WUMPUS WORLD REPORT

PROJECT TITLE: Wumpus world implementation using autonomous robot

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COMPONENTS USED:

1. 4 Wheelers chassis frame.
2. 11.1V Battery.
3. Jumping wires.
4. L298D Moter Drive.
5. Arduino UNO.

1.CHASSIS FRAME:

Chassis is the vehicle's main support structure, also known as the 'Frame.' It bears all the stresses on the vehicle in both static and dynamic conditions. In a vehicle, it is analogous to the skeleton of a living organism.

The Chassis has the following functions. It:

- Supports or bears the load of the vehicle body.

- Provide the space and mounting location for various aggregates of vehicle.
- Withstands the stresses arising due to bad road conditions.
- **SPECIFICATION:**
  - FOR BO MOTOR:

1.operating voltage:3V-6V DC
2.Gear ratio: 1:48
3.No-load speed(5v): about 208RPM
4.Rated torque:0.8kg.cm@5v
5.load current:170mA(when it is 4.5V)
6.Size:70*23*18mm
7.Weight:28g
8.shaft length:10mm
9.shaft type:6mm,double-D

  - FOR WHEEL:

1. Loading Capacity: Max 2.5Kg
2. Double D-hole For BO Motor: 6 mm
3. Weight: 34g
4. Wheel Diameter: 65 mm
5. Color: Black (Tyre), Yellow (Rim)
6. Wheel width: 27 mm
7. Body Material: Plastic
8. Grip Material: Rubber.

