

# MOBILE CONTROLLED FRICTIONAL VEHICLE FOR DIFFERENTLY ABLED PEOPLE

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## **Abstract**

*In day to day life everyone is willing to have a vehicle for their sophisticated life. The need for vehicles is inevitable. But there are many issues faced because of the petrol and diesel-based vehicles. To overcome this issue, it is necessary to switch to an alternative energy resource. Whenever the road surface and vehicle tyres are brought to contact friction effect occurs. This friction creates electricity when the piezoelectric crystals laid with the asphalts along the roads and the vehicle tyres come in contact. This electricity is produced to a considerable amount, so that it can be used as a source of motion for the vehicles. The proposed **MOBILE CONTROLLED FRICTIONAL VEHICLE FOR DIFFERENTLY ABLED PEOPLE** uses two main operations: Motion by frictional energy and Mobile controlled operation using Bluetooth. Here motion by friction is carried out by electrical energy produced from the piezoelectric crystals laid on the road surface and Mobile control operation is carried out using Dual Tone Multiple Frequency Decoder (DTMF) connected to 8051 Microcontroller coded in Embedded C language Keil Micro vision 4 compiler connected to the DC gear motors which is in turn connected to the vehicles tyres to control the vehicle movements according to the data transferred from users mobile.*

## **I. INTRODUCTION**

In day to day life everyone is willing to have a vehicle for their sophisticated life. The need for vehicles is inevitable. But there are many issues faced because of the petrol and diesel based vehicles. To overcome this issue it is necessary to switch to an alternative energy resource. The basic idea is to reduce the use of fossil fuels and to provide a sustainable vehicle for differently abled people. To provide a solution in terms of economy, environment and social needs, a new evolution of energy can be obtained using Piezoelectric. Since fossil fuels are being consumed in greater amount this technology will make a challenge to provide power which is sufficient in the next era for the effect of growing economy. Whenever the road surface and a vehicle tyre brought to contact friction effect occurs. This friction creates electricity when the piezoelectric crystals laid with the asphalts along the roads and the vehicle tyre comes in contact. Two main operations, motion by frictional energy and mobile controlled operation using Bluetooth. Here motion by friction is carried out by electrical energy produced from the piezoelectric crystal laid on the road surface and Mobile control operation is carried out using Bluetooth and arduino.

## **II. PIEZO IMPOSED ON STREET LAMP**

### **A. Overview**

The existing system uses the principle of piezoelectricity generated from roads to use that energy obtained from the vehicles which are in motion. The energy that is obtained uses piezoelectric technology to convert it into electrical energy which replaces the fossil fuel. The state of being strong in this technology is to arise that fossil fuels are consumed in high amount which makes this technology to give us required power in the next generation since the economy is a growing population. Hence switching to renewable energy is required to reach greater global consumption

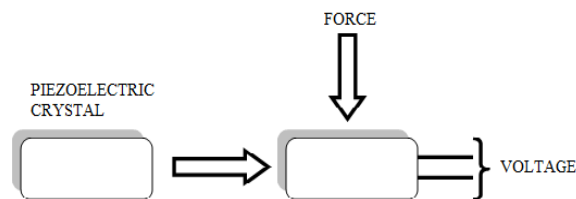
level which decrease the level of risks involved in the usage of fossil fuels. Piezoelectric road is a new energy harvesting technique to provide a sustainable economy.

**B. Fossil Fuel Phase Out**

As the need for fossil fuel is greatly increasing certainly, the use of obtaining power using non-renewable energy will come to an end. The over usage and the risks involved here pressures the environment as well as economy. Since the economy is growing and considering population as a major factor it is estimated that consumption of non- renewable energy has increased. It will remain increasing for the next 20 to 30 years by considering population as a major factor.

