AUTOMATED ANIMAL FEEDING AND SMART PARKING SYSTEM

Submitted By

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Introduction

Automated Animal Feeding using Ultrasonic and PIR Motion Sensor:

 Summers are cruel to all alike, but birds and stray animals find it harder to survive the heat without shade or water to quench their thirst. Birds fly for miles to get to a water body and many of them die before they get any closer. Stray animals are no different, in the winters they struggle for food and in summers, water.

This project helps these animals and birds survive summer at the same time eases the process for the user. It refills the dishes of water automatically by attaching sensors to detect low levels of water, and sensors to detect movement around the dish ensuring a full dish of water for our little friends at all times.

But this project is not only for the animals outside our houses, it is also for pets. Instead of having to fill water bowls for the pet animals every time, this automatic refilling pet bowl fills it for them, so the pets will never go thirsty.

Smart Parking System using Ultrasonic Sensor:

A major problem in Indian metropolises is the skewed demand for on-street parking since it's cheaper than off-street parking. On-street parking issues often cause delays, especially on roads with heavy traffic. As we can often see parking in non-parking zones is very common in India.

This project also proposes a method to help reduce on- street parking in front of no-parking boards.

Objective

- To design an automated animal feeding system using an ultrasonic and PIR sensor
- To design a smart parking system using multiple ultrasonic sensors.

Hardware and Software Requirements

•ARDUINO UNO
•ULTRASONIC SENSOR
•PIR MOTION SENSOR
•SERVOMOTOR
• BREAD BOARD
• CONNECTING WIRES
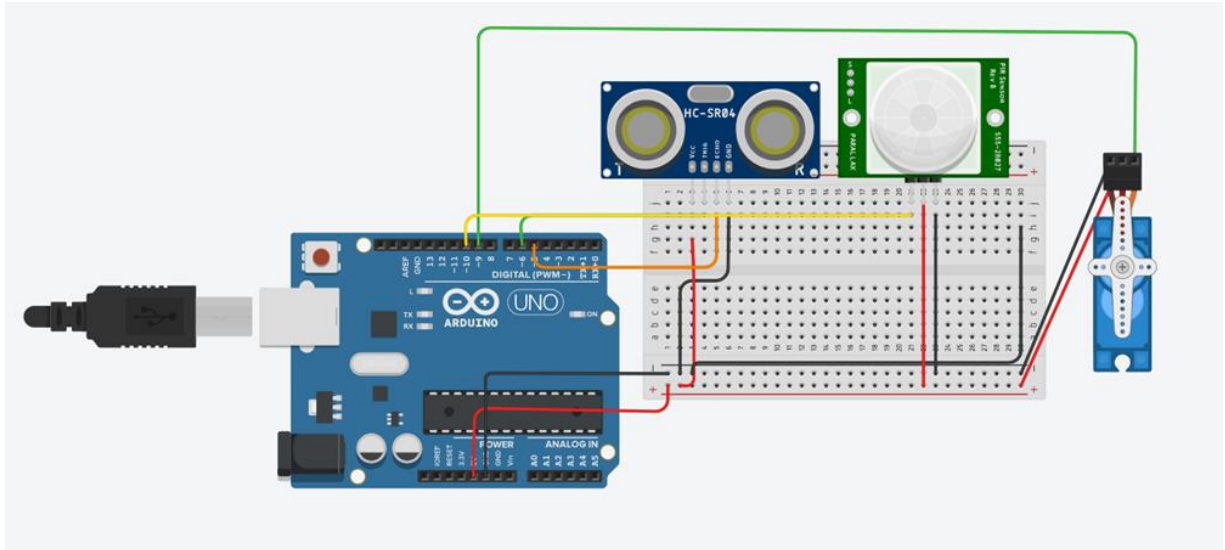• PIEZZO BUZZER

TOOLS:
•TINKERCAD's CIRCUIT AND 3D DESIGNS

Implementation and Outputs

Automated Animal Feeding using Ultrasonic and PIR Motion Sensor:

CIRCUIT DESIGN:

WORKING LOGIC:

The Ultrasonic Sensor is used to keep track of the level of water in the pet bowl. It is attached to a tank fixed at the side of the bowl facing downwards towards the water in the bowl. This report includes a 3-D model of the project for better visualization. The PIR Motion Sensor will detect the movement of any animal in its surrounding.

