A Project report on

OBSTACLES AVOIDANCE SYSTEM FOR DRONES

Submitted in partial fulfillment of the award of the

BACHELOR OF SCIENCE

IN

AERONAUTICS

(AVIONICS)

By

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BONAFIDE CERTIFICATE

This is to certify that project report titled ***"0BSTACLES AVIODANCE SYSTEM FOR DRONES"***, is a bonafide record of work carried out by **MR. CHAUVAN DIPAK ARUN** during the final semester from **February 2021** to **May 2021** under my guidance, in partial fulfillment of the requirements for the award of **Bachelor of Science** in **Aeronautics** (**AVIONICS)**

Prof.Dr.M Suresh Kumar

Principal

PROJECT GUIDE NAME-

Miss Murnali Pant

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

CHAUVAN DIPAK ARUN

ROLL NO. = 2018-A-009

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Date:

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Stream:

- AVIONICS

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CHAUVAN DIPAK ARUN
(2018-A-009)

Date:_____/_____/_____.

ABSTRACT

The main objective of this project is to develop a collision avoidance system in an UAV. Safe navigation through corridors plays a major role in the autonomous use of unmanned aerial vehicle (UAV) in indoor and outdoor environment. Nowadays the use of aerial vehicles in the indoor environment is getting popularized. The use of aerial vehicles in indoors has a disadvantage of getting collided with objects. To avoid collision with objects these aerial vehicles are to be installed with a collision avoidance system. In this project I present an approach for wall collision avoidance using ultrasonic sensors on a quad rotor. An IMU data is needed for maintaining the stability UAV through indoor and outdoor corridor.

1. INTRODUCTION

An unmanned aerial vehicle (UAV), commonly known as a drone and referred to as a Remotely Piloted Vehicle (RPV) by the International Civil Aviation Organization (ICAO), is an aircraft without a human pilot onboard. Its flight is controlled either autonomously by onboard computers or by the remote control of a pilot on the ground or in another vehicle. The typical launch and recovery method of an unmanned aircraft is by the function of an automatic system or an external operator on the ground.

Historically, UAVs were simple remotely piloted aircraft, but autonomous control is increasingly being employed. They are usually deployed for military and special operation applications, but also used in a small but growing number of civil applications, such as policing and firefighting, and nonmilitary security work, such as inspection of power or pipelines. UAVs are often preferred for missions that are too "dull, dirty or dangerous" operations instead of manned aircraft.