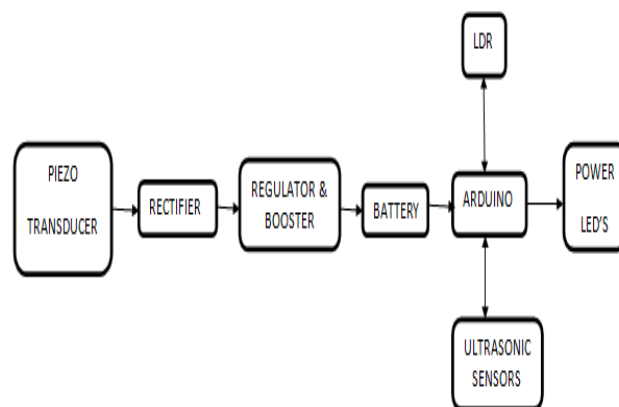
**C. Piezoelectric Working Principle**

Crystals plays a vital role behind the principle of piezoelectricity. When crystalline materials are subjected to any external strain, force, or pressure, an electrical voltage is induced as shown in figure1. Natural crystals like Amazonite and clear quartz are used today to obtain piezoelectricity which are found under the surface or deep within the earth.



**Figure 1** Principle of piezoelectric effect

The characteristic factors of PZT are high material strength, complex shape, ease of fabrication, heat temperature over 100°C and long life service. Other than crystalline material the following table gives some other parameters that determine the best results of piezoelectricity. The figure2 shown block diagram of the piezoelectricity which undergoes the process that is prior to the energy output. The piezoelectric device generates force or pressure from where the AC voltage is induced. The AC voltage is converted in DC voltage and adjusted, then it is stored in the battery. Also the converted voltage is stored in capacitors for the application for electrical purposes.

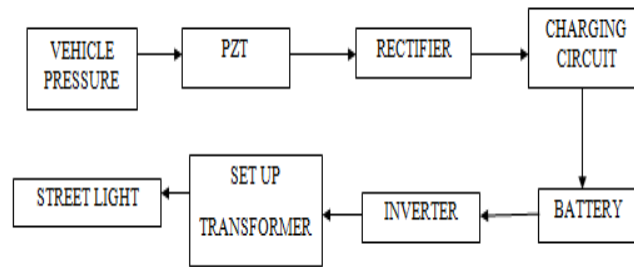


**Figure 2** Block Diagram

**D. Energy Generation**

The electrical power for the street lights are obtained from Power asphalt and the set up involves piezoelectric devices which are laid under asphalt roads, at approximate distance of 10m. This setup

generates electrical power up to 2KWh in shown in figure4. Another setup involves the passing rate for vehicles up to 200-400.



**Figure 3** Power Generation block diagram

According to calculations, for 6 days 10 street lights can be operated with free of cost and clean energy. Based on the above calculations it is seen that at an average of 90 pennies are required to light up one street lamp per day by using fossil fuels. Different shapes can produce different levels of vibration modes and the piezoelectric devices can be manipulated over different shapes. Such modes of vibration provide very high frequency to specific distance.

### III. HARVESTING OF ENERGY THROUGH MOBILE CONTROLLED VEHICLE

#### A. Piezoelectric Crystals

The piezoelectric crystal which is one of the diminutive crystal is a form of energy resources. When those crystals are immediately deformed, a tiny voltage is produced which is called piezoelectricity in figure4. This form of renewable technology is not suitable for any kind of industrial applications. The main principle of this crystal is to generate piezoelectricity which can be reversible for automatic stress in crystals. Nanometres are used to done with the twist and its applications are sound detection and vibrations. The piezoelectric crystals are hexagonal in shape and also it has three axis including electrical, mechanical and optical. This is termed as piezoelectricity. a piezoelectric effect. The principle behind these piezoelectric crystals is that whenever any kind of force is applied to the crystals then electricity is generated. When the crystals experience a electromagnetic force, then after some time crystals begin to vibrate .It is also called as inverse piezoelectric effect.