The bowl refills when the PIR sensor detects an animal in front of the bowl and the ultrasonic sensor will detect the decrease in the level water and sends the signal to the tank, and the valve of the tank is opened to refill the bowl with the help of a motor attached near the valve. In this implementation we have used a servo motor to simulate the opening and closing of the valve.

During the refilling process, the Ultrasonic Sensor is also used to prevent the overflowing or excessive filling of the pet bowl.

CODE:

```cpp
#include <Servo.h> //Servo library
const int tPinf = 6, ePinf = 5,sPinf=10; //trig pin of sensors to pin 6 and 8
Servo myservo; //initialize a servo object for the connected servo
float pos = 0;
int val = LOW;              // we start, assuming no motion detected
unsigned long timef;
unsigned long distancef;
void setup() {
pinMode(tPinf, OUTPUT); // Sets the trig pin as an output
pinMode(ePinf, INPUT); // Sets the echo pin as an input
pinMode(sPinf,INPUT);
Serial.begin(9600);
myservo.attach(9);
}
void loop() {
  val = digitalRead(sPinf);
// Clears the trig pin
digitalWrite(tPinf, LOW); delayMicroseconds(2);
// Sets the trig pin on HIGH for 10 micro seconds
digitalWrite(tPinf, HIGH); delayMicroseconds(10);
digitalWrite(tPinf, LOW);
// Reads the echo pin, returns the sound wave travel time in microseconds
timef = pulseIn(ePinf, HIGH);
// Calculating the distance from time through velocity of air
distancef = timef*0.034/2.0;
// Conditions for buzzer
//The distance given, is for simulation in tinker-cad can be adjusted accordingly

  if(distancef>30&&distancef<50&&val==HIGH){
   Serial.println(distancef);
   myservo.write(90);
  }
  if(distancef<20){
  Serial.println(distancef);
  myservo.write(0);
  }
 }
```

Basic 3D Modelling of the Automated Animal Feeding System
Using TinkerCad

Refill the water into this tank

Animal drinks water from this bowl
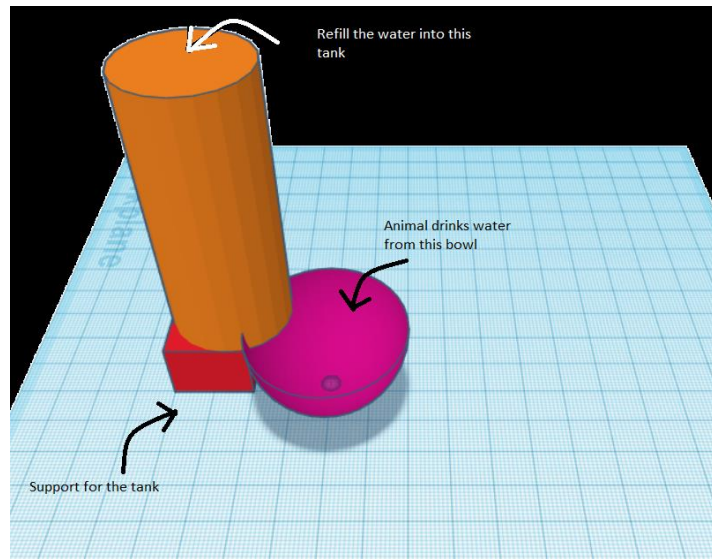
Support for the tank

Fig. 1 representing the top view of the system

The animal is expected to drink the water from the pink bowl and the cylinder represents the model of a tank in which we are expected to fill water when required as shown in Fig.1.
The red cube represents the support for the tank as the tank is placed at a higher level, the red cube can also be used to keep the circuitry.

