**BAZLA BILQUEES**

**U3312671**

**IIT- ASSIGNMENT 1**

**PART # 01:**

**STEP# 01: UNDERSTAND & DEFINE THE PROBLEM (ANALYSIS):**

Designed a system of automatic pet feeder that measures all the consequences of the system i.e. consumption of food, dispensation of food, time schedules for feeding and send alert if the food is not eaten, food level in dispense is low, food tray/ bowl is empty.

**STEP # 02: ORGANIZE AND DESCRIBE THE DATA:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SYMBOLS** | **Variable** | **Devices** | **Type** | **Unit** | **LOGIC** | **Description** |
| FT | Feeding Time | Real Time Clock | Input | Seconds | Feeding time (7am and 5pm) = 1, No feeding time= 0 | RTC clock is used to check the feeding time |
| FL | Food Level at Storage Tank | Ultrasonic sensor | Input | Cm | Food level in the storage tank is low= 0, High = 1 | By emitting the ultrasonic waves, the sensor determines the level of food in the storage tank. |
| FT | Feeding Tray | Actuator/ weight sensor | Input | Kg | If the bowl is empty then = 1, if it is full = 0 | Measure the tray weight and tell us about the food tray is empty or not. |
| FE | Food eaten | Load Cell | Input | gm | If the animals have eaten the food =1, if not eaten= 0 | By using the load cell, we can measure the amount of the food in the bowl which indicates that the food has been eaten or not. |
| ALARM | User Alert | LCD/ Mobile | Output | SMS | Alarm (ON)=1, OFF=0 | Notify the alert when any issue will occur. |
| FD | Food Dispense | Servo Motor | Output | ON/ OFF | Food Dispensed=1, Food Not dispensed =0 | When the relay gives command to the motor it will dispense the food in the bowl. |

**BLOCK DIAGRAM:**



**A diagram of a system

AI-generated content may be incorrect.**

**STEP 3: PLAN THE SOLUTION (DESIGN THE ALGORITHM):**

**3.1: Algorithm:**

1. Initialize all outputs (ALARM) =0.

2. Check the feeding time and the food level in the storage tank.

* If Time=1 and Food Level=0, proceed, else stop.

3. Check the tray is empty or not if the tray status = 0, Else set Alarm “The Tray is Empty” = 1 and stop.

4. Check the previous food has been eaten or not if the PE = 0, set Alarm “The Food is not eaten before dispensing” = 1 and stop.

5. Check all the consequences and after that if it is the feeding time and tray is empty with no alarm then Food is dispensed = 1, by sending the command to the relay to dispense the food in the bowl.

6. After dispensing wait for 10min then check if food is eaten or not

* If FE = 0, Else Set Alarm “The Food is not eaten after the dispensing” =1.

7. End.

**3.2: Truth Table:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feeding Time | Food Level(0=Full) | Food Tray (1=Empty) | Previous Food Eaten (1=Eaten) | Eaten after 10min(1=Eaten) | Food Dispense (FD) | Alarm Tray is Full | Alarm that "The Food is not eaten" | Alarm that the "The food is not eaten" after dispensing |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
|  |  |  |  |  |  |  |  |  |

**3.3 BOOLEN EXPRESION (SOP):**

* **When the Alarm is “Tray is Full”:**

1. FT . FL ^. FT ^. PF ^. FE ^. FD ^
2. FT . FL ^. FT ^. PF ^. FE . FD ^
3. FT . FL ^. FT ^. PF . FE ^. FD ^
4. FT . FL ^. FT ^. PF . FE . FD ^

***ALARM “TRAY IS FULL”= A+B+C+D***

* **When the Alarm is “The food is not eaten before dispensing”**

1. FT . FL ^. FT . PF ^. FE ^. FD ^
2. FT . FL ^. FT . PF ^. FE . FD ^

***ALARM “THE FOOD IS NOT EATEN BEFORE DISPENSING” TRAY IS FULL = A+B***

* **When the Alarm is “The food is not eaten after dispensing”**

1. FT . FL ^. FT . PF . FE ^. FD

***ALARM “the food is not eaten after dispensing” = A***

* **When the food is dispensed**

1. FT . FL ^. FT . PF . FE ^. FD

***Food is dispensed = A***

* NOTE: ^ SIGN SHOWS THAT THE GATE IS NOT (0)

**3.4 PSEUDOCODE:**

IF (FT . FL ^. FT ^. PF ^. FE ^. FD ^) OR (FT . FL ^. FT ^. PF ^. FE . FD ^) OR

(FT . FL ^. FT ^. PF . FE ^. FD ^) OR (FT . FL ^. FT ^. PF . FE . FD ^)

THEN ALARM “The Tray is FULL” = 1

Else ALARM = 0.

IF (FT . FL ^. FT . PF ^. FE ^. FD ^) OR (FT . FL ^. FT . PF ^. FE . FD ^)

Then ALARM “ The food is not eaten before dispensing”= 1

Else ALARM = 0.

IF (FT . FL ^. FT . PF . FE ^. FD)

THEN ALARM “ The food is not eaten after dispensing”= 1

Else ALARM = 0.

IF (FT . FL ^. FT . PF . FE ^. FD )

THEN FOOD IS DISPENSED

Else The food is not dispensed.

**3.4 FLOWCHART:**



**STEP 4: IMPLEMENT THE SOLUTION (WORD CODING)**

1. Compare the actual time with the feeding time, must be 1.
2. Check the food level (FL) and the storage tank must be 0 (Full).
3. Check the weight of the food bowl / tray must be empty = 1.
4. If the tray is not empty, then send the alarm (1) that “The tray is FULL” on the user LCD/Mobile.
5. Check if the food has been eaten or not, must be eaten 1 (eaten).
6. Then send the command from the controller to the relay which switches the motor to dispense the food in the bowl.
7. If the food has not been eaten (0), then send the alarm on the LCD/Mobile.
8. After dispensing the food wait for 10 minutes, after that checking whether the pet has eaten the food or not, it must be = 1 (eaten).
9. If the food has not been eaten send the alarm (1) to the user that “The food has not been eaten”.

**Logic Diagram:**



**STEP 5: TEST AND REFINE THE SOLUTION (DEBUG AND VERIFY)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feeding Time | Food Level(0=Full) | Food Tray (1=Empty) | Previous Food Eaten (1=Eaten) | Eaten after 10min(1=Eaten) | Food Dispense (FD) | Alarm Tray is Full | Alarm that "The Food is not eaten" | Alarm that the "The food is not eaten" after dispensing |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |

Table [1]. Alarms that are expected.

|  |  |  |
| --- | --- | --- |
| Alarm Tray is Full | Alarm that "The Food is not eaten" | Alarm that the "The food is not eaten" after dispensing |
| 1 | 0 | 0 |
| 1 | 0 | 0 |
| 1 | 0 | 0 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 1 |
| 0 | 0 | 0 |

Table [2]. Alarms that are obtained on the above conditions.