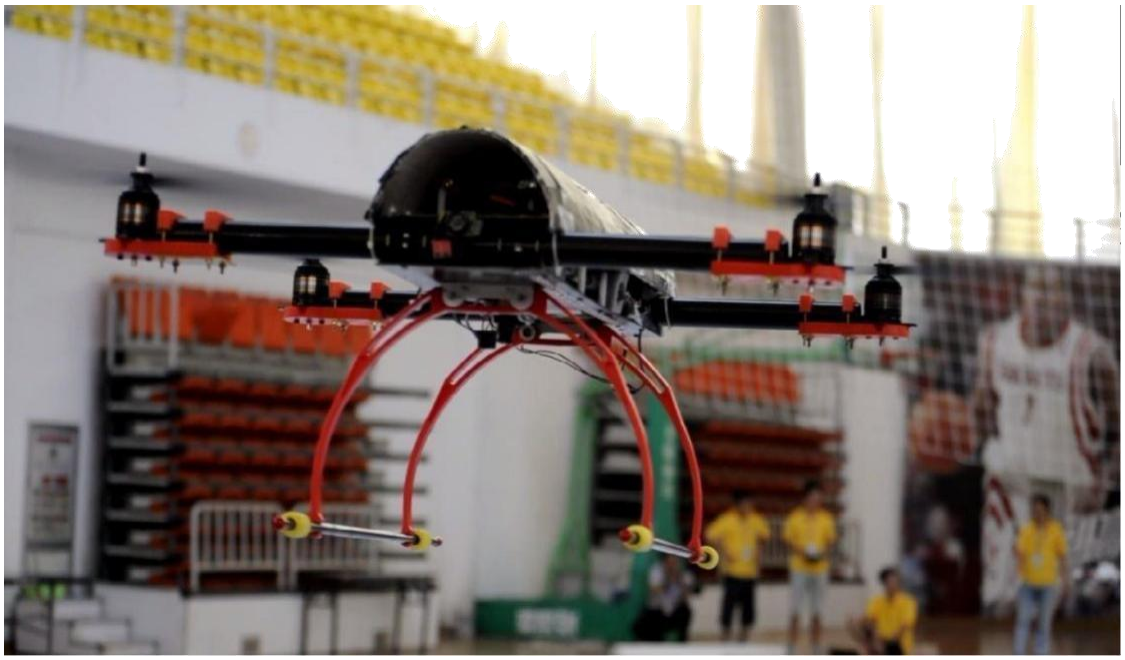


FIG 1 - UAV

COLLISION AVOIDANCE SYSTEM

A collision avoidance system is an system designed to reduce the severity of an accident. Also known as precrash system, collision warning system or collision mitigating system, it uses radar and sometimes laser and camera sensors to detect an imminent crash. Once the detection is done, these systems either provide a warning to the pilot when there is an imminent collision or take action autonomously.

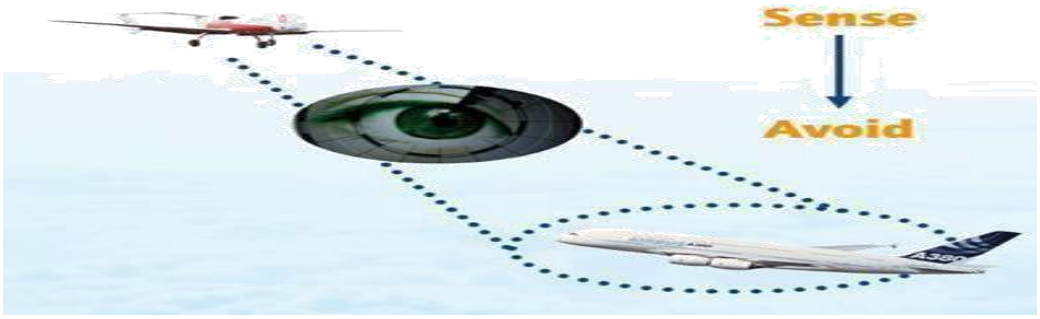


FIG 2 - COLLISION AVOIDANCESYSTEM

ULTRASONIC SENSORS

Ultrasonic sensors also known as transceivers as they both send and receive, but more generally called transducers. Its work on the principle similar to radar or sonar, which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.

Piezoelectric ceramics are used for ultrasonic transmission and reception.

Features

1. Colors Do Not Influence Detection

Unlike photoelectric sensors, Ultrasonic Sensors can detect an object without being influenced by its colors. For example, if two objects have the same shape, even if one is transparent, such as glass, and the other is black plastic, they can both be detected with the same settings.

2. Detecting Objects over a Wide Area

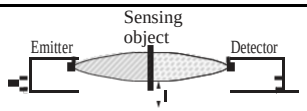
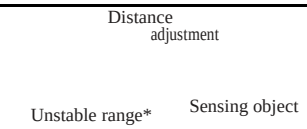
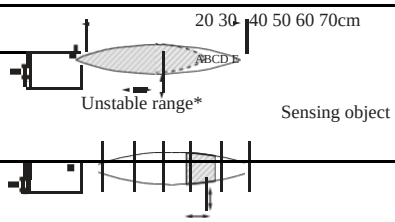
Ultrasonic sensor detect reflection from a wider area than photoelectric sensors, so they can check a wide area all at the same time.

3. Non-Contact Detection

Because Ultrasonic Sensors detect sensing objects without touching them, they do not scratch the sensing objects.