PIR Sensor to detect the movement of any animal

Sensor and Valve along with the Motor

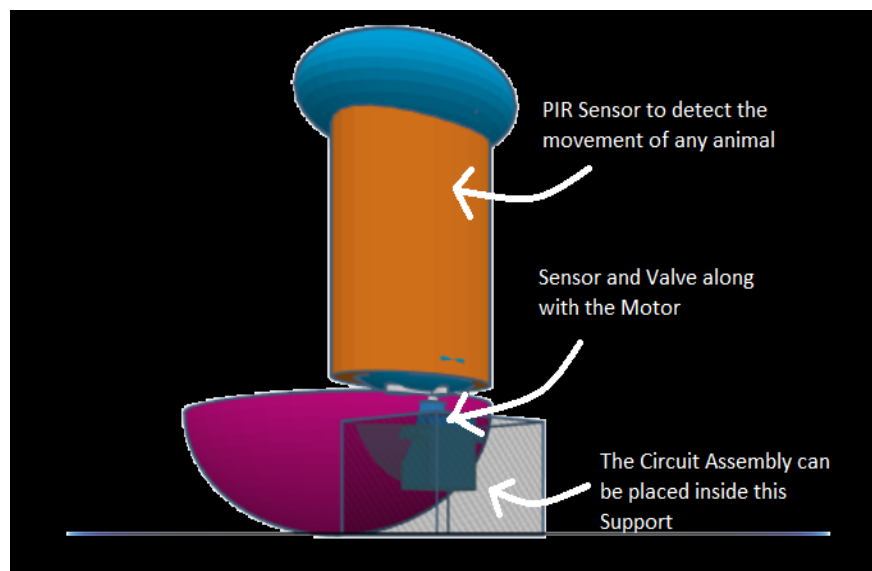The Circuit Assembly can be placed inside this Support

Fig 2 representing the side view of the system

It can be seen clearly from the Fig.2, the tank is slightly immersed into a small portion of the bowl so that the sensor can detect the level of the water and if the water level is below a specific threshold distance then the valve (with the help of the motor) will open for the water from the tank to flow into the bowl.

Smart Parking System using Ultrasonic Sensor:

CIRCUIT DESIGN:
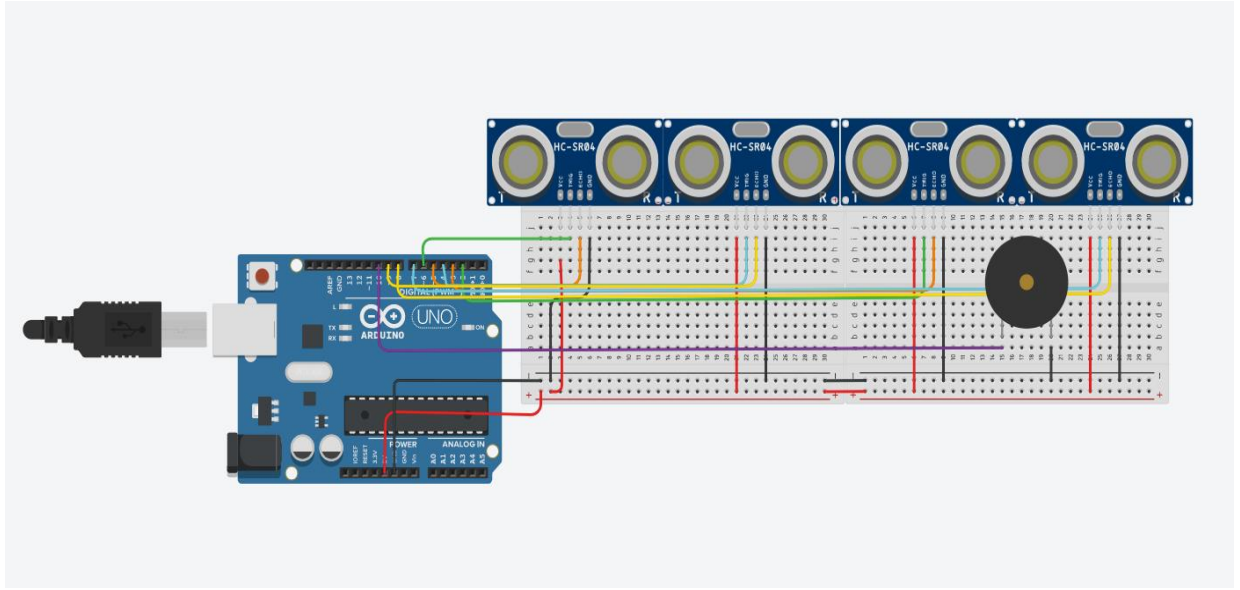
WORKING LOGIC:

The Ultrasonic Sensors are used to check if a car is parked at the no parking zone. These sensors are attached to the no parking signs and are used to detect the presence of a car. More number of Ultrasonic sensors are used to help identify if the object (if present) within the cone range of the sensor is a car based on whether all the sensors are able to detect an object at the same time (as width of the rear of a car or bonnet of a car is high).