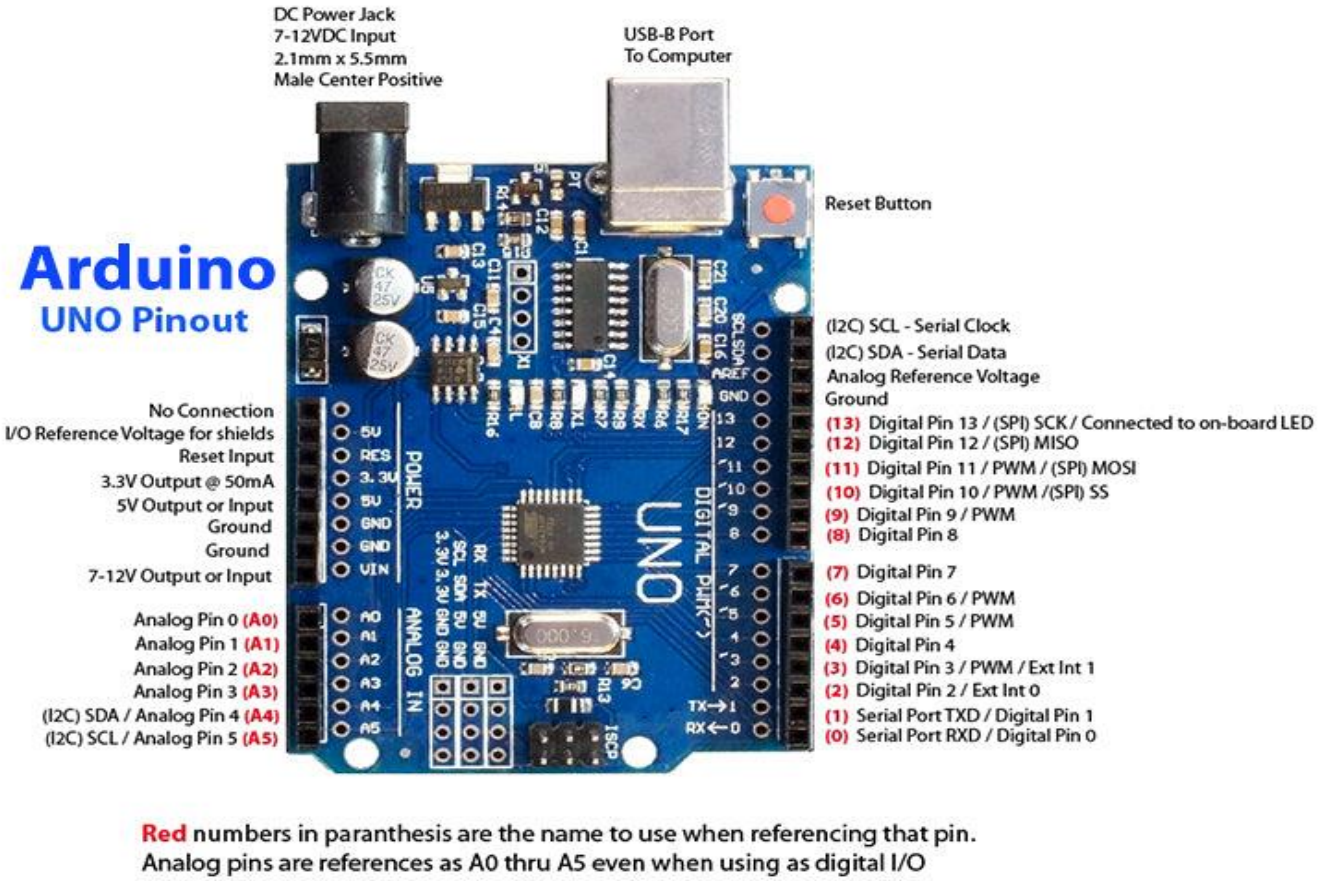
- **FEATURES:**

1. Very handy and simple in assembling/disassembling. RoboticsBD
2. Strong components to withstand extreme terrain conditions.
3. Transparent Car Chassis.
4. Attractive design.
5. Double-layer structure, much of mounting holes, enough space
6. Easy to install a variety of control panels, sensors
7. Educational toys, Ideal for the DIY platform.

2.ARDUINO UNO

- Arduino UNO is based on an ATmega328P microcontroller.
- The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.
- The Arduino UNO includes 6 analog pin inputs, 14 digital pins.

- A USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header.
- It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.



COMPONENTS IN ARDUINO UNO

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the ATmel family. The processor code inside it is of 8-bit. It combines Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.

- **ICSP pin** - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- **Power LED Indicator**- The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.
- **Digital I/O pins**- The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- **TX and RX LED's**- The successful flow of data is represented by the lighting of these LED's.
- **AREF-** The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- **Reset button**- It is used to add a Reset button to the connection.
- **USB**- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.
- **Crystal Oscillator**- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- **Voltage Regulator**- The voltage regulator converts the input voltage to 5V.
- **GND**- Ground pins. The ground pin acts as a pin with zero voltage.
- **Vin**- It is the input voltage.
- **Analog Pins**- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.

Technical Specifications of Arduino UNO

The technical specifications of the Arduino UNO are listed below:

