimated error < 1
- Lifetime: 5 years, 1 year warranty
- Water resistance: No

2.2 Technical Feasibility

To measure the usage of salt, sugar, and cooking oil, weight sensors such as load cells, for example, the HX711, will be required for accurate weight measurements. These load cells can be connected to the ATmega328P board via its pins.

To ensure proper device functionality, all components must be integrated and controlled by a central controller. The ATMEGA328P microcontroller was selected for this purpose due to its optimal power consumption and availability in the market.

An LCD can be used to display information to the user. The LCD display is a popular and cost-effective option.

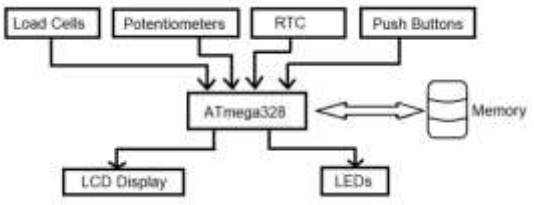
For calibration and resetting purposes, as well as obtaining detailed consumption reports, push buttons can be connected to the ATmega328P board.

Three LEDs are used to indicate if the user has exceeded their daily consumption limit

The device relies on the user's actions and requires good user interaction. The user should be able to easily provide input and receive feedback from the machine. To facilitate this, a LCD display was incorporated into the design to display instructions and track the usage of salt, sugar, and cooking oil in a user-friendly manner.

To power the device, a 5V power supply can be provided using an AC/DC power adaptor.

3.0 Product Architecture



3.1 Inputs

There are two types of inputs acquired by the device.

1. User given inputs.

   A. Potentiometers

      Potentiometers are used to input number of family members, to navigate through the main menu, select options, set alarm time. Input is proportional to the turning of the potentiometer.

   B. Push Buttons

      Push buttons are used to acquire user inputs in various in various scenarios such as activating the 'Detailed Report' mode, asking user confirmations on when an addition of salt, sugar or oil is detected and to confirm the selection. The functionality of the push buttons will be described up to a satisfactory level in the product manual.

2. Internal Inputs

   A. Load Cells

      Three load cells has been mounted under each platform where the compartments were kept. The load cells will send real-time weight of each compartment to the microcontroller, where those data will be processed.

   B. Real Time Clock (RTC) module

      An RTC module has been used to get the real time and date since they are needed for the effective analysis of the consumption over both shorter and longer period of time.

3.2 Output

There are two types of outputs of the device.

1. LEDs

   A. An LED has been placed near each compartment to indicate if the condiment is already used more than recommended per day.

   B. Power indicator

2. LCD Display

   An LCD display has been used to output the calculated usage of each condiment. When the 'Detailed Report' mode is used, that information will also be displayed on the LCD display.

3.3 Storage

The collected data will be stored in a SD card module added to the ATmega328P board to store data for long term analysis, enabling the device to retrieve and analyze data later. Later on, when the user selects the 'Detailed Report' mode, the stored data will be accurately processed and conveniently displayed on the LCD display, allowing for a comprehensive analysis of the gathered information.

4.0 UI/UX and Enclosure Design

4.1 UI and UX design

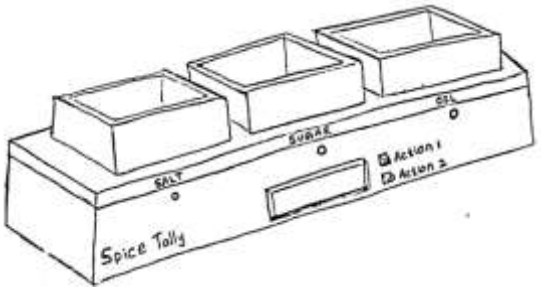
- The interface consists of a LCD display, confirm button and a button for the detailed report.

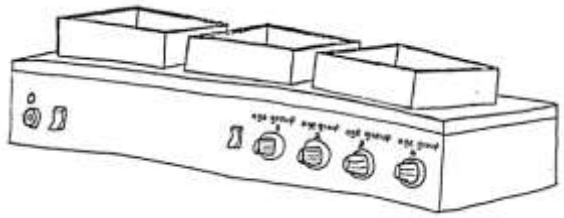
- The LCD display is used to display information regarding to the health report and necessary alerts.
- The multipurpose nob is for the user to navigate through the main menu and for the selections.
- At the rear of the device, the power supply is attached and a LED indicator displays the power status, with a power on/off switch.
- For the convenience of users, the compartments intended for condiments and the buttons are labeled with the corresponding names.
- 'Sound Profile' option is for the user to select silent mode or unmuted mode.
- 'Detailed Report' option has been used to provide an auditory feedback of the consumption of this month and the previous month and the trend of the usage.

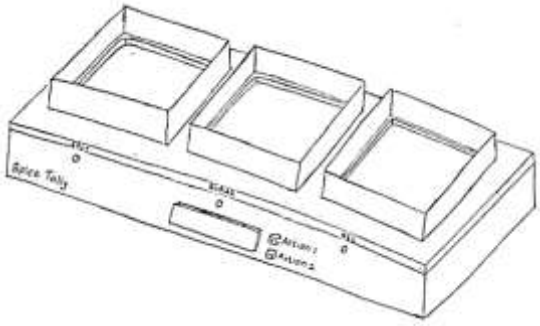
4.2 Enclosure Design

4.2.1 Initial hand drawn sketches

This initial sketches highlights the key design features and functionalities of our product, which were chosen to enhance the user experience and ensure ease of use.