CODE:

```
const int tPin1 = 6, ePin1 = 5;
const int tPin2 = 4, ePin2 = 9;
const int tPin3 = 2, ePin3 = 3;
const int tPin4 = 7, ePin4 = 8;
const int buzzer = 10;
int stop = 0;
unsigned long time1,time2,time3,time4;
unsigned long distance1,distance2,distance3,distance4;
```

```cpp
void setup() {
pinMode(tPin1, OUTPUT);
pinMode(ePin1, INPUT);
pinMode(tPin2, OUTPUT);
pinMode(ePin2, INPUT);
pinMode(tPin3, OUTPUT);
pinMode(ePin3, INPUT);
pinMode(tPin4, OUTPUT);
pinMode(ePin4, INPUT);
pinMode(buzzer, OUTPUT);
Serial.begin(9600);
}
void loop() {
digitalWrite(tPin1, LOW); delayMicroseconds(2);
digitalWrite(tPin1, HIGH); delayMicroseconds(10);
digitalWrite(tPin1, LOW);
time1 = pulseIn(ePin1, HIGH);
digitalWrite(tPin2, LOW); delayMicroseconds(2);
digitalWrite(tPin2, HIGH); delayMicroseconds(10);
digitalWrite(tPin2, LOW);
time2 = pulseIn(ePin2, HIGH);
digitalWrite(tPin3, LOW); delayMicroseconds(2);
digitalWrite(tPin3, HIGH); delayMicroseconds(10);
digitalWrite(tPin3, LOW);
time3 = pulseIn(ePin3, HIGH);

digitalWrite(tPin4, LOW); delayMicroseconds(2);
digitalWrite(tPin4, HIGH); delayMicroseconds(10);
digitalWrite(tPin4, LOW);
time4 = pulseIn(ePin4, HIGH);
distance1 = time1*0.034/2.0;
distance2 = time2*0.034/2.0;
distance3 = time3*0.034/2.0;
distance4 = time4*0.034/2.0;
  delay(100);
  if(distance1<=100&&distance2<=100&&distance3<=100&&distance4<=100){
    if(stop == 0){
      for(int i =0; i<50; i++){
  tone(buzzer, 1000); // Send 1KHz sound signal...
  delay(50);          // ...for 1 sec
  noTone(buzzer);     // Stop sound...
  delay(50);
   }
      stop = 1;
    }


    }

    if(distance1>=100|| distance2>=100|| distance3>=100||distance4>=100){
  stop = 0;
    }
  Serial.println(stop);
}
```

ERROR IN US SENSOR READING:

The error can be calculated using the formula

$$\text{Percentage Error} = \left| \frac{v_A - v_E}{v_E} \right| \times 100\%$$

$$v_A = approximate\ (measured)\ value$$
$$v_E = exact\ value$$

Thus, for this project the expected value as given on tinker cad has been noted and the value obtained on tinker cad's serial monitor has been noted. A simple matlab program has been written to calculate the error using 10 readings.

MATLAB CODE:
```
expected = [42.1, 17.5, 38.4,129.9, 132.4, 89, 67.5,
199,147.4, 8.6];
observed = [40, 17, 37, 127,129,87, 66, 196,144, 8];
error = (abs(expected - observed)./expected)*100;
me = mean(error);
accuracy = 100 - me;
```

OUTPUT:
```
>> me
me =
    3.1552
>> accuracy
accuracy =
   96.8448
```

Conclusion

Both these projects were designed with the objective of helping the society, however they can be further advanced to increase its productivity. A few ideas have been mentioned in this section.
Water is essential for the body to perform optimally and aids the body in maintaining a regular temperature. Many countries are known for their high temperatures, especially in the summer months, making animals more susceptible to dehydration when the correct precautionary steps are not put in place. A large number of animals die every year due to thirst and small systems like this project, if set up in a lot of houses or other places can help solve this problem.
On-street parking is one of the major problems that causes blockage and frequent traffic jams. Due to the limited resources available, this implementation includes only a buzzer as a warning system, however technology similar to the FASTAG technology used in toll booths can be implemented along with the buzzer for the smart parking system. Therefore, whenever a driver parks in front of a no-parking sign the buzzer buzzes as a warning and after a certain time has elapsed and if the driver has not removed his/her car money can be extracted from their bank accounts as a fine for parking in a no-parking zone.