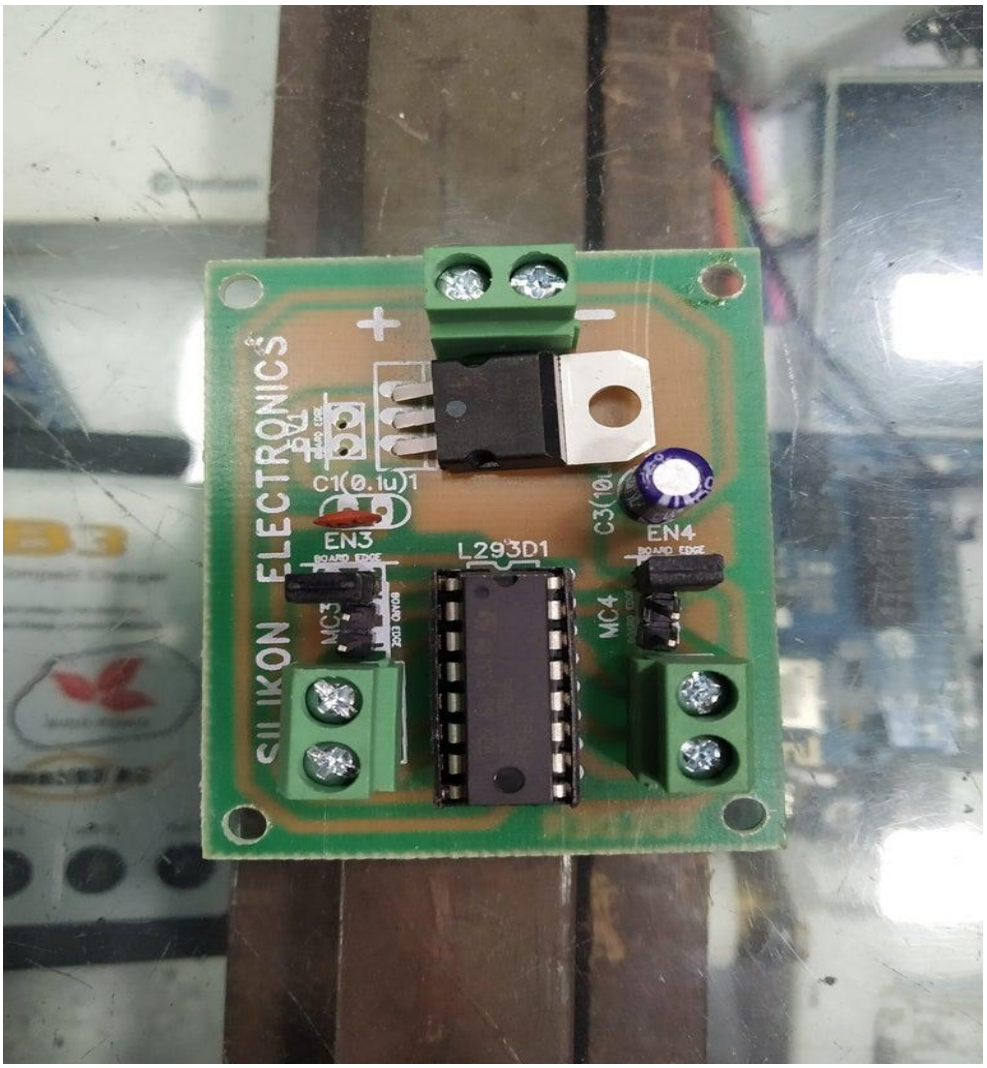
1. There are 20 Input/Output pins present on the Arduino UNO board. These 20 pins include 6 PWM pins, 6 analog pins, and 8 digital I/O pins.
2. The PWM pins are Pulse Width Modulation capable pins.
3. The crystal oscillator present in Arduino UNO comes with a frequency of 16MHz.
4. It also has a Arduino integrated WiFi module. Such Arduino UNO board is based on the Integrated WiFi ESP8266 Module and ATmega328P microcontroller.

5. The input voltage of the UNO board varies from 7V to 20V.
6. Arduino UNO automatically draws power from the external power supply. It can also draw power from the USB

3.JUMPING WIRES:

- A **jump wire** (also known as **jumper**, **jumper wire**, **DuPont wire**) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering
- Types of jumping wires:
  1.MALE TO MALE JUMPING WIRES
  2.MALE TO FEMALE JUMPING WIRES
  3.FEMALE TO FEMALE JUMPING WIRES

4. L293D Motor Driver Shield



Motor Driver – L293D Driver Module is a medium power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L293 motor driver IC. It can drive 4 DC motors on and off, or drive 2 DC motors with directional and speed control.

