Mood Coffee – System Test Report

1. Test objectives

This document outlines the system-level testing of the Mood Coffee Machine. The purpose is to validate that the entire system—integrating hardware sensors, recognition modules, and the brewing unit—functions cohesively to provide an intelligent and personalized coffee-making experience based on user mood.

2. Test environment

a. Hardware: Raspberry Pi, camera module, water pump, display screen, contact sensors

b. Sensors: Heart rate and blood oxygen sensor (biological signal sensor)

c. Software: C++ backend, Qt GUI, mood recognition algorithms (image + biological analysis)

3. Functional test items

No	Test Item	Test Method	Expected Result
1	Mood Recognition	Test with users showing different emotions, observe system output	Correctly recognize mood and provide analysis
2	Biological Data Collection	whether the heart rate/blood oxygen is read correctly by Biological Signal Sensor	heart rate/blood oxygen is read correctly
3	Coffee Recommendation	Input emotion states and check recommendation	Suggested coffee matches mood

4	Automated Coffee Brewing	Trigger brewing from emotion result	Correct coffee brewed automatically
5	Inconsistent Mood Inputs	Feed conflicting dat	Picks safe or fallback emotio
6	Manual Interruption	Interrupt manually	Stops safely, alerts user
7	System Reset	Restart system mid-process	Resumes operation safely
8	Full Workflow Test	Simulate full user interaction	All modules cooperate, workflow is successful

4. Test Procedure

4.1 Mood Recognition Test

Number	Test Item	Test Method	Expected Result
1	Mood Recognition	Test with users showing different emotions, observe system output	Correctly recognize mood and provide analysis

4.1.1 Prepare

Ensure the system is running properly and the mood recognition module is loaded.Set up the testing environment, including the user facial expression camera and emotion analysis software.

Choose users with different ages, genders, and emotional expression abilities to ensure a diverse sample.Each user will be tested in different emotional states to ensure the system's broad applicability.

4.1.2 Conduct the Test

Ask each test user to display different emotions, for example:

Happy: User smiles broadly, showing a joyful emotion.

Sad: User displays a sorrowful or downcast facial expression.

Angry: User furrows their brow, showing a tense expression.

Surprised: User widens their eyes, showing surprise.

Neutral: User maintains a neutral facial expression.

Observe whether the system provides accurate recognition of each emotion.Record the system's output after each test to see if it correctly recognized the emotion.Outputs should include: the identified emotion type, accuracy rating (e.g., 100% accurate or margin of error), and any additional mood analysis (e.g., intensity of the emotion, emotional transition, etc.).

Conduct repeated tests to verify the consistency and reliability of the system. Ensure the recognition results are stable for each emotional expression displayed.Optionally, test each user with random combinations of different emotions to evaluate the system ' s adaptability.

4.1.3 Result

The system accurately identify each emotion displayed by the user and provide appropriate analysis.

The recognition accuracy for each emotion reach at least 90% (adjustable based on test design).

The system be capable of recognizing complex emotional changes, such as transitioning from happy to sad, and provide relevant mood analysis feedback.

4.2 Biological Data Collection Test

Number	Test Item	Test Method	Expected Result
2	Biological Data Collection	whether the heart rate/blood oxygen is read correctly by Biological Signal Sensor	heart rate/blood oxygen is read correctly

4.2.1 Prepare

Ensure that the Biological Signal Sensor is calibrated and functioning correctly. Test the sensor on a known, controlled input to verify accuracy.

Verify that the heart rate and blood oxygen sensors are connected properly to the system.

Ensure the user is in a comfortable position (e.g., seated and relaxed) to obtain accurate biological readings.

Ensure that no electrical interference or environmental factors will affect sensor readings.

4.2.2 Conduct the Test

Instruct the user to sit still and place their fingers or any other specified body part on the sensor.Make sure the user is relaxed and not engaging in physical activity to prevent inaccurate readings.

Begin the process of collecting biological data, such as heart rate and blood oxygen levels, from the sensor.Observe the readings displayed on the connected system (e.g., software interface).

To ensure accuracy, perform the test on multiple users (with varying biological conditions) to observe if the sensor works consistently across different users.

Input control data (such as known heart rate/blood oxygen levels) to compare with sensor readings.

