# AUTOMATIC PET FEEDER USING INTERNET OF THINGS

*An IoT based Pet Feeder*

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***Abstract :*** Over half of the people in the world intentionally have pets as their companions, But these pets are becoming burden to the pet owners. There is a lot of stress for the owner while feeding their pets. Over the years different automatic pet feeders are available in the market, but none of them are still not able to solve lot of problems like overeating, obesity. This project aims in rectifying the problems caused by existing feeders and designing an efficient automatic pet feeders using internet of things. This Automatic pet feeder uses a NODEMCU Micro Controller and consists of an interface with DC servo motor, relays, water pump and other hardware equipment. A software code is dumped into the micro controller to perform operations like rotating motors and switching relays on and off. The whole feeder system is controlled using a mobile phone installed with blynk software. The user sends signals to the micro controller using blynk application through blynk cloud. When the DC servo motor runs, the motor rotates the propeller which is in the feeding device, which drops down pet food through the pipe into perforated feeding bowl. The water pump will be kept in a tank containing water. When the water pump runs, the water is pumped into the water bowl of pet. So, the pet will receive regular amounts of food and water on a steady feeding schedule.

***Index Terms – Internet of things*(IoT), DC Servo Motor, Water Pump, Relay.**

## I. INTRODUCTION

Automatic pet feeder is one of the new technologies for feeding pet. It will help pet owner to take care of their pet while they are not at home. Even the owners are not at home, they still can feed their pet. Automatic pet feeder is built to help pet owner taking care of their pet. IoT pet feeder is one of the pet feeders that will be controlled by a mobile application through internet. The automatic pet feeder will automatically dispense predetermined amount of food and water to the bowls. As pet lovers, user should understand those pets also need a proper diet management. Whether user away from home unexpectedly or simply would like one less chore to worry about, user can feel secure that the beloved pet will be cared for and fed on time every time.

The Automatic pet feeder will solve two problems which pet owners face i.e., making sure that each pet has access to a healthy amount of food throughout the day, regardless of the owner's schedule. Making sure that each pet eats only its own food though there are a variety of products on the market which solve the first problem, there are none which address the second. The automatic pet feeder will give pet owners a solution to both problems, thereby improving the lives of both pets and owners by allowing the owner to reliably provide food to a pet at the time the owner wishes and keep the pet from reaching the food stored for later feedings.

Many animal feed systems can be designed to function as an automatic device that allow the user to feed whenever he wishes from anywhere through internet. The purpose of having sensors in a system like this is to automate the feed process completely with less human interference.

## II. OBJECTIVE

The objective of this project is to create an automatic feeding machine for pets feeding. This project is designed keeping the view of dairy farms, poultry farms and pets at home it is important to maintain the diet of animals just like human being from keeping them healthy for better production and good quality of milk in the case of dairy farm and eggs and chicken in the case of poultry farm.

Now a days, everyone can have a pet at home without giving their full commitment to have a healthy pet. With this feeding machine, it will help pet owner to manage their pet diet wheel. When user is at home, it can be controlled by a mobile application through internet. If user is not at home, user can set the timer to feed their pet. To make sure that the food does not exceed force sensor will active and detect the exact amount should be in the bowl.

Whenever we go to work or are away on vocation. We always end up paying so much money for pet sitters to feed our pets. We realized that adapting a pet feeder to an iot application would not only solve our problem but would also benefit other pet owners.

## III. BLOCK DIAGRAM

The block diagram of the Automatic pet feeder represents the components that are used and the connections which are made accordingly. The block diagram is depicted in the figure below. The below block diagram consists of the components like ultrasonic senor, DC motor, relay. The power supply is used to supply the necessary power to make the board function.

