Team MORSE Studio
Georgia State University

A. Statement Expressing Our Interest in Entering the Contest.

We are expressing our interest in participating in the IEEE Sensors Council contest with our experimental project, **Assessing the Impact of Temperature and Humidity on Milk Spoilage.** Our plan is leveraging the capabilities of the MYOSA platform and the SI7021 Temperature and Humidity Sensor to develop an experimental setup that monitors how environmental conditions influence milk spoilage over a two-week period. This project integrates sensors and camera systems to collect numerical data, which will enable us to analyze the factors contributing to milk degradation across different brands.

Our project involves comparing two setups: one milk sample kept refrigerated and another kept at room temperature on a kitchen counter. We will collect temperature and humidity data for both setups, removing a small cup of milk daily from each gallon for spoilage testing. By analyzing the collected data, we seek to identify patterns that can help improve storage practices and extend the shelf life of milk products. Participating in this contest offers us an excellent opportunity to apply our technical skills, contribute to public health awareness, and engage with the scientific community. We look forward to presenting our findings and demonstrating the practical applications of sensor technology in food safety.

B. Details of Team Members

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C. Details of Faculty Mentor

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Ideation Details
1. How will the MYOSA board be used in the project?

The MYOSA board will serve as the central control unit for our Smart Milk Spoilage Detection System. Programmed in **C++** using the Arduino IDE, the MYOSA board will interface with the SI7021 Temperature and Humidity Sensor to monitor environmental conditions around the milk samples. We will set up two MYOSA boards, one for each milk sample—one kept refrigerated and the other kept at room temperature on a kitchen counter. The boards will collect temperature and humidity data at regular intervals over a two-week period. By utilizing the MYOSA board's capabilities, we can efficiently manage data acquisition and ensure accurate monitoring of conditions that affect milk spoilage.

2. Which sensors or actuators will be used?

We will use the following component from the MYOSA list:

1. **SI7021 Temperature and Humidity Sensor (x2)**: To monitor the ambient temperature and humidity affecting milk spoilage in both setups.

3. What additional circuit and/or software will be created around the MYOSA board to make your application work?

Additional Circuitry:

- **Sensor Interface Circuit**: To connect the SI7021 sensor to the MYOSA board
- **Power Supply Module**: To provide stable voltage for the MYOSA board and the sensor.

Software Development:

- **Firmware in C++**:
    - **Sensor Initialization**: Using the provided `TempAndHumidity.h` library, we'll write code to initialize and read data from the SI7021 sensor.
    - **Data Logging**: Develop a system to record temperature and humidity readings at set intervals, with timestamps for accurate tracking.
    - **Data Storage**: Store the collected data on an SD card module connected to the MYOSA board or transmit it via serial communication to a computer for analysis.
    - **Communication Protocols**: Implement serial communication to transfer data to a PC for further processing.
    - **Dual Setup Management**: Ensure both MYOSA boards operate synchronously by collecting comparable data from the refrigerated and non-refrigerated samples.
- **Data Analysis Software**:
    - **On PC**: Develop a Python program to receive the data from the MYOSA boards, analyze it, and visualize the results.
    - **Statistical Analysis**: Apply statistical methods to determine the correlation between environmental conditions and milk spoilage rate in both setups.

4. Highlight the significance of the specific application that the team is aiming to address

Milk spoilage is a common issue that poses health risks and leads to food waste. By comparing refrigerated and non-refrigerated milk samples over a two-week period, our project aims to provide valuable insights into how temperature and humidity influence milk degradation. Daily removal of a small amount of milk for spoilage testing allows us to monitor changes in milk quality over time. This information can help consumers, retailers, and producers improve storage practices, extend shelf life, and reduce waste. Our Smart Milk Spoilage Detection System demonstrates how simple yet effective sensor technology can contribute to food safety.

5. The intended use of the MYOSA platform and how the proposed project exploits its potential.

The MYOSA platform, programmed in C++ using the Arduino IDE, provides an excellent environment for interfacing with the SI7021 Temperature and Humidity Sensor. By utilizing two MYOSA boards we can simultaneously monitor environmental conditions in both refrigerated and non-refrigerated setups. This straightforward yet impactful application demonstrates how the MYOSA platform can be used to address important issues in food safety and quality control.

6. The demo that is intended to be performed at the selected conference venue

We plan to demonstrate a working prototype of our monitoring system:

Demo Components:

- Two sample milk containers, one representing the refrigerated setup and the other representing the non-refrigerated setup.
- Each container is equipped with a MYOSA board and the SI7021 sensor.
- A live display showing real-time temperature and humidity readings from both setups.
- Graphs and charts generated from the collected data to illustrate how changes in environmental conditions affect milk spoilage over time.
- Presentation of daily spoilage test results based on the milk samples removed each day.

Demonstration Flow:

1. **Introduction**: Briefly explain the project's objectives and its importance in improving food safety.
2. **Real-Time Monitoring**: Show live temperature and humidity data from both setups as we simulate changes in the environment.
3. **Data Analysis Presentation**: Present findings from previous experiments and highlight the correlation between environmental conditions and milk spoilage.
4. **Spoilage Testing**: Explain the daily removal of a small cup of milk from each sample for spoilage testing and how these results correlate with the environmental data.

Objective:

- To illustrate the practical application of the MYOSA board and the SI7021 sensor in monitoring environmental conditions.
- To demonstrate how temperature and humidity influence milk spoilage and the importance of proper storage.