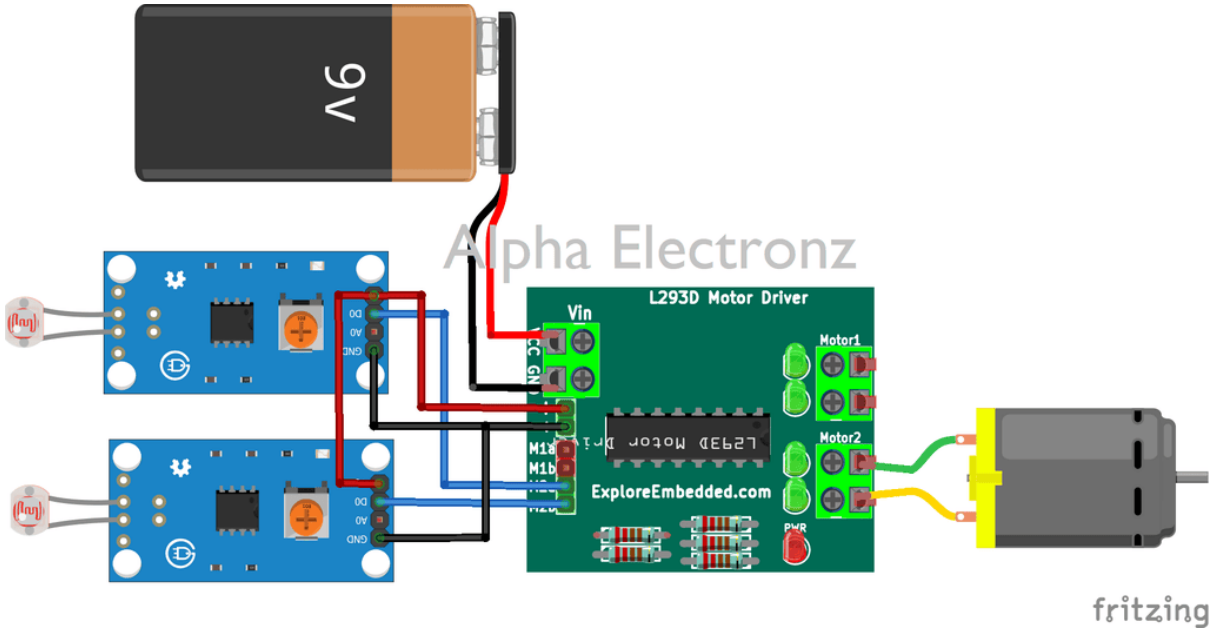
The driver greatly simplifies and increases the ease with which you may control motors, relays, etc from micro-controllers. It can drive motors up to 12V with a total DC current of up to 600mA.

You can connect the two channels in parallel to double the maximum current or in series to double the maximum input voltage. This motor driver is perfect for robotics and mechatronics projects for controlling motors from micro-controllers, switches, relays, etc. Perfect for driving DC and Stepper motors for micro-mouse, line following robots, robot arms, etc.

Note: Image may vary from actual product in terms of Design according to the availability.