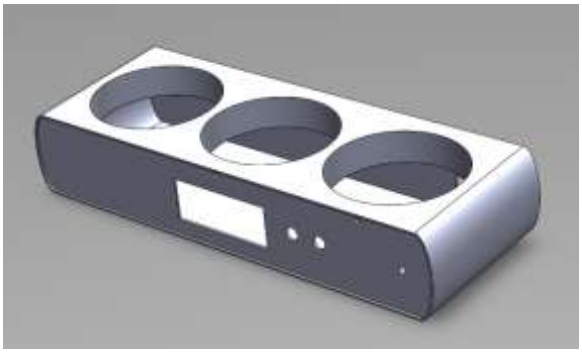






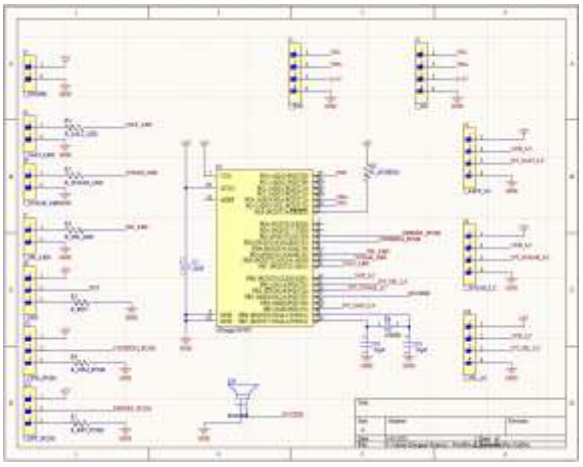
4.2.2 3D renders of the finalized design

These 3D renders showcases the design elements of our product, which were carefully considered and implemented to enhance the user experience and ensure ease of use. The enclosure was designed using Solid-Works.

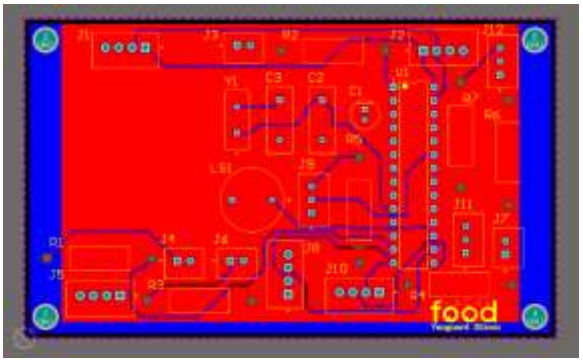


5.0 PCB Design

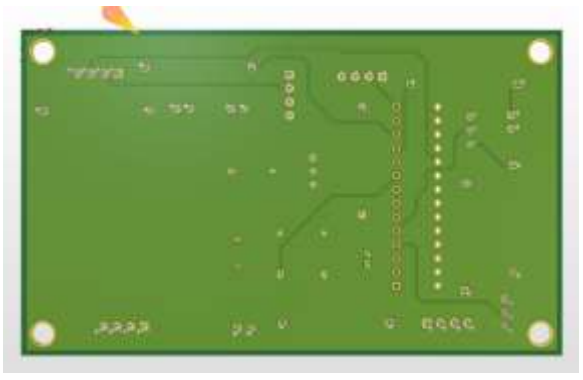
5.1 Schematic Design



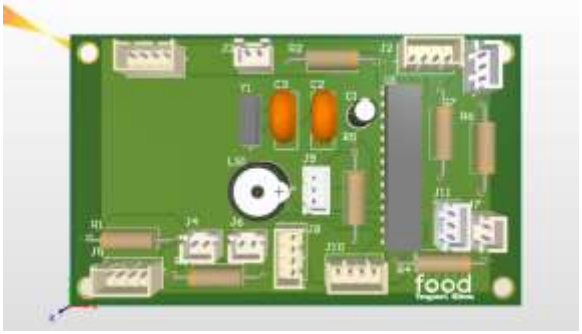
5.2 Altium Design



Routing



Bottom View



Top View

6.0 Marketing and Sales Plan

6.1 Marketing

- Once the prototype of the product is successfully implemented, the next stage is to build the final product design.
- It's important to maintain clear documentations regarding each and every step during the production process.
- Before the product is released to the public, it's mandatory to receive necessary approvals from the relevant officials.
- The marketing process will be started after once the approval is received.
- The product can be marketed to the public via relevant distributers of consumer electronics.

6.2 Maintenance

- The device must be kept in a dry environment.
- The device can be cleaned by taking apart the removable enclosure parts.
- The device needs to be cleaned every 3 months time interval.
- In any instance of malfunctioning, repair will be done free of charge during the

warranty period. (Terms and conditions apply)

7.0 Bill of Quantities

Components	Price(Rs)
5V power supply	850
ATmega328P chip	1400
Components	10,080
PCB	2870
Enclosure	4500
Miscellaneous	2900
Total	**22,600**

8.0 Task Allocation

The responsibility of implementing the Arduino board and the circuit implementation with standalone ATmega328P has been assigned to team member Yasiru.

The task of developing the algorithm and programming the microcontroller chip has been assigned to the team member Linuka.

Team member Kumuthu has been assigned with the responsibility of creating schematic diagrams and designing the PCB.

Team member Kavindu has been assigned with the responsibility of designing the enclosure and creating hand-drawn sketches.

9.0 Acknowledgement

Developing a device that analyses people's health, within the first semester at ENTC is a challenging task that required a deep understanding of Electronics. As this was our first design project, we were facing several obstacles and had to learn numerous concepts and skills.

We extend our deepest gratitude to our lecturer Dr. Ajith Pasqual for their unwavering support and guidance throughout the development process. The valuable lectures we had with Dr. Pasqual were always helpful in motivating us and clearing our doubts.

10.0 References

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