

Automatic pet feeder - Documentation

1. The objectives of the proposed project

- Implementation of a smart solution for feeding pets without the need for manual action. This objective involves the creation of an automated system that releases a predefined amount of food at scheduled time intervals. The system is able to store a sufficient amount of food to ensure the feeding of the pet for an extended period of time, thus reducing the need for frequent refilling and can also be used in the absence of the owner by setting the desired interval for feeding.

Benefits:

- Ensures regular feeding of the pet, even in the absence of the owner.
- Reduces the time and effort required for daily manual feeding.
- Provides comfort and peace of mind to the owner, knowing that his animal receives food on time.

- Monitoring and recording the feeding behavior of the pet. This objective is used to adjust the timing and amount of food delivered by the system, thus ensuring that the dietary needs of the pet are optimally met.

Benefits:

- Allows personalized adjustment of the feeding schedule based on the animal's actual behavior.
- Helps identify eating problems such as loss of appetite or overeating.
- Contributes to maintaining the health and well-being of the pet.

- Saving the amount of food by controlling the portions at a table. This goal involves the implementation of a portion control system that allows the owner to precisely adjust the amount of food released at each meal. This would not only help save food, but could also help maintain a healthy pet weight. The system could be programmed to deliver small

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portions of food at regular intervals throughout the day, which helps prevent overeating and maintain a steady metabolism.

Benefits:

- Contributes to saving food by avoiding wastage.
 - Helps maintain a healthy pet weight.
 - Prevents overeating and related problems such as obesity.
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- Keeping the food fresh by putting a pre-set amount and avoiding drying out the grains. The system is designed to release only the amount of food needed for a single meal, so that the rest of the food remains in the container until the next meal. This helps prevent the food grains from drying out and maintain their quality and appeal to the pet.

Benefits:

- Ensures that the food remains fresh and appetizing for the pet.
- Prevents food waste by releasing only the amount needed for each meal.
- Contributes to maintaining the animal's health by providing quality food.

2. Description of the proposed solution

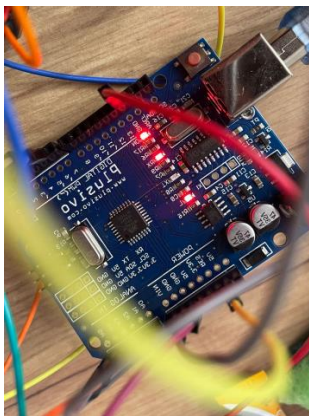
Components Used:

a) Animal food dispenser: we chose to use an already existing device on the market, which we automated using the components mentioned later.

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b) Development board compatible with Arduino Uno + USC cable 30 cm (to connect to the laptop): It has an operating voltage of 5V, an operating frequency of 16MHz, representing the brain of the system, responsible for controlling all components and operating logic.



c) MG995 Servo Motor: It is a high-speed digital servo motor that rotates 90° in each direction, making the servo 180° . It has accurate positioning, fast control response, an operating voltage between 4.8V and 7.2V, and an operating speed of 0.20 sec/ 60° (4.8V), being used to operate the feed release mechanism.

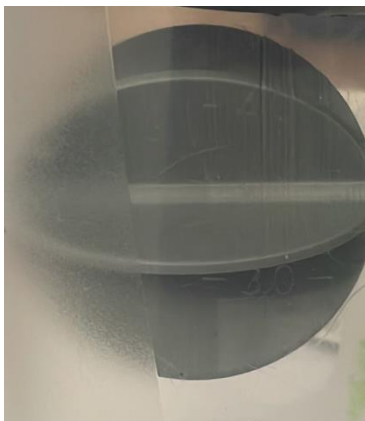
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d) Rod type M3: connects the servo motor to the feed release propeller.

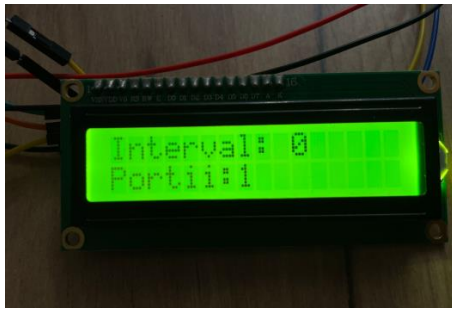


e) 3D printed propeller: it rotates when the servo motor is actuated and releases the food in the form of pellets, thanks to its 5 slots that allow the storage of several food elements.

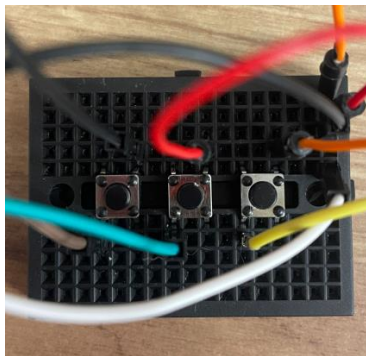


f) LCD screen 1602: it displays 2 lines of 16 characters each, it has a supply voltage of 5V and a current of 2mA, it can be used easily in low light conditions, because it also has a background light. It displays the time of feeding and other information relevant to the user, such as the number of servings and the interval at which we want the feeding to take place.