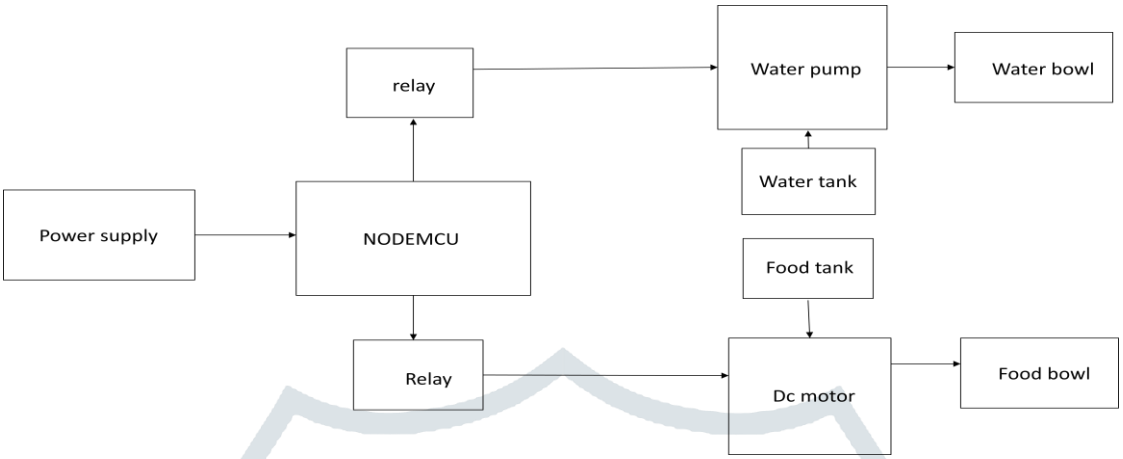


Fig. 1. Block diagram of automatic pet feeder

### 3.1 Ultrasonic Sensor

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their colour. Even transparent materials or thin foils represent no problem for an ultrasonic sensor.

### 3.2 DC Motor

Almost every mechanical movement that we see today is accomplished by an electric motor. An electric motor takes electrical energy and produces mechanical energy. Electric motors come in various ratings and sizes. Some applications of large electric motors include elevators, rolling mills and electric trains. Some applications of small electric motors are robots, automobiles and power tools

### 3.3 Water Pump

A centrifugal pump is one of the simplest pieces of equipment in any process plant. Its purpose is to convert energy of a prime mover (a electric motor or turbine) first into velocity or kinetic energy and then into pressure energy of a fluid that is being pumped.

### 3.4 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

## IV. NODEMCU

The NodeMCU (Node Microcontroller Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SOC) called the ESP8266. The ESP8266, designed and manufactured by Espressoif Systems, contains all crucial elements of the modern computer: CPU, RAM, networking (WI-FI), and even a modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs only $2 USD a piece. That makes it an excellent choice for IOT projects of all kinds. However, as a chip, the ESP8266 is also hard to access and use. You have to solder wires, with the appropriate analog voltage, to its PINs for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. And, you have to program it in low-level machine instructions that can be interpreted by the chip hardware. While this level of integration is not a problem when the ESP8266 is used as an embedded controller chip in mass-produced electronics, it is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IOT projects.

Borrowing a page from the successful playbooks of Arduino or a Raspberry Pi, the NodeMCU project aims to simplify ESP8266 development. It has two key components.

- An open source ESP8266 firmware that is built on top of the chip manufacturer's proprietary SDK. The firmware provides a simple programming environment based on ELUA (embedded LUA), which is a very simple and fast

scripting language with an established developer community. For new comers, the LUA scripting language is easy to learn.

- A DEVKIT board that incorporates the ESP8266 chip on a standard circuit board. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, WI-FI antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board. Figure 1 shows the DEVKIT board, and Figure 2 shows the schema of its pins.
- The NodeMCU DEVKIT board that comes preloaded with the firmware can be purchased for $8 USD a piece, which makes it a very economical device for prototyping and even for production use. But, what about Arduino, you ask? The Arduino project creates an open source hardware design and software SDK for a versatile IOT controller. Similar to NodeMCU, the Arduino hardware is a microcontroller board with a ready USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other boards. But unlike NodeMCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming environments. In fact, there is an Arduino reference design for the ESP8266 chip as well. However, the flexibility of Arduino also means significant variations across different vendors. For example, most Arduino boards do not have WI-FI capabilities and some even have a serial data port instead of a USB port. I feel that NodeMCU provides a more consistent and accessible experience for IOT developers.