Classifications

Classification by Sensing Method

Through-beam		Detects the attenuation or interrupted condition of the ultrasonic beam caused by the object passing between the Emitter and Detector. Typical model: E4E2	
Reflective	**Convergent reflective (Distance adjustable)**	Detects only the beam reflected from the object existing within the sensing distance range set with the distance adjuster. Typical model: E4C-UDA	
	Convergent reflective (Zone setting)	Detects only the beam reflected from the object existing in the sensing range set with the distance selector. Typical model: E4PA-N	

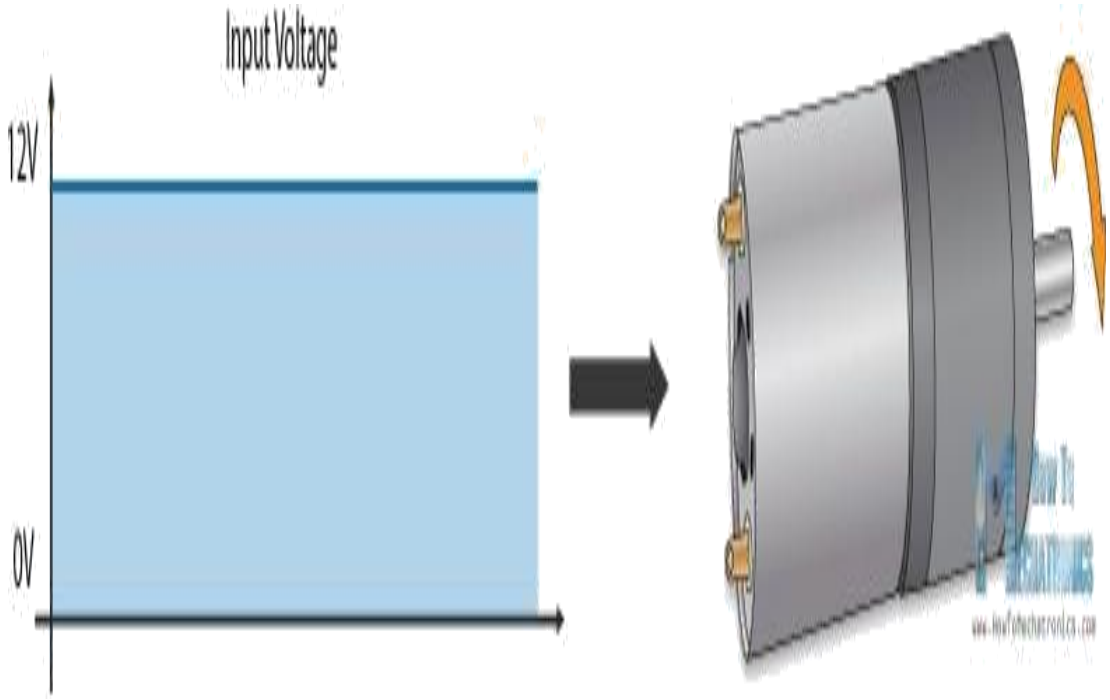
* An object may be detected due to multiple reflection if the object is in the unstable range where the distance adjuster is ineffective, in which case however, the detection of the object will not be stable. Therefore, do not attempt to use the Ultrasonic Sensor to detect an object in the unstable range.

Arduino DC Motor Control Tutorial – L298N | PWM | H-Bridge

In this Arduino Tutorial we will learn how to control DC motors using Arduino. We well take a look at some basic techniques for controlling DC motors and make two example through which we will learn how to control DC motors using the L298N driver and the Arduino board.

Overview

We can control the speed of the DC motor by simply controlling the input voltage to the motor and the most common method of doing that is by using PWM signal.



PWM DC Motor Control

PWM, or pulse width modulation is a technique which allows us to adjust the average value of the voltage that's going to the electronic device by turning on and off the power at a fast rate. The average voltage depends on the duty cycle, or the amount of time the signal is ON versus the amount of time the signal is OFF in a single period of time.

