Step 5: Test and Refine the Solution

Scenario One – Pet eats as expected

In this scenario, the pet feeder system performs ideally. The current time matches a scheduled feeding time, the food tank contains plenty of dry kibble, and following the dispensing of the kibble, the bowl weight sensor detects that the pet has eaten.

Test outputs

According to the step 4 logic, the system would first initialise and then start the continuous loop. The primary condition, "**IF (IsItFeedingTime IS TRUE · NOT (FoodStorageTank IS EMPTY))**", would evaluate to true because the current time matched a scheduled interval and the food tank is not empty. this evaluation triggers the system to "**Activate Dispensing Mechanism**", accompanied by a sound to signal the pet. Following this action, the system would then wait for 10 minutes, allowing the pet to eat its kibble. Finally, the decision "**IF (BowlWeight IS UNCHANGED)**" would evaluate to false, since the bowl weight sensor indicates a change due to the pet eating the food. This leads directly to the system to carry out "**Log: Successful Feeding**".

Discussion of logic

This scenario effectively shows that the system's core functions are able to operate as intended. The series of dispensing, the designated waiting period, and the logging of a successful feeding all align well with the problem statement's requirement for reliable feeding. The idea of adding an audio cue for the pet is a thoughtful detail that elevates the pet's experience. This performance contributes to the overall goal for enhancing operational efficiency and ensuring consistent reliable feeding practices within the animal shelter.

system refinements

while these test results are solid and demonstrates the pet feeder's ability to function as desired, for better reliability, considering adding a secondary sensor is a good idea. For instance, an infrared beam senser at the dispenser's exit could be added to confirm the kibble's being dispensed. This would add an extra layer of verification beyond just activating the dispensing mechanism and relying simply on the food tank level and bowl weight sensors. This sensor could detect and signal issues such as a blocked dispenser, which is not covered by the current sensors. This would also elevate the pet feeder's reliability and maintainability.

Scenario Two – Pet does not eat

In this scenario, the automated pet feeder successfully dispenses food at a scheduled time, with plenty of kibble in the food tank. However, despite the food being dispensed, the pet fails to eat the kibble within the timeframe, leading to the activation of the system's monitoring and alert mechanisms.

Test outputs

According to the Step 4 logic, the system would first initialise and then start the continuous loop. The primary condition **"IF (IsItFeedingTime IS TRUE · NOT (FoodStorageTank IS EMPTY))**" would evaluate to true, as the current time matches a scheduled interval (via the real time clock input) and the infrared level sensor confirms the food storage tank is not empty. This triggers the system to

"**Activate Dispensing Mechanism**", accompanied by a sound to signal the pet. Following this, the system would then wait for 10 minutes, giving the pet plenty of time to finish eating. After the waiting period ends, the decision "**IF (BowlWeight IS UNCHANGED)**" would evaluate to true, indicating that the bowl weight sensor detects no change in the food bowl, this outcome leads to two actions:

1. OUTPUT: ALERT STAFF (FOOD UNEATEN): An alert is announced and displayed to staff. This directly prompts them to investigate the pet's wellbeing, as the system does not posse's direct animal health diagnostic capabilities.
2. LOG: UNEATEN FEEDING: This is logged by the pet feeder which is important for distinguishing between different feeding times (E.g., Breakfast vs Lunch) and helps to track feeding patterns or recurring issues.

Discussion of logic

This scenario demonstrates the pet feeder's monitoring capabilities and its alignment with the problem statement's requirements for generating immediate and actionable alerts. The notification to staff when food remains uneaten is crucial as it directly supports the primary aim of prompting staff for further investigation into the pet's wellbeing. Furthermore, the system's ability to log uneaten feeding is not only important for marking the end of a specific cycle but also assists staff to recognise and take note of patterns and valuable data of a pet's eating habits.

system refinements

While the immediate alerts are effective and aligns with the problem statement, to further enhance the system's reliability and maintainability and ensure more urgent attention for potentially serious health issues, it can be a good idea to implement an escalation protocol. For instance, if the same animal's food stays uneaten for a second consecutive feeding, the alert could be automatically re-categorised as a high priority alert. This additional alert system would ensure more urgent attention for potentially serious health issues, moving beyond the initial notification to proactively address recurring problems, while still staying true to the client's low-cost hardware implementation goal.

Scenario Three – Food tank is empty

In this last scenario, the pet feeder reaches one of the scheduled feeding intervals, using input from the real time clock. However, the infrared level sensor in the food tank detects that the kibble is finished, preventing any food from being dispensed into the bowl.

In this scenario as well, it first initialises system and then starts the continuous loop. When the pet feeder checks **"IF (IsItFeedingTime IS TRUE · NOT (FoodStorageTank IS EMPTY))**". This word code represents two conditions:

1. IsItFeedingTime IS TRUE : which is true as it is one of the scheduled time
2. FoodStorageTank IS EMPTY: which is true as the tank is empty

Therefore, the NOT (FoodStorageTank IS EMPTY) would be false. This would mean The whole IF path would be false.

The system would then proceed to the "**ELSE IF (IsItFeedingTime IS TRUE · FoodStorageTank IS EMPTY) THEN**" path which would be evaluated as true.

After this ELSE IF condition confirms to be true, it will trigger the next action which is "**OUTPUT: ALERT STAFF (FOOD TANK EMPTY)**". This alert is presented through a displayed message and a sound signal, prompting the staff that the Food level has reached 0% and needs refilling. After this alert, the system will move to the "Wait for next cycle".

Discussion of logic

This scenario highlights the pet feeders monitoring capabilities and its ability to generate alerts for staff. The scenario shows the importance of the pre dispensing check and the use of a infrared level sensor, which helps to prevent any attempt to dispense food from an empty tank. This is crucial as it avoids potential strain on the dispensing mechanism and, more importantly, prevents unfilled feeding intervals so that no pets miss a meal.

system refinements

although the alert on its own is highly effective, to further refine this condition and minimise disruption, considering an implementation of a low food warning alert would be a good idea. This could be a distinct alert, differentiated by the display message, that activates when the food tank reduces to 10% or 20%. this alert would allow the staff to refill the tank before a scheduled feeding is missed, thereby reducing the risk of missed meals or lag.