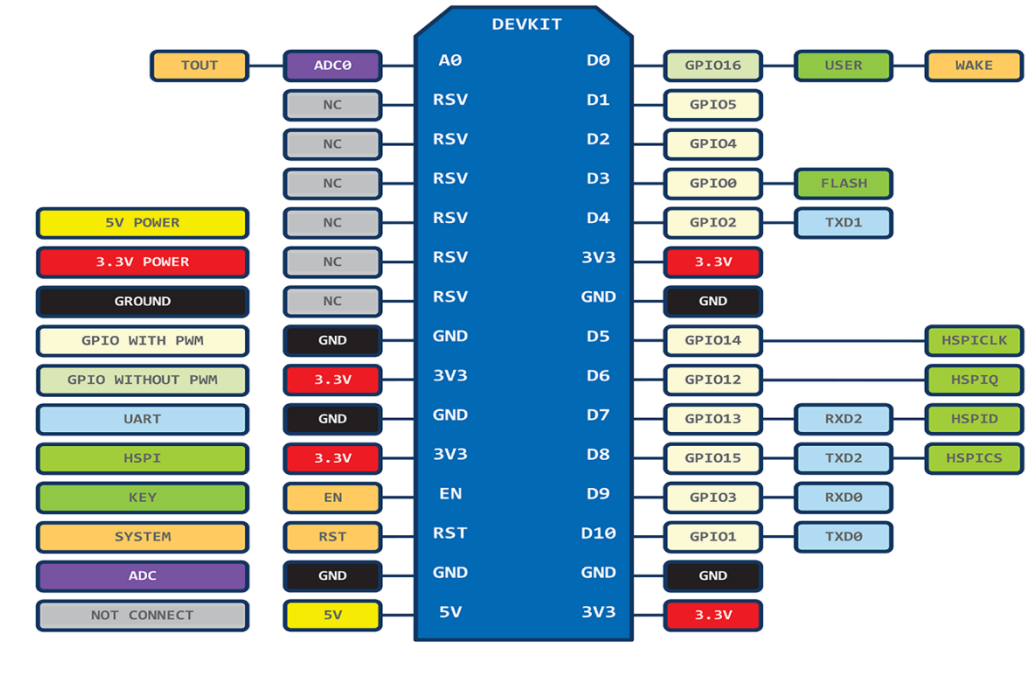


Fig. 2. NodeMCU pinout

### 4.1 NodeMCU Specification

- Voltage:3.3V.
- WI-FI Direct (P2P), soft-AP.
- Current consumption: 10uA~170mA.
- Flash memory attachable: 16MB max (512K normal).
- Integrated TCP/IP protocol stack.
- Processor: Ten silica L106 32-bit.
- Processor speed: 80~160MHz.
- RAM: 32K + 80K.
- GPIOs: 17 (multiplexed with other functions).
- Analog to Digital: 1 input with 1024 step resolution.
- +19.5dBm output power in 802.11b mode
- 802.11 support: b/g/n.
- Maximum concurrent TCP connections: 5.

## V. METHODOLOGY

Automatic Pet Feeder using Microcontroller NodeMCU will feed the pets whenever the owner wishes. With the press of a button from anywhere in Blynk mobile application through internet the user can feed their pet. This system is very user friendly. Dispensing dude consists of a container that acts as storage for the food, dc motor to mechanize the dispensing action and a NodeMCU with motor driver to control the motor. Basically, the output current offered by developing boards like NodeMCU is in the order of 40mA and dc motors require a good 500mA to drive them that is why the motor driving shield comes in. The logic

behind dispensing action is whenever the user presses the button in Blynk app through internet to switch on the dc motor which is connected to spinner.