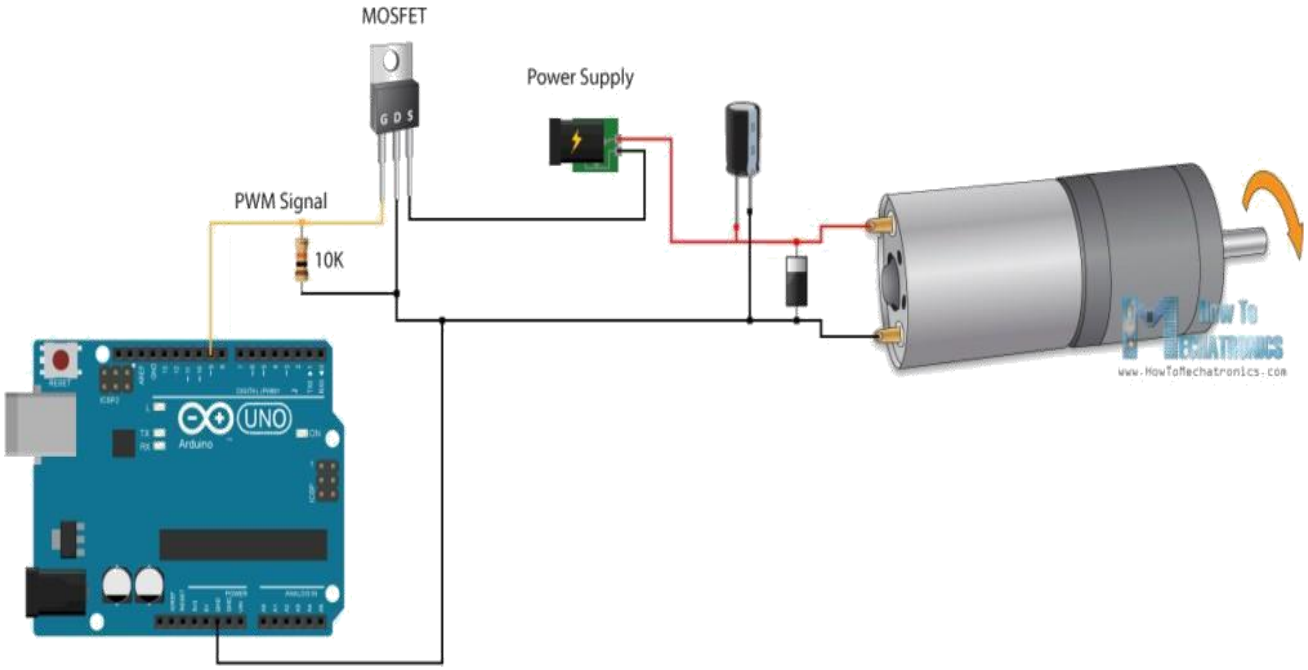


FIG 3 - PWM DC MOTOR CONTROL

So depending on the size of the motor, we can simply connect an Arduino PWM output to the base of transistor or the gate of a MOSFET and control the speed of the motor by controlling the PWM output. The low power Arduino PWM signal switches on and off the gate at the MOSFET through which the high power motor is driven.

H-Bridge DC Motor Control

On the other hand, for controlling the rotation direction, we just need to inverse the direction of the current flow through the motor, and the most common method of doing that is by using an H-Bridge. An H-Bridge circuit contains four switching elements, transistors or MOSFETs, with the motor at the center forming an H-like configuration. By activating two particular switches at the same time we can change the direction of the current flow, thus change the rotation direction of the motor. So if we combine these two methods, the PWM and the H-Bridge, we can have a complete control over the DC motor. There are many DC motor drivers that have these features and the L298N is one of them.