4.2.3 Result

Heart Rate/Blood Oxygen Accuracy:

The system accurately display the heart rate and blood oxygen levels corresponding to the user's actual measurements.

Verify that the readings match the expected range based on user data or control input (a healthy adult should have a resting heart rate between 60-100 beats per minute and a blood oxygen level of 95-100%).

The sensor readings consistent across multiple tests and users.

There are no significant deviations or errors in the heart rate or blood oxygen readings under normal conditions.

4.3 Coffee Recommendation

Number	Test Item	Test Method	Expected Result
3	Coffee Recommendation	Input emotion states and check recommendation	Suggested coffee matches mood

4.3.1 Prepare

Ensure that the mood recognition system is active and ready to accept input, either manually or through user input. Verify that the coffee recommendation system is properly linked with the mood recognition module, so it can respond accordingly to mood inputs.

Create a list of predefined coffee recommendations that are mapped to specific mood states.

4.3.2 Conduct the Test

Ask the test user to input different emotion states into the system. These could be through:Facial expression recognition (e.g., smiling for happiness, frowning for anger).

Text input (e.g., typing “I feel happy” or “I feel sad”).Once the emotion state is recognized or entered, trigger the coffee recommendation process by having the system output a

recommended coffee based on the mood input.
Check whether the recommended coffee matches the mood. For example:
If the input is "happy," verify that the coffee recommendation suggests something energizing like an espresso.
Repeat the process for various emotions, including happy, sad, angry, stressed, and neutral, ensuring that the system consistently suggests the right coffee for each mood.

4.3.3 Result

The system should correctly suggest a coffee that matches the mood input.
Happy → Espresso or strong coffee.
Angry → Smooth or balanced coffee.
Stressed → decaffeinated coffee.
The coffee recommendation consistent and match the defined mood-coffee mapping across multiple tests and users.

4.4 Automated Coffee Brewing

Number	**Test Item**	**Test Method**	**Expected Result**
4	Automated Coffee Brewing	Trigger brewing from emotion result	Correct coffee brewed automatically

4.4.1 Prepare

Ensure that the coffee brewing system is correctly installed and functioning. This includes verifying that all hardware (e.g., coffee machine, water supply, coffee beans) is connected and operational.Make sure the brewing system is capable of receiving external inputs, such as commands from the coffee recommendation system or emotion result module.

Ensure that the brewing system can produce different types of coffee based on predefined recipes (e.g., espresso, latte, cappuccino). The system should be able to adjust parameters such as coffee strength, milk ratio, and brewing time.

4.4.2 Conduct the Test

Based on the recognized emotion, the system should trigger the coffee brewing process for the corresponding coffee recommendation.Observe the brewing process and ensure

that the correct coffee is brewed automatically without manual intervention. Verify that the coffee machine performs the brewing steps properly (e.g., grinding, water heating, brewing).

Repeat the process for various emotions (e.g., happy, sad, angry, neutral) and ensure the machine brews the correct coffee for each emotion input.Monitor the time taken for each brewing process and verify that the coffee is brewed correctly, matching the intended coffee type for the given mood.

4.4.3 Result

The coffee brewing system brew the correct type of coffee automatically based on the emotion input. The coffee machine operate without errors, and there are no delays or malfunctions during the brewing process.

The coffee brewed consistent with the selected recipe across different tests and users and no variation in the quality or quantity of the brewed coffee.

4.5 Inconsistent Mood Inputs

Number	Test Item	Test Method	Expected Result
5	Inconsistent Mood Inputs	Feed conflicting dat	Picks safe or fallback emotio

4.5.1 Prepare

Verify that the system can handle multiple types of emotion inputs and provide a corresponding mood analysis.

Create scenarios where conflicting mood data may be inputted into the system.

Using extreme or ambiguous emotional states that may confuse the system (e.g., "confused" or "mixed emotions").

4.5.2 Conduct the Test

Test various conflicting emotional inputs into the system. Observe how the system processes the conflicting inputs. Does it select a fallback emotion? Does it pick a neutral emotion or decide on the more dominant feeling based on predefined rules?

Feed multiple conflicting emotional inputs over a period of time (e.g., several iterations of different mixed emotions). Check for consistency in the system' s handling of these conflicting inputs.