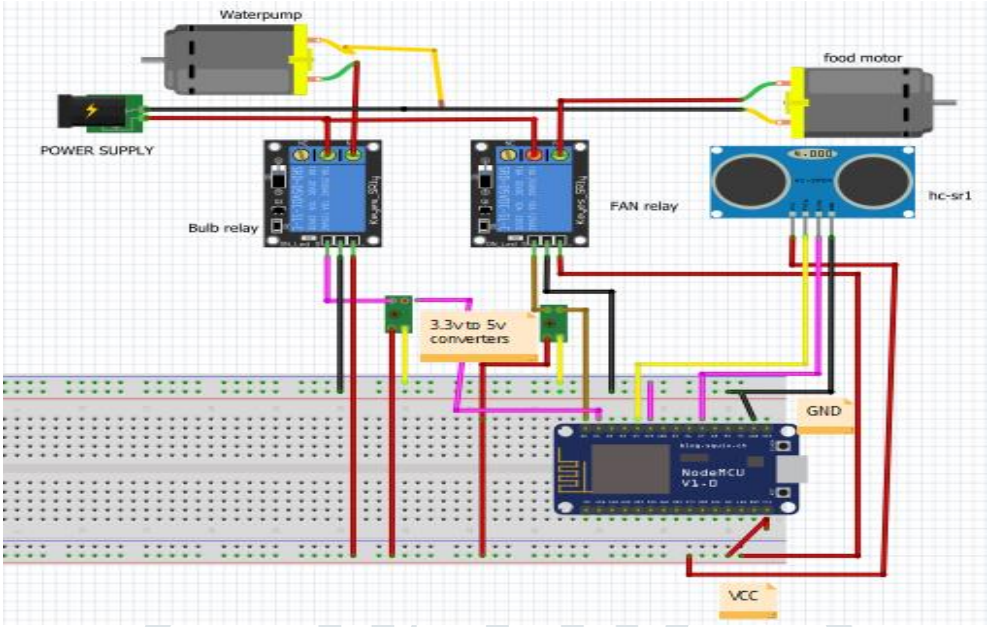


Fig. 3. Circuit diagram

Here the spinner is a mechanism to dispense food. The dc motor rotates the spinner, spinner dispense the food into the bowl slowly. As well as the user can serve the water to his pet whenever he wishes. Whenever the user presses the button in Blynk app through internet to switch on the water pump which is inserted into the water can. The water pump pumps the water into the water bowl of his pet only if there is no Water.