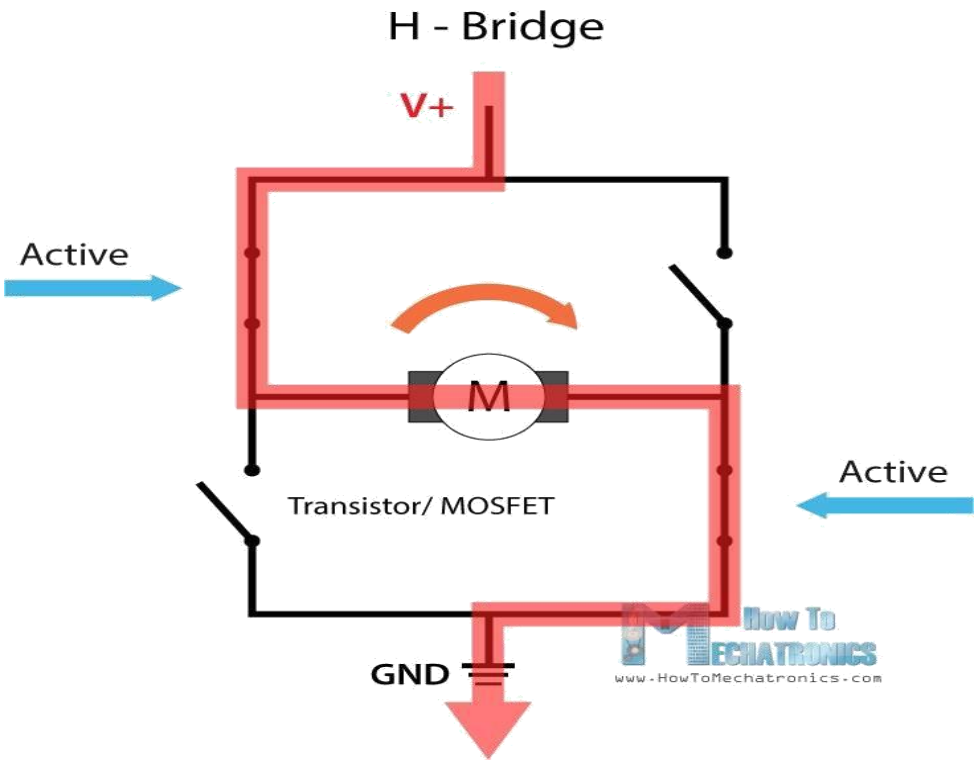


FIG 4 – H-BRIDGE DC MOTOR

Arduino and L298N

Now let's make some practical applications. In the first example we will control the speed of
the motor using a potentiometer and change the rotation direction using a push button. Here's the circuit schematics.