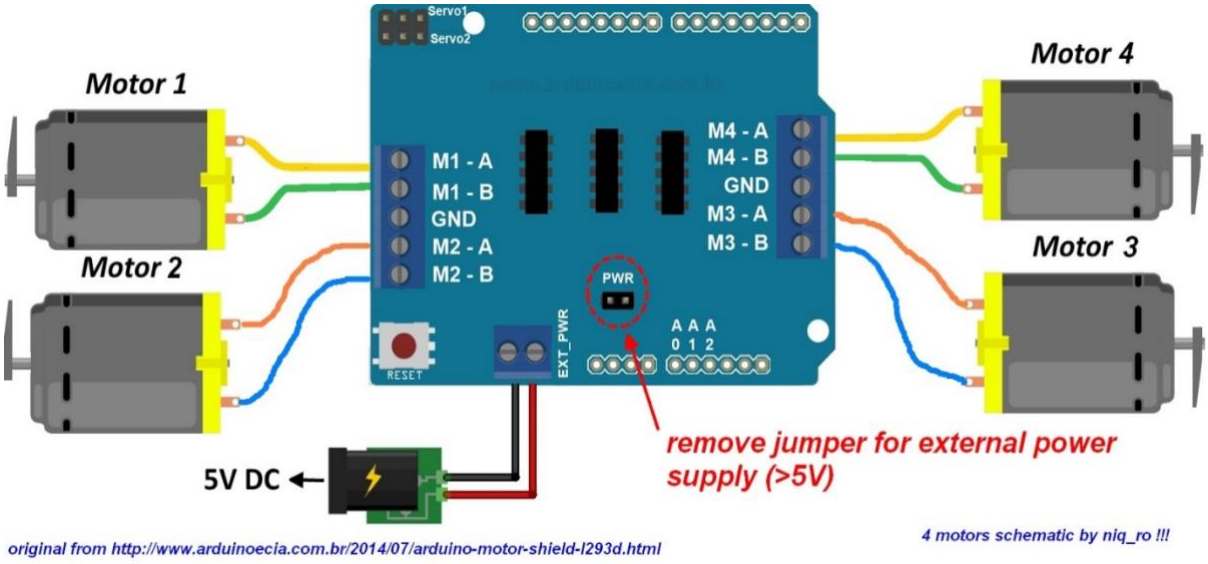
❖ Features :

- Wide supply voltage: 4.5 V to 12 V.
- Max supply current: 600 mA per motor.
- The driver two holes of 3 mm dia.
- Male burg-stick connectors for supply, ground and input connection.
- Screw terminal connectors for easy motor connection.
- High noise immunity inputs.



Circuit Diagram

Control 4 DC motor using L293D DC motor shield for arduino



Pulse Width Modulation (PWM) is a technique used in electronics to control the average power delivered to a device by rapidly switching it on and off. This is commonly used to control the speed of motors, the brightness of LEDs, and other similar applications.

Generating PWM in Arduino: The Arduino can generate PWM signals using its pins that support PWM output. For instance, on most Arduino boards, pins 3, 5, 6, 9, 10, and 11 support PWM.

Connecting to L293D: The PWM pin from the Arduino is connected to one of the input pins (e.g., ENA for Motor A or ENB for Motor B) on the L293D.

Duty Cycle: PWM is characterized by a duty cycle, which is the ratio of time the signal is high (on) to the total time of one cycle. In Arduino, this is controlled using analog Write() function which accepts values from 0 (always off) to 255 (always on).

L293D Interpretation: The L293D interprets the PWM signal as an average voltage level. For example, if the duty cycle is set to 50%, the L293D will consider it as an average of half voltage.

Motor Speed Control: The L293D, based on this interpreted average voltage, adjusts the speed of the motor.

Wumpus world using backtracking

Initial State: You start at a certain location in the grid, typically at the beginning of the cave system.

Exploration: You begin by making decisions on which adjacent cell to move into. Before moving, you gather information about the neighboring cells through sensory perceptions like breeze (indicating a nearby pit) and stench (indicating the presence of the Wumpus).

Decision Making: Based on the information gathered, you decide which direction to move. You may choose a direction that seems safe or a direction that is less risky based on the available information.

Recording Actions: You keep a record of your actions. This includes the cells you've visited and the decisions you've made.

Unfolding Consequences: If you encounter a pit or the Wumpus, you realize that you've made a mistake. This is where backtracking comes into play. You "undo" the last decision you made by returning to the previous state.