4.5.3 Result

The system select a fallback or neutral emotion when presented with conflicting mood inputs. If "happy" and "angry" are both inputted, the system could default to a neutral mood or pick one emotion based on predefined rules (e.g., the system may prioritize "happy" if it detects more of that emotion).

The system not crash or malfunction when receiving conflicting inputs. It handle conflicting data gracefully without errors.

The system consistently apply the same fallback or safe emotion selection logic when faced with conflicting inputs. There are no unexpected behavior or inconsistencies between tests.

4.6 Manual Interruption

Number	Test Item	Test Method	Expected Result
6	Manual Interruption	Interrupt manually	Stops safely, alerts user

4.6.1 Prepare

Ensure that the system includes a manual interruption mechanism.Verify that the system is programmed to handle interruptions safely without causing system errors or incomplete processes.Ensure the system can provide user feedback (e.g., via screen, LED indicator, or sound) when interrupted.

4.6.2 Conduct the Tes

Start the full workflow, beginning from mood input to coffee recommendation, and into the brewing process.At various stages, manually trigger the interruption.

Check if the system halts operations immediately and safely (e.g., brewing stops, no further commands are executed).

Ensure the user is clearly alerted of the interruption via:

Visual messages (e.g., "Process Stopped by User").

Audible signals (e.g., a beep).

Interface update (e.g., red icon or flashing warning).

If applicable, test whether the system logs the interruption or allows the user to restart the process afterward without errors.

4.6.3 Result

The system stop safely at the point of manual interruption, without causing system failure, incomplete brewing, or unexpected behavior.The system clearly notify the user that the process has been manually interrupted, and no further steps are taken unless reinitiated.

4.7 System Reset

Number	Test Item	Test Method	Expected Result
7	System Reset	Restart system mid-process	Resumes operation safely

4.7.1 Prepare

Verify that the software supports resuming operations after an unexpected stop or intentional reset. Prepare the full system, including mood recognition, coffee

recommendation, and coffee brewing modules.

4.7.2 Conduct the Tes

Begin a test cycle with a mood input, trigger the coffee recommendation, and initiate brewing.At each predefined test point, force a system reset.Let the system resume and observe if the coffee is brewed correctly and safely without any duplicate or skipped steps.

4.7.3 Result

The system resume operation safely without data corruption or misbehavior. If exact resumption is not possible, the system either restart the process from a known safe point or prompt the user to confirm actions.The system inform the user that it has been reset and explain what will happen next. Hardware (e.g., coffee machine) not overheat, overrun, or repeat steps unnecessarily. No unsafe conditions occur during or after the reset.

4.8 Full Workflow Tes

Number	Test Item	Test Method	Expected Result
8	Full Workflow Test	Simulate full user interaction	All modules cooperate, workflow is successful

4.8.1 Prepare

Ensure all system components are connected and working properly.Verify that data flows smoothly between modules, e.g., mood and biological data are successfully processed and forwarded to the coffee recommendation system, which then communicates with the brewing module.

Prepare a user (real or simulated) to interact with the system from start to finish.Have test data ready for mood inputs and biological signals to trigger meaningful system responses.

4.8.2 Conduct the Test

Step 1 – Mood & Biological Data Collection

Simulate a user approaching the system.

Capture facial emotion or input text-based mood.

Measure heart rate and blood oxygen level through the sensors.

Verify that both types of data are collected and displayed/analyzed.

Step 2 – Emotion Analysis & Coffee Recommendation

Confirm that the system combines mood and biological data to determine the user's emotional state.Observe if the system recommends an appropriate coffee type based on the analysis.

Step 3 – Automated Coffee Brewing

After recommendation, the system should initiate brewing without additional user input.

Verify the correct coffee type is selected and brewed according to the mood-based recommendation.

Step 4 – User Notification & Completion

Ensure the user receives a notification that their coffee is ready (e.g., message on screen, sound alert).

Record how long the process takes and check if each module transitions smoothly without errors or delays.

4.8.3 Result

All modules work together without manual intervention.

The process flows logically: Mood input → Data collection → Emotion analysis → Recommendation → Brewing → Notification.

The brewed coffee matches the expected type for the user's mood.The workflow completes successfully without crashing, freezing, or requiring a restart.The process feels

smooth and responsive, with clear guidance for the user at each step.