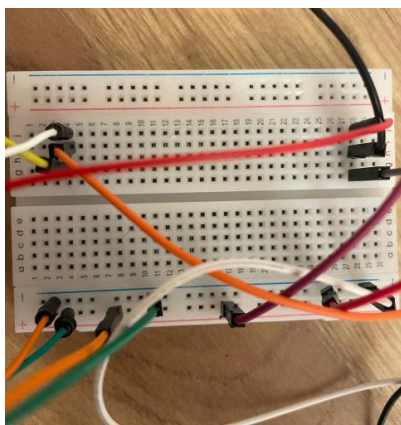
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g) 3 Buttons (on the breadboard), push-button type: it represents a simple switch, which activates when pressed, allowing the user to interact with the system, set the feeding intervals and initiate other functionalities.



h) Breadboard: connects the Arduino to the other components, providing the necessary circuits for the operation of the system.



i) DS3231 RTC Module: Battery powered real-time clock (RTC) module, this model is the most popular RTC, works best with 5V based chips like Arduino. Ensures the accuracy of time for

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the release of food at the scheduled times. This component is accompanied by a CR2032 3V watch battery, which is a portable power source.



j) Improvised cover made of polystyrene, with walls of the same material, located between the rod and the cover of the device, which favors the fall of the grains in the helix and a circular opening in the middle, with the direction in the helix



k) Sponges glued to the walls of the edges, around the rod, on either side of the propeller, to prevent the grains from reaching unwanted places.



l) Cylindrical tube made of paper, which, once inserted in the opening of the lid, avoids overcrowding of grains in the hole in the lid.

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m) Plastic bottle, cut in the shape of a funnel, which instead of the stopper, has inserted the paper tube, thus allowing the introduction of a greater number of grains, to ensure a greater number of portions.



Benefits:

- a) Automation: ensures regular feeding of pets without manual intervention.
- b) Accuracy: RTC guarantees that food is released at the exact times set by the user.
- c) Ease of use: the LCD screen and buttons allow a simple and intuitive interaction with the system.
- d) Flexibility : the modular design on the breadboard allows for easy changes and improvements to the system.

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e) Food Quality: the controlled release of feed helps to maintain its freshness and attractiveness for animals.

3. Description of the implemented solution with the presentation of the functionalities related to the solution

This solution is an automatic pet feeder designed to release food regularly and controlled using an Arduino microcontroller, a servo motor, an RTC (Real-Time Clock) module, an LCD screen and 3 buttons. The system allows setting of feeding intervals and number of servings, ensuring pets receive food at scheduled times or manually by pressing a different button for each function.

The functionalities offered by this solution are:

1. Setting the Interval and Number of Portions:

- The user can manually adjust the feeding interval and the number of servings using the dedicated buttons. For example, it can set the feed to be delivered once every 8 hours and 2 servings to be distributed at each feeding. This adjustment can be made by pressing button 1, specific for the number of gates, a number that can increase up to 10. So, when running the code, the number of portions appears on the LCD screen, which will be released by turning the servo motor, when button 3 is pressed, the manual one. When the feed is released, the message "Feeding" will be displayed on the screen.

2. Automatic feed release

- At the programmed times, the system activates the servomotor to release the feed in the set quantities. This process is precisely managed, ensuring that each portion is dispensed correctly and that the feed is not accidentally released outside of the scheduled intervals. This is done with the help of the RTC component, which identifies the exact time and delivers the feed according to the set interval. The interval can be increased by pressing button 2, and its value can increase up to the value of 23. Also, along with the number of portions, the selected interval is also displayed on the LCD screen.

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- The release of feed is achieved with the help of the servo motor that rotates 180 degrees, through two opposite movements as the direction, a metal rod to move a 3D printed propeller, which allows precise control of the amount of feed released, one rotation of the motor representing a portion offered.

3. Manual Feed Activation

- The user has the possibility to activate the feeding manually, regardless of the scheduled time for the automatic feeding, by pressing button 1. This functionality is useful in situations where the pet requires additional feeding or when the user wants to offer the food on demand. Also, in the case of increasing the number of servings, the food is released only when this manual button is pressed.

4. Display and Interaction

- Information about the feeding interval and the number of portions set is displayed on the LCD screen in real time, giving the user a clear picture of the current settings. Initially, at the beginning of the execution, with the first rotation of the motor, the default one, the message is displayed on the screen "Feeding", which appears every time the food is released. After the motor has finished its rotation, the messages appear on the screen: "Interval: "(where the value of the interval is specified), on the first line, and on the second line: "Portions" (which displays the number of portions), these parameters changing when buttons 1 and 2 are pressed.

