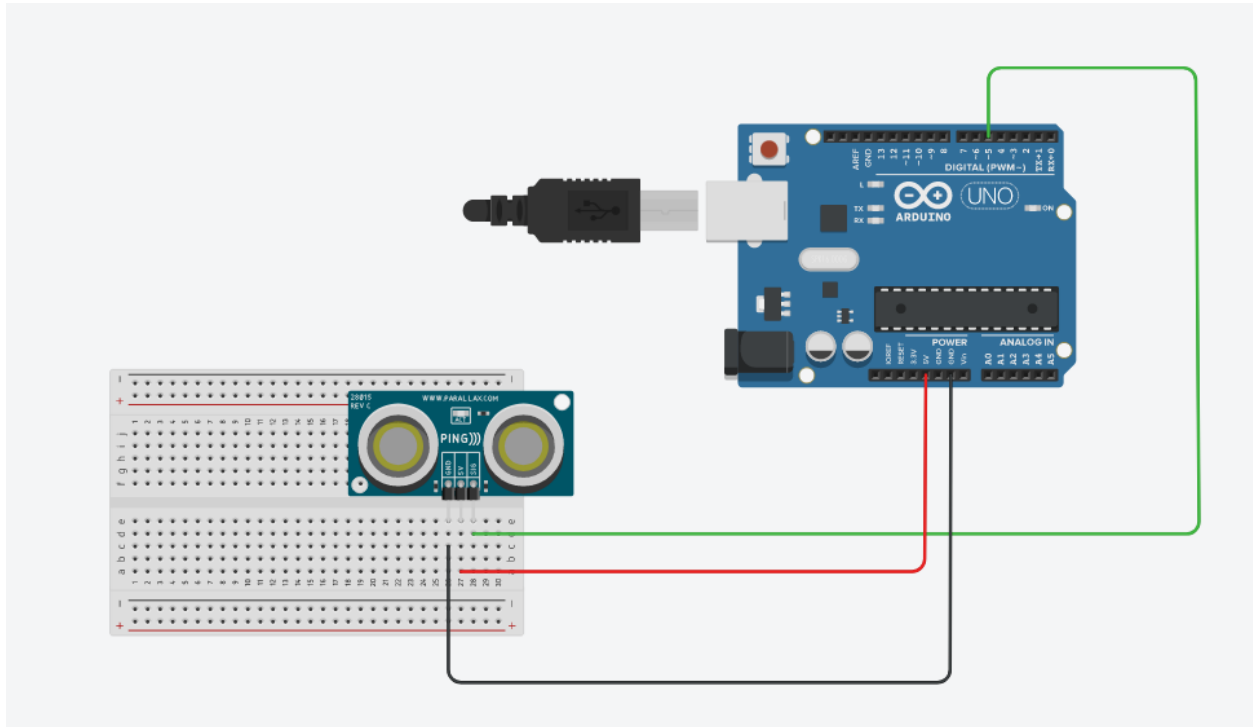


LAB REPORT 9

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(Date) 4/29/21

Screenshot + components:



Distance Sensor: It was used to measure distance from an object in order to calculate velocity.

Summary:

This experiment was done to calculate the velocity of an object. To do this I first created the circuit, which was given in the instructions. A distance sensor and an arduino were the only components required. Once the circuit was complete I completed the code. The ping method was used for distance, then I calculated the time using `pulseIn(...)`. Using those two pieces of data, I then calculated the velocity by doing the change in distance over change in time. After that I printed out the results.

Results:

The results were that the velocity was calculated and printed.

Serial monitor output:

210

D: 210| V: -1.00

138

D: 138| V: -1.00

138

D: 138| V: -1.00

233

D: 233| V: -1.00

Conclusions:

- 1) I learned that you can calculate the velocity of an object with a simple distance sensor and an arduino.
- 2) I learned that the distance sensor basically uses sonar to detect objects by bouncing a signal.

The biggest mistake was when trying to calculate the correct velocity. I had no idea why my velocity was always -1. My code seemed correct when it came to calculating it. Overall the most confusing part was figuring out when to get the change in time and change in distance.

Code:

```
const int pingPin = 5;
int DELTA_T = 1000;
int d;                // distance (current)
int t;                // time (current)
int old_t;
int old_d;
float velocity;
int change_t;
int change_d;
```

```
void setup() {
  Serial.begin(9600);
```

```
  d = 0;
  t = 0;
}
```

```
void loop() {
  old_d = d;
  old_t = t;

  d = ping(pingPin);
  t = pulseIn(pingPin, HIGH);
```

```
  Serial.println(d);
  delay(DELTA_T);
```

```
  change_t = t - old_t;
  change_d = d - old_d;
  velocity = change_d / change_t;
```

```
  Serial.print("D: ");
  Serial.print(d);
  Serial.print("| V: ");
  Serial.print(velocity);
```

```
    Serial.println();
}

/*returns the distance in centimeters to where
* the wave hit something and turned around
*/
int ping(int pingPin) {
    int duration;

    pinMode(pingPin, OUTPUT);
    digitalWrite(pingPin, LOW);
    delayMicroseconds(2);
    digitalWrite(pingPin, HIGH);
    delayMicroseconds(5);
    digitalWrite(pingPin, LOW);

    pinMode(pingPin, INPUT);
    duration = pulseIn(pingPin, HIGH);

    return duration / 29 / 2;
}
```

Rubric:

Each lab is graded out of 10. Labs are due at midnight a week after they are assigned. Labs turned in late receive a max of 7 points:

| Item | Points worth |
|--------------------------------------|--------------|
| Code correctness | 3 |
| Submission form correct | 3 |
| Report contains accurate information | 2 |
| Some effort put into report* | 2 |

*No answer is too short to properly address the lab report section and I can tell you tried at least just a little.