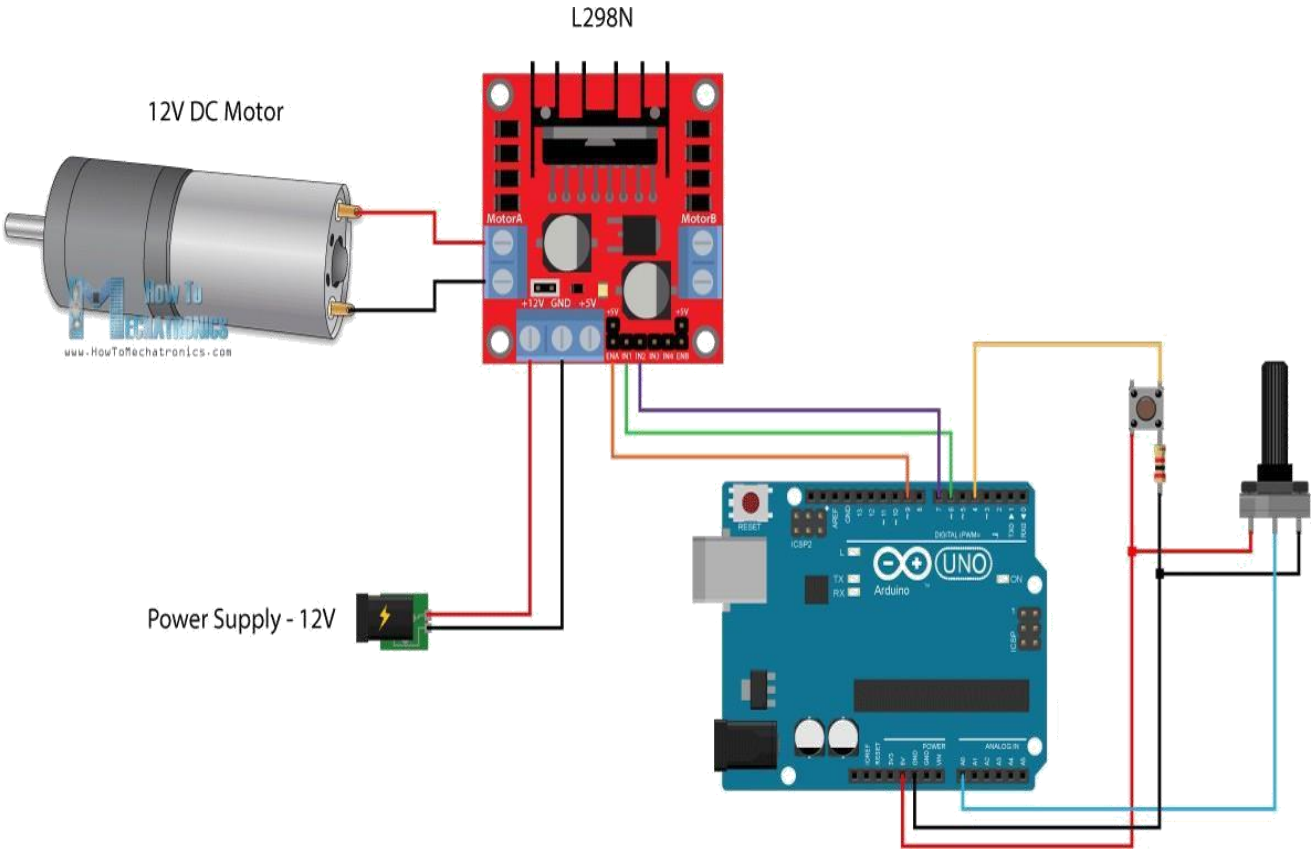


FIG 5 – **ARDUINO AND L298N**

So we need an L298N driver, a DC motor, a potentiometer, a push button and an Arduino board.

L298N Dual H-Bridge Motor Driver

This dual bidirectional motor driver, is based on the very popular L298 Dual H-Bridge Motor Driver Integrated Circuit. The circuit will allow you to easily and independently control two motors of up to 2A each in both directions .It is ideal for robotic applications and well suited for connection to a microcontroller requiring just a couple of control lines per motor. It can also be interfaced with simple manual switches, TTL logic gates, relays, etc. This board equipped with power LED indicators, on-board +5V regulator and protection diodes.

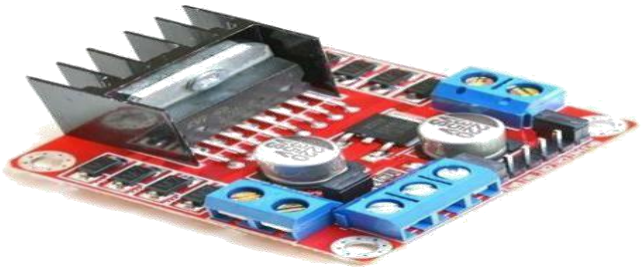


FIG 6 - SKU: MDU-1049

Brief Data:

- Input Voltage: 3.2V~40Vdc.
- Driver: L298N Dual H Bridge DC Motor Driver
- Power Supply: DC 5 V - 35 V
- Peak current: 2 Amp
- Operating current range: 0 ~ 36mA
- Control signal input voltage range :
- Low: -0.3V ≤Vin ≤1.5V.
- High: 2.3V ≤Vin ≤Vss.
- Enable signal input voltage range :
    - Low: -0.3 ≤Vin ≤1.5V (control signal is invalid).
    - High: 2.3V ≤Vin ≤Vss (control signal active).

: Maximum power consumption: 20W (when the temperature T = 75 ℃).
Storage temperature: -25 ℃~ +130 ℃.

- On-board +5V regulated Output supply (supply to controller board i.e. Arduino).
- Size: 3.4cm x 4.3cm x 2.7cm