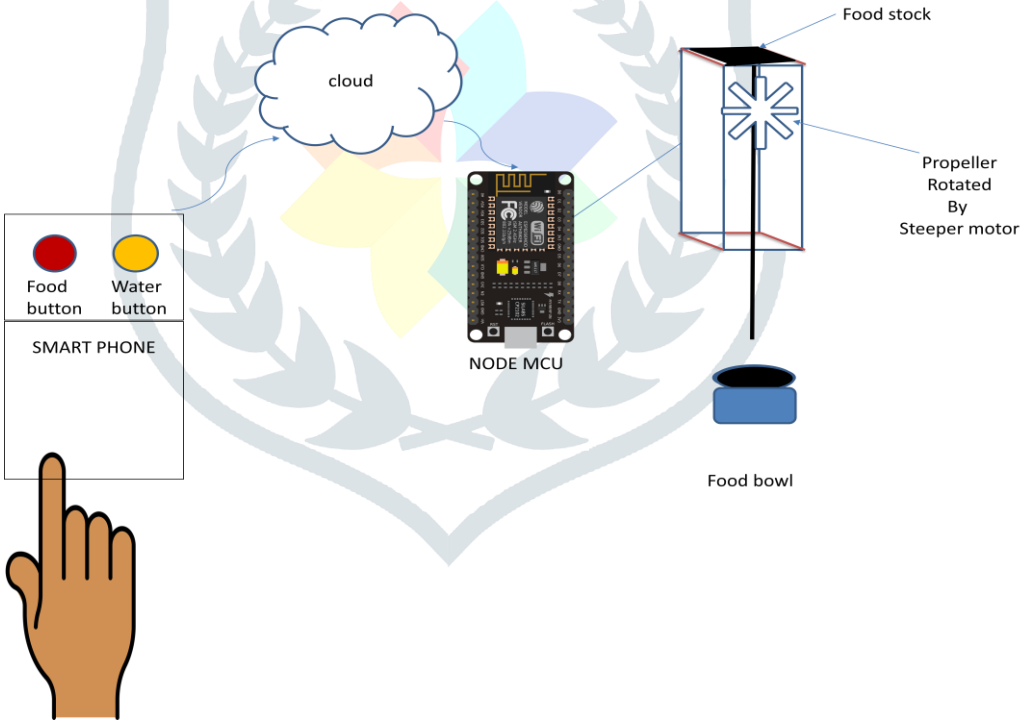


Fig. 4. Food motor working model

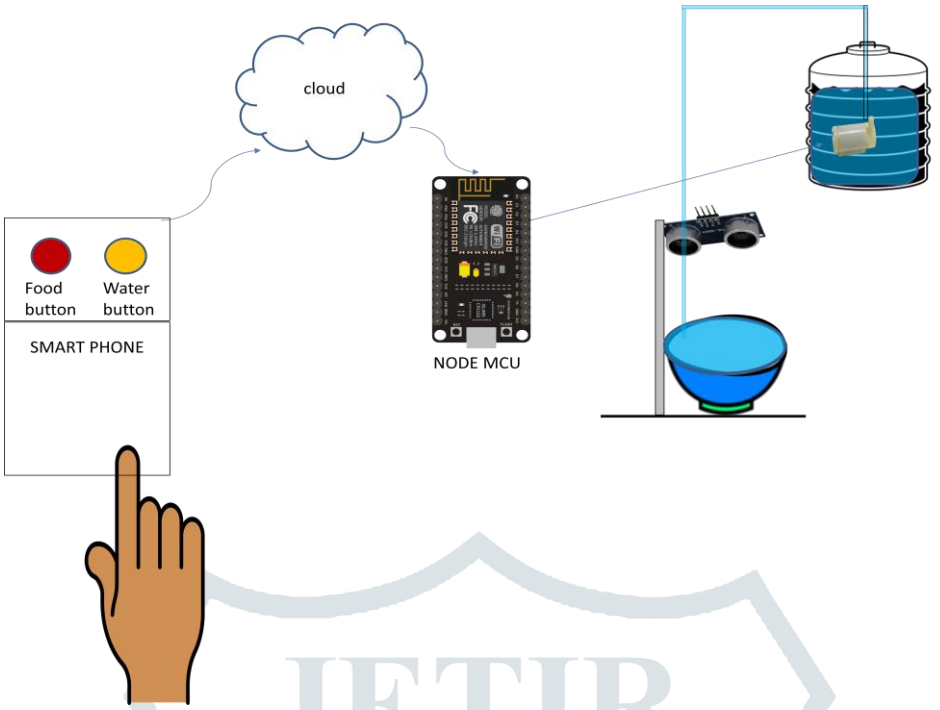


Fig. 5. Water motor working model

The logic behind this is we are using an ultrasonic sensor to check whether water is there or not. The ultrasonic sensor is used to measure the distance of an obstacle. Here, the obstacle is water if there is water or the bottom of the bowl if there is no water. If distance is greater than or equal to the approximately the bowl height means there is no water in the bowl. At this moment if user presses the button to switch on the water pump, the pump will start. Otherwise the motor will not start. We use this ultrasonic sensor logic to reduce the wastage of water as possible.

## VI. RESULT

Automatic pet feeder works efficiently and fulfils the objective of feeding pet in absence of its master. It works on 9v D.C. supply. The servomotor rotates the propeller and food gets delivered into the plate as programmed in the NodeMCU. The whole system is connected to the mobile phone via internet using an online cloud portal called blynk cloud.

If any interrupt is occurred in the blynk app it is transferred to the microcontroller unit through internet. For example, in order to start food motor on we have to press on button in the blynk app, then the signal is transmitted NodeMCU there by it turns on the servo motor which guides the food down to the food bowl through propeller.