**Figure 4** Piezoelectric crystals

#### B. Arduino Uno

Arduino shown in figure5 is an open source of electronic platform or electronic board. Software program code is programmed in arduino. The Arduino Uno is based on a microcontroller board on the ATmega328. It consists of 14 digital input/output pins where 6 pins are utilized as PWM outputs, 6 analog inputs, ICSP header, 16 MHz ceramic resonator, USB connection, reset button and power jack. These have all the necessary support needed for the microcontroller. Arduino language is nearly a set of C/C++ functions. When multiple times any action is need to be performed for the same action then in such typical case, function is created. Any programmer to remain organized is done with the help of

Functions. For example Arduino boards read input from the light on the sensor, and is converted into output, turning on an LED.

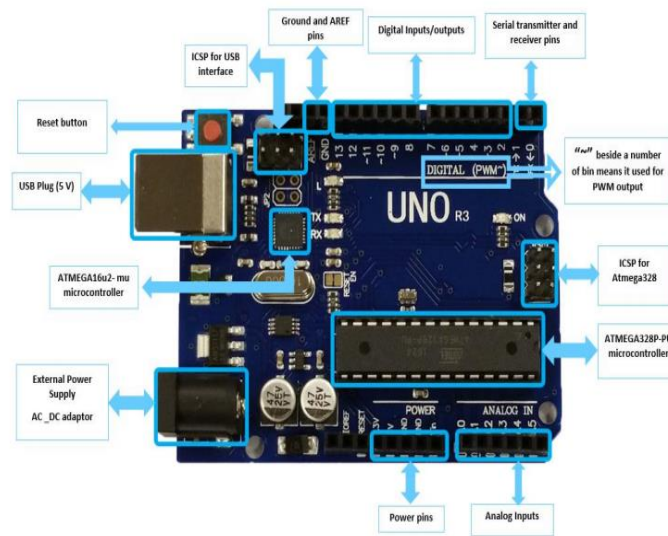


Figure 5 Arduino UNO

### C. L298N Motor Driver

The L298N in figure6 is a dual H-Bridge motor driver which simultaneously allows the control of speed and direction of two DC motors. The module is capable of driving DC motors with voltages between 5 and 35V, with a peak current up to 2A. The module has a 5V regulator onboard which is either turned on or disabled using a jumper. If the motor supply voltage is up to 12V, then the 5V regulator can be activated and the 5V pin can be used as output, for example to properly control our Arduino boardwork.

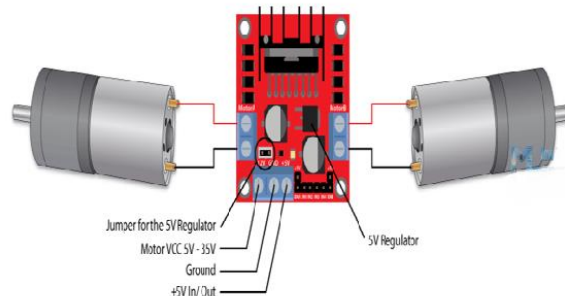


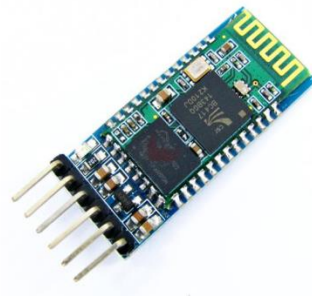
Figure 6 L298N

Here it is noted that this IC causes a voltage drop of about 2V. For example, if a 12V power supply is used, the voltage at motor terminals will be around 10V, which means that our 12V DC motor won't be able to reach the full speed. Next are the inputs of the control logic. The Enable A and Enable B pins are used to enable and regulate motor speed. The emitters of the lower transistors of each bridge are attached and the related external terminal may be used for an extra contact to the sensor resistor.

### D. HC-05 Bluetooth Device

The HC-05 in figure7 is a very nice package that will attach wireless two-way (full-duplex) features to the designs. This module can be used to connect with two microcontrollers such as Arduino, or to interact with any computer with Bluetooth features such as a Mobile or Laptop. There are already several android applications available which make this process far easier. The HC-05 has two operating modes, one is the Network mode where you can transmit and retrieve data from other Bluetooth devices and the other is the AT Command mode where you can adjust the default interface

settings. Just power the module with+ 5V and attach the module's Rx pin to MCU's Tx and Tx pin to MCU's Rx. The key pin can be grounded to enter Command mode during power up, if left free it will enter the data mode by default. Upon powering the module you should be able to discover the Bluetooth device as "HC-05" in figure9.