1. Board Dimension & Pins Function:

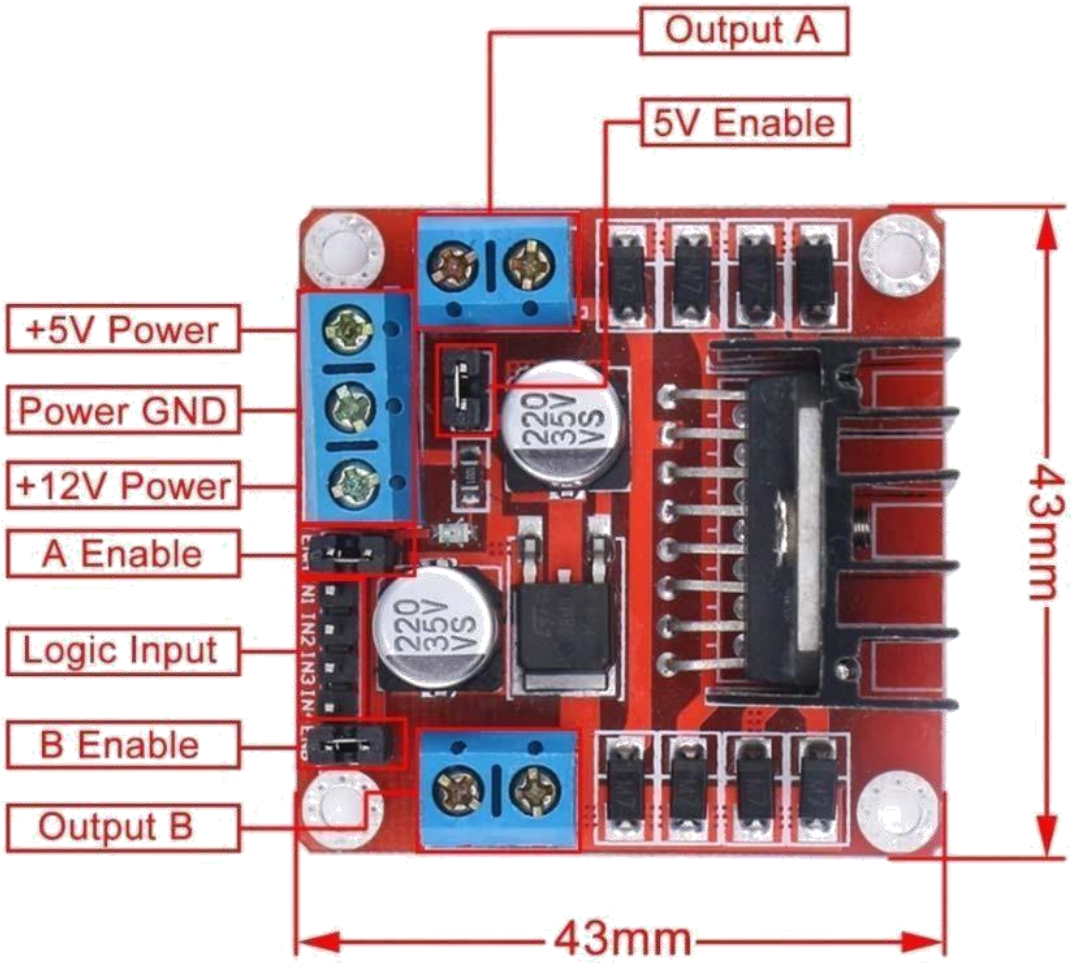


FIG 7 – BOARD DIMENSION AND PIN FUNCTION

SUMMARY

Ultrasonic sensor ,as it work is to sense the obstacle, as ultrasonic sensor as it is connected to 9 volt battery , ,it will sense the obstacle ,after sensing , it will give input to Arduino nano micro controller worker ,it is an onboard computer it will take the input from sensor and it will activate the motor ,the propeller will rotate counter clock wise and will change the direction .

CONCLUSION

A quad rotor UAV is used as the research platform. Ultrasonic sensors are used for obstacle avoidance. The paper shows the use of cheaper commercial off-the-shelf sensors processor board in the design and implementation of obstacle avoidance algorithm .The method of obstacle model is simple according to obstacles data by an onboard detection system , which uses one or more standard convex bodies to enclose the detected parts of an obstacle .Consequently ,the circular arc avoidance trajectory is designed through the obstacles model .It not only transforms an obstacle avoidance problem into a path following problem, but it also simplifies the design of an obstacle avoidance algorithm . The present work is focused on the design of an obstacle avoidance algorithm for a UA ,and it has been verified in a simulation environment. Our future work will be do more extensive and complex simulation to analyze the characteristics and performance of the proposed algorithm and apply the algorithm to actual flight tests

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