### 6.1 Output in Blynk App

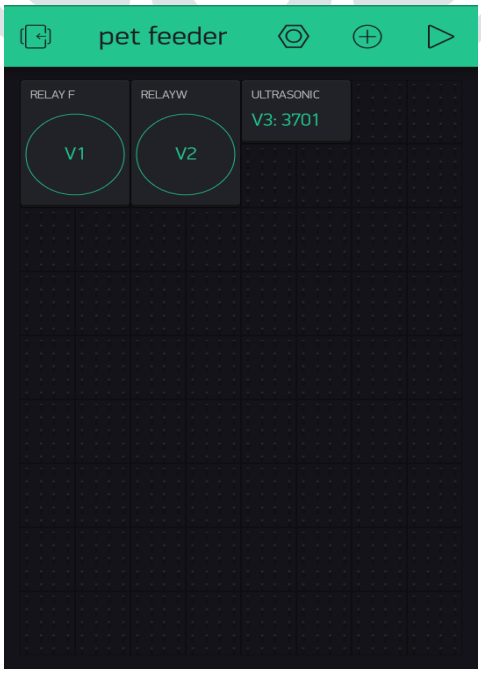


Fig. 6. Output in Blynk application

The above image shows the output of the pet feeder in the blynk application. We can see that it consists of three pins, these are called virtual pins. These are connected to digital pins of the board through internet. The virtual pin v1 is connected to food relay, virtual pin v2 is connected to water relay, virtual pin v3 is connected to ultrasonic sensor. We can run the system by pressing the triangle in the right top corner of the blynk app.

**6.2 Output in blynk App:**

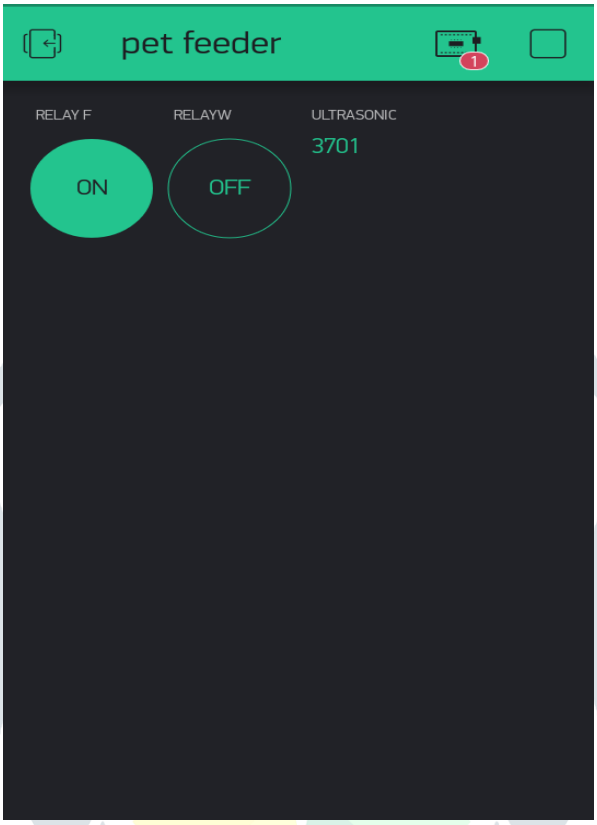


Fig. 7. Output in Blynk application

After pressing the run button, the system looks like the one shown in the above figure. We can switch on and off the food and water relays by pressing the on them. If we press the on button in blynk app the signal is transferred to board and the motor gets on.

**6.3 Serial monitor output**

The readings of ultrasonic sensor can be viewed in the serial monitor. It measures the height of the water level. If the water level is low i.e. below 6 centimeters. The Food motor automatically switches on and water is dispensed into the bowl from the water tank.

