**SELF DRIVING CAR**

Arduino car that can sense things in front of it avoiding the obstacle while LED lights are flashing. It works by using ultrasonic sensors to avoid objects by using servo motors

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

**Why Arduino?**

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

**Advantages of using Arduino**

**Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50

**Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

**Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

**Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

**Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

**Component used in Arduino uno:**

This is the **HC-SR04 ultrasonic distance sensor**. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

There are only four pins that you need to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). You will find this sensor very easy to set up and use for your next range-finding project!

This sensor has additional control circuitry that can prevent inconsistent "bouncy" data depending on the application.

**Micro Servo Mini Tower Pro 9g SG-90** – Interfacing an SG-90 servo motor is like a rite of passage in this craft. The Servo Mini Tower Pro 9g SG-90 is a lightweight servo motor that rotates 90 degrees in both directions. It works just like its bigger brothers but without the need to use a motor controller. It’s best for prototyping and quick fixes.

The **Arduino Motor Shield** is based on the L298 (datasheet), which is a dual full-bridge driver designed to drive inductive loads such as relays, solenoids, DC and stepping motors. It lets you drive two DC motors with your Arduino board, controlling the speed and direction of each one independently. You can also measure the motor current absorption of each motor, among other features. The shield is TinkerKit compatible, which means you can quickly create projects by plugging TinkerKit modules to the board.

they are low cost and used to connect hardware such as sensors, Arduino boards and breadboards together. Dupont cable includes Male to Male, Male to Female, Female to Female cable

A **lithium-ion (Li-ion) battery** is a type of rechargeable batter

y that uses lithium ions as the primary component of its electrochemical cells. These batteries are widely used in various electronic devices,

including smartphones, laptops, cameras, and electric vehicles. Here are some key

characteristics

and components of lithium-ion batteries

High energy density: Lithium-ion batteries can store a significant amount of energy in a relatively small and lightweight package.

Rechargeable: Lithium-ion batteries can be

recharged multiple times, making them suitable for long-term use.

Low self-discharge: Li-ion batteries have a lower self-discharge rate compared to other rechargeable batteries.

**DC motor**, or direct current motor, is a type of electric motor that converts electrical energy into mechanical motion. Here are the key components and principles of a DC motor

When an electric current is applied to the armature, it generates a magnetic field. This magnetic field interacts with the magnetic field provided by the stator.

According to Fleming's left-hand rule, the interaction of these magnetic fields produces a torque, causing the armature (and hence, the motor shaft) to rotate.

DC motors are found in a wide range of applications, from small household devices to larger industrial machinery.

They are commonly used in electric vehicles, robotics, conveyor systems, and various automated systems.

**Working Principle:**

***• ~~Obstacle Detection:~~***

***• ~~The ultrasonic sensor continuously sends out ultrasonic waves.~~***

***• ~~When these waves hit an obstacle, they bounce back to the sensor.~~***

***• ~~The sensor calculates the distance to the obstacle based on the time taken for the waves to return.~~***

***• ~~Decision Making:~~***

***• ~~The Arduino Uno processes the distance information received from the ultrasonic sensor.~~***

***• ~~If the distance is within a certain predefined range (indicating an obstacle), the Arduino decides that there's an obstacle in the way.~~***

***• ~~Steering Control:~~***

***• ~~Depending on the side of the obstacle, the Arduino sends a signal to the servo motor to turn the wheels in the opposite direction.~~***

***• ~~For example, if an obstacle is detected on the right side, the servo motor turns the wheels to the left, and vice versa.~~***

***• ~~Movement:~~***

***• ~~The Arduino also controls the motors responsible for moving the car forward or backward.~~***

***• ~~If there's no obstacle, the car moves straight ahead.~~***

***~~Code Structure:~~***

***~~Your Arduino code will include sections for:~~***

***• ~~Initializing the servo motor and ultrasonic sensor.~~***

***• ~~Reading data from the ultrasonic sensor.~~***

***• ~~Making decisions based on the distance readings.~~***

***• ~~Controlling the servo motor to steer the car.~~***

***• ~~Controlling the motors to move the car.~~***

***~~Remember to fine-tune the parameters (such as distance thresholds) and ensure the responsiveness of your system~~***

**APPLIED PHYSICS**

**PROJECT REPORT – OBSTACLE AVOIDING CAR**

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