5. Real Time Functionality

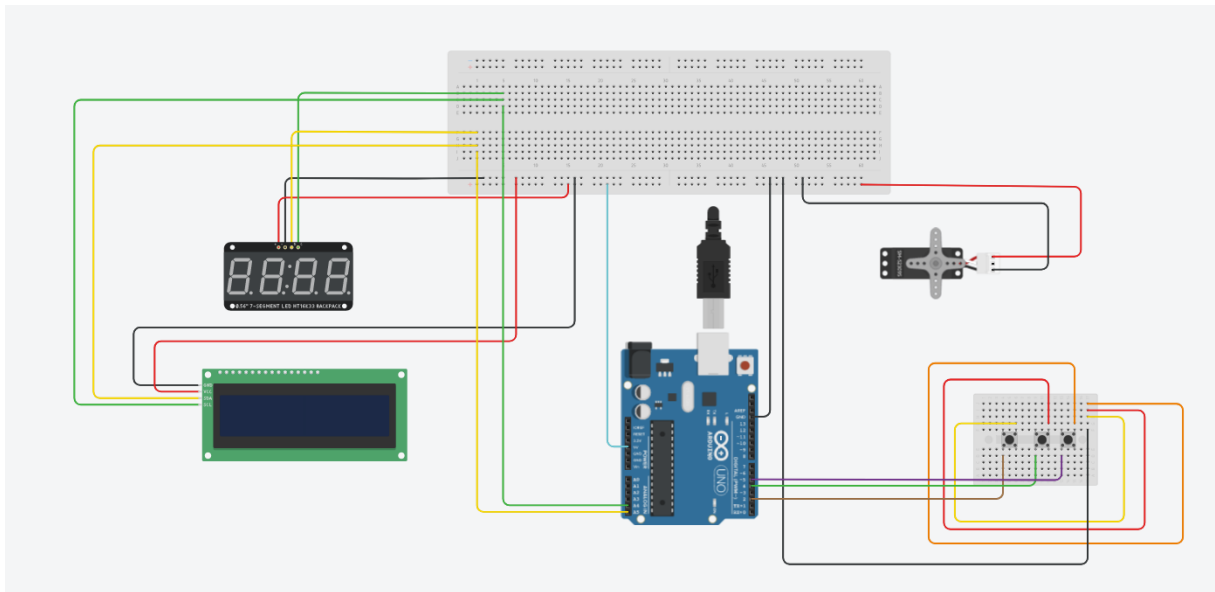
- The RTC module measures the current time and ensures that the time is kept correctly and that feeding is carried out at the scheduled times without delays or deviations, also using the interval modified according to the user's preferences.

6.Feed Flow Control functionality

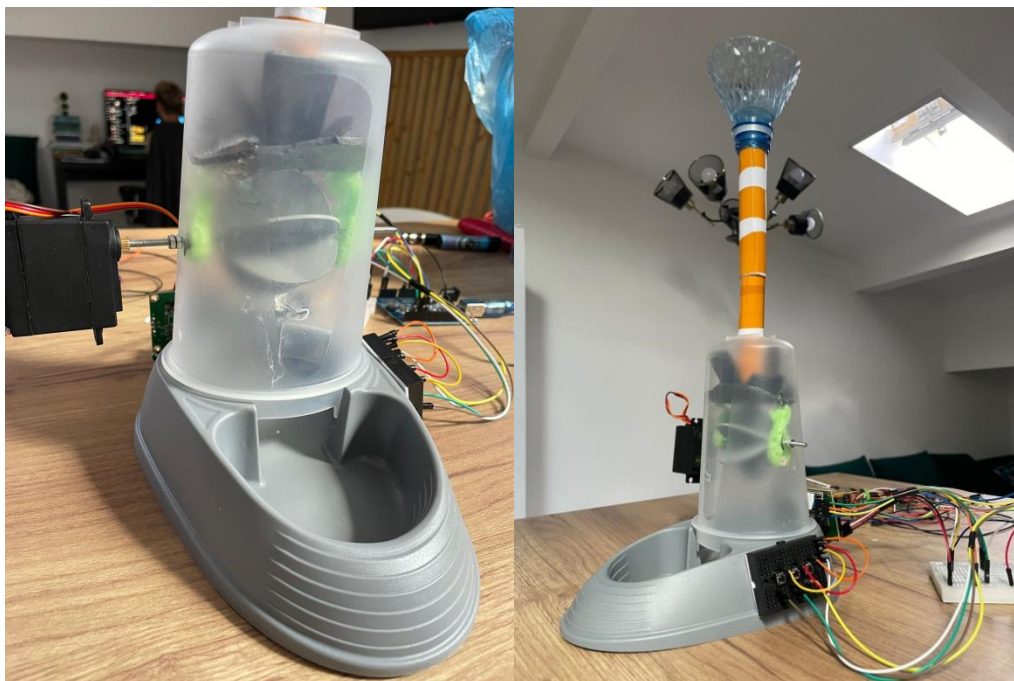
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- The user can set the level of control of the feed flow, ensuring that the feed is distributed evenly and without blockages. This functionality uses the improvised physical components (l, m, n, o from the list above), to guide the feed from the main container to the servo motor propeller, thus favoring the fulfillment of the previously mentioned functionalities.

Diagram made in TINKERCAD (the electrical part, without the physical components)



4. The final product



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