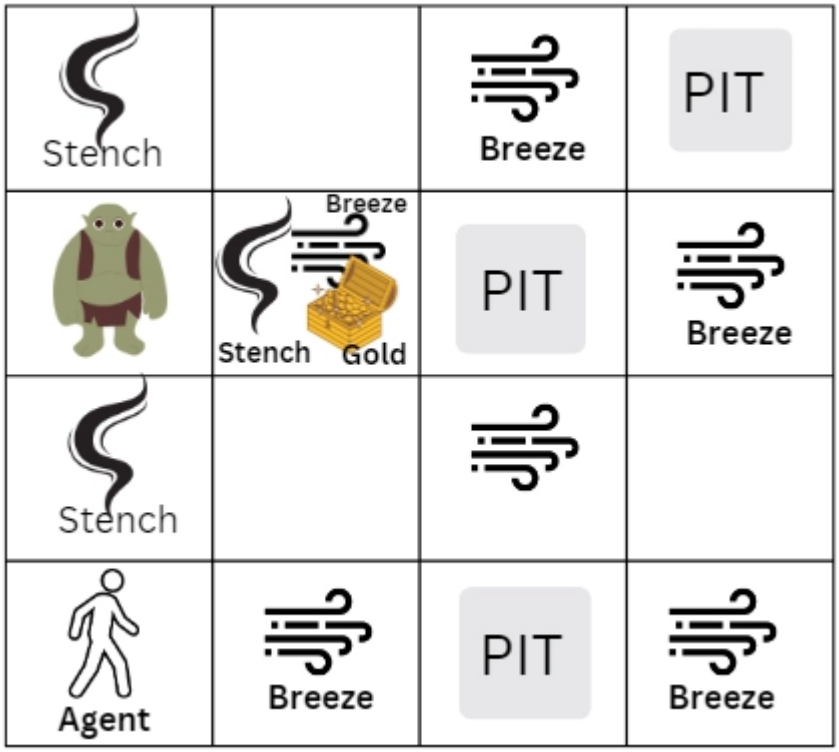
Alternative Paths: Once you've backtracked, you explore a different path. This could involve choosing a different direction or taking a different series of actions.

Repeating the Process: You continue this process of exploration, decision-making, and backtracking until you reach your goal (e.g., finding the gold and exiting the cave) or determine that it's not possible to achieve your goal.

Completing the Mission: If you successfully navigate to the gold and find a path back to the starting point, you've completed the mission. If not, you may need to reassess your strategy or try a different approach

The Wumpus World Description

The Wumpus World's agent is an example of a knowledge-based agent that represents Knowledge representation, reasoning and planning. Knowledge-Based agent links general knowledge with current percepts to infer hidden characters of current state before selecting actions. Its necessity is vital in partially observable environments. Problem Statement: The Wumpus world is a cave with 16 rooms (4×4). Each room is connected to others through walkways (no rooms are connected diagonally). The knowledge-based agent starts from Room[1, 1]. The cave has – some pits, a treasure and a beast named Wumpus. The Wumpus can not move but eats the one who enters its room. If the agent enters the pit, it gets stuck there. The goal of the agent is to take the treasure and come out of the cave. The agent is rewarded, when the goal conditions are met. The agent is penalized, when it falls into a pit or being eaten by the Wumpus. Some elements support the agent to explore the cave, like -The wumpus adjacent rooms are stenchy. - The agent is given one arrow which it can use to kill the wumpus when facing it (Wumpus screams when it is killed). – The adjacent rooms of the room with pits are filled with breeze. -The treasure room is always glittery



Hardware Design and Development

Grid Representation

The physical grid was designed to replicate the **4x4 grid** of the standard Wumpus World. Each cell was equipped with pressure sensors to detect the presence of the agent, Wumpus, pits, and gold.

ALGORITHM: -

1-By using AF_motor.h library of L293D motor driver we created four-wheel drive robot.

2-Which can follow the instructions given to it.

3.According to the instructions present in the code the robot moves and returns back.

4-according to the given speed the Arduino generates the PWM to the motor driver and it rotates the wheels accordingly.

5-Using 9v battery the motor driver and Arduino works accordingly.

6-Arduino has the memory of 2KB Static RAM, 32KB flash memory, 1KB EEPROM.

7-Using the digital pins to each individual motor, finally they work on the given instructions.