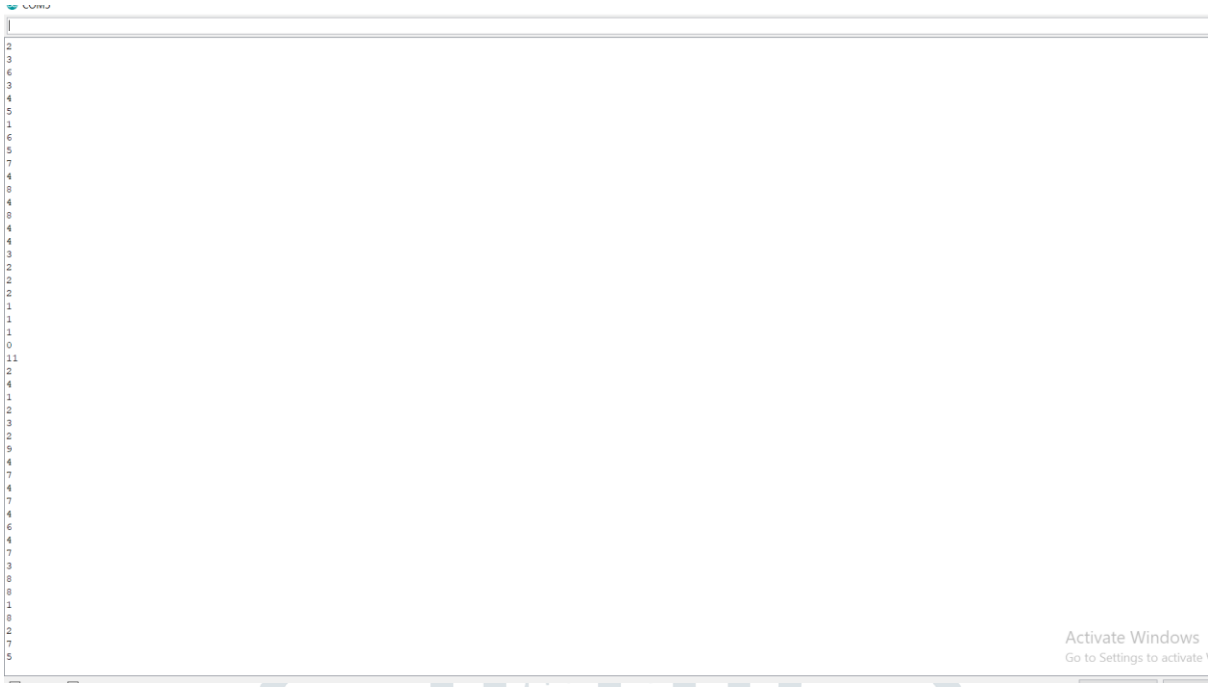


Fig. 8. Serial monitor output

## VII. CONCLUSION

The interaction between humans and physical devices and objects is attracting increasing attention. Many studies have attempted to provide a natural and intuitive approach to request services. The current trend of combining pet control and IOT technology offers exciting future developments. The proposed system is also referred on smart-home technology, including the smart pet door and pet feeder. The results not only present the key improvement of the pet monitor system involved in the IOT technology, but also meet the demand of pet owners.

The basic vision behind the IOT, it may have a new way of operational method, it may have a new method of connecting devices, and there might be the even complete clean-slate approach. As the full operational definition is finalized, but there are numerous research issues that can be worked on. As a next step, we will fully integrate the other pet care devices into our system, including litter boxes, pet cam, etc. With that, the diverse needs of the owners can be met, and the health, monitor, and entertainment topics for pets are all covered. Besides, standing as the cloud term, how to connect the numerous networking devices around the globe is the next issue. In the future, we will centralize on the study of the IOT gateway and long-distance detection of the pets.

## VIII. FUTURE SCOPE

With the correct libraries used and codes used we were able to merge the codes we have and also the components to work as one with a process that work the way we wanted to. After a series of troubleshooting and code editing, we were able to create an Automatic Pet feeder that dispense food and water at right time that can help the owner to support and maintain their pet's health and condition.

Our Automatic pet feeder has a lot more things to improve. For further and deeper research, they can put more functionalities in our Automatic Pet feeder like putting an additional camera so that the owner can see or monitor if his/her pet is eating its meal or not. Also putting an RFID tag will make it even better so that the pet can eat anytime by just going near the automatic food dispenser.

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