**Figure 7** HC-05 Module

### ***E. DC Motors***

A DC motor in the below figure8is one of a class of rotary electric motors which converts electrical direct current into mechanical energy. The most that forms depend on magnetic-field effects. DC motors were the first commonly adopted type of engine, since they could be driven from existing direct-current distribution systems. The speed of a DC motor may be regulated over a wide range, either by using a variable supply voltage or by adjusting the current force in its field windings. Larger DC motors are commonly used in hybrid truck, elevator and hoist driving, and in steel rolling mill drives. The introduction of control electronics in many systems has made possible the substitution of DC engines by AC motors. DC motor is a machine which converts electric energy in the form of rotation into mechanical energy. The acceleration is brought on by the electromagnetism's physical actions. Within DC motors have inductors which generate the movement-generating magnetic field.



**Figure 8** DC Motors

### ***F. Rechargeable Battery***

A rechargeable battery, backup battery, or secondary cell (or obsolete accumulator) is a form of electrical battery that can be powered, discharged and recharged several times, as opposed to a discarded or main battery that is completely powered and discharged each usage. It is made of an electrochemical cell or more. Rechargeable batteries usually cost more than conventional batteries at first, but have a significantly lower overall cost of ownership and effect on the climate, since they can be recharged easily several times before they require replacement. The positive active substance, producing electrons, is oxidized while charging, and the negative content is the, absorbing electrons. The chargers require a battery charge from a few minutes to several hours. Different chemistries of batteries require specific charging schemes. For starters, certain forms of batteries can be recharged securely from a source of constant voltage. Other forms must be charged with a controlled current supply, which tapers when the battery hits maximum charged voltage.

## **IVWORKING**

The new system's key goal is to raising the usage of fossil energy and promotes the use of renewable fuels by differently abled people. The operation of vehicle consists of two mechanisms: Motion by

friction and mobile operation. The motion by friction is carried out by using piezoelectric crystals. Whenever vehicles move on the road surface friction occurs. This friction generates electricity when the piezoelectric crystals laid with the asphalts along the roads and the vehicle tyre comes in contact. The generated electricity is stored in the rechargeable battery and can be kept refilled in the E-stations. From those E-stations, power can be used whenever it is needed in future. This technology will reduce the use of fossil fuels. Mobile controlled operation is carried out by Bluetooth module HC-05. The module is interfaced with mobile by using Arduino and Microcontroller. The directions of the vehicle is established through mobile. The 8051 Microcontroller is connected to the DC gear motors which is in turn connected to the vehicle tyres to control the vehicle movements according to the data transferred from users mobile. L298N is used to connect two DC motors of the vehicle. This technology will reduce the use of fossil fuel consumptions and an ease use type of vehicle for the differently abled people.

## V CONCLUSION

Energy harvesting is a vital technology to enable robotic, self-powered electronic devices. For low-power electronics reduction technology needs, the usage of energy harvesting devices becomes more feasible for long as they provide control attractively. Energy storage technology has the ability to change the way small devices are supplied with electricity; the transition from dependent on battery power to self-powered, self-governing systems. In this study, ideas were discussed for the processing of multifunctional piezoelectric vibration electricity. Some of the most possible implementations of piezoelectric vibration energy harvesting is in given the power to self-governing sensor nodes is in. Piezoelectric vibration energy harvesting uses the electromechanical coupling seen in piezoelectric materials to transform interference from the atmosphere of a device that is addicted to usable electric energy. The harvester is part of the wireless sensor node's control sub-system. First, before making suggestions for potential research activities, will be discussed the helps made towards this aim.

## VI FUTURE WORK

As a future work more number of piezoelectric crystals can be laid over the road surface as a impact that more electricity can be generated thus the fossil fuel is greatly reduced and pollution can be decreased. Piezoelectric technology and mobile control operation can be integrated with each other as a real time.

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