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PEO2: Design, demonstrate and analyze the mechanical systems which are useful to society.

PEO3: Maintain professional and ethical values, employability skills and multidisciplinary approach to realize engineering issues in broader social context by engaging in life-long learning.

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1. Automatic Rain Sensing and Protection Cover for Crop Grains and Seeds

Introduction

In India, one of the most important professions is farming. About 70% of humans in India are farmers. It contributes approximately 17% to the full GDP and employs over 60% of the population. As human beings, we can't manage herbal phenomena like rain, humidity, heat, etc. Although Some measures are taken in opposition to this environmental danger they're treated manually. In the contemporary device, there may be no automated safety for plants/seeds in opposition to herbal failures including rains and in addition from over Sun heat. These can harm the seeds and decrease yields. When unseasonal rain falls on the harvested plants, which might be saved to dry up, they rot and get destroyed because of which farmers should face an enigma. Some plants have to be dried earlier than it's bought in the agriculture marketplace yard, consequently, the farmer wishes a few areas for the plants to dry which a maximum of the farmers don't have and it takes an of time to dry up.

In this Paper, we advocate a device to shield the seeds from heavy rains/untimely rainfall, excessive temperature, and humidity. This is fulfilled with an embedded device layout and the use of GSM technology. In this paper, we strive to set up a brand-new smart device that allows shielding the of seeds and different beneficial substances in opposition to environmental effects like rain. This device consists of seed safety via an automatic roof that covers a particular area. In this study, we suggest a method that guards against crop spoiling brought on by prolonged periods of rain. Utilizing embedded system design is accomplished technology incorporated. The auto roof will be controlled based on whether it is wet or sunny outside. The Arduino's capacity for judgment. The rain detector (which is also called a sensor) is activated when there is any cloudburst and it'll deliver a notification to that microcontroller. When rain is sensed, the microcontroller immediately shuts the roof automatically. In addition, it uses GSM to send a Text to the owner. The controller opens the roof mechanically after the rain stops. This version additionally comes with a guide manage mode with SMS. i.e.; the roof may be opened/closed manually via way of means of the proprietor or farmer sending an SMS.

Proposed System

In this study, we suggest a method that guards against crop spoiling brought on by prolonged periods of rain. Utilizing embedded system design is accomplished technology incorporated. The auto roof will be controlled based on whether it is wet or sunny outside. The Arduino's capacity for judgment. Whenever there is significant downpour, the rain sensor detects and

notifies the microcontroller. Once rain is noticed, the controller immediately closes the roof and also transmits a message to the farmer via GSM. The controller opens the roof mechanically after the rain stops. This version also includes a physical mode with SMS functionality. Such that the proprietor or farmer can able to open/close the covert (i.e., rooftop) manually via way of means of sending an SMS. if the temperature is excessive or low it'll ship message to the farmers via GSM If Humidity is on within side the surroundings it'll additionally ship message to the farmers so he/she will close/open the roof via way of means of sending an SMS. If farmers forgot their telephones for that scenario farmer can close/open the roof manually via way of means of preserving the switch as shown in Figure 1.1.



Figure 1.1 Developed prototypes and opening the roof

Conclusions

Here we proposed an automatic roof system for farmers who face challenges during the rainy season by developing a prototype. The system is equipped with a rain sensor which detects the rain. Then the microcontroller which attaches to the sensor closed the roof and can send a message to the owner. This automatic roof system can protect the crop from heavy and unseasonal rainfalls and prevent losses for farmers. This system may help in various fields of agriculture that wants to protect their crop from rain. It may help further research in the future using this automatic roof system.

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2. Head Moment Based Wheelchair

Introduction

In this paper, we have attempted our best to correlate between the advancement of technology and the human requirement, for human ease. The main aim is to control wheel chair through human head direction. This wheelchair is mainly designed for Quadriplegics and especially those people who can't utilize their hand to drag their wheel chair on account of some incapacity. This system includes head motion module to recognize the motion of the user for controlling the direction of wheelchair.

Quadriplegia refers to the paralysis of the body from beneath the neck which results in paralysis, hence immobility of the hands, legs and the torso. Spinal cord injury, cerebral palsy and strokes can cause quadriplegia. When the spinal cord is injured the brain cannot properly communicate with it and so sensation and movement are impaired. The hands and legs of a quadriplegic patient can, therefore, not move at all and any small function such as grasping an object or moving around can therefore be impossible for such patients, only possible movement is through head.

Objectives

1. The aim of this paper is to design a Head Motion wheel chair for physically challenged person using Head Gesture.
2. It enables individuals with physical disabilities to independently navigate in their environment.
3. The Communication between the transmitter and receiver is achieved through Wireless Transmission over a Bluetooth Modules.

METHODOLOGY

This system comprises of 2 sections Transmission section and receiving section. The Head Gestures are converted into electrical signals by the MPU6050 (Gyro sensor) and Arduino Nano processes the incoming signals and sends it to the Bluetooth Module. In the receiving end, these signals are received by the Bluetooth module and sent to the Arduino for decoding. The Arduino, on receiving the signals, actuates the DC motors via the motor driver.

Results and Discussions

The proposed framework is expected to make a financially savvy wheelchair to assist quadriplegic with people who think that it's hard to move freely. The structure uses head advancement to control the wheelchair. The tilt focuses made are distinguished and voltages are created by accelerometer. These voltages are taken by microcontroller which in this way

controls the course of wheelchair. This venture work was carried on to satisfy the prerequisite of older and impair individuals, giving the autonomous route utilizing head movement controlled wheelchair. It causes them to move effectively as like ordinary people do. The circuit works appropriately to the order given by the user and the wheelchair is moved in understanding to the head signal given by the individual. Head movement controlled wheelchair incorporates obstacle detection, which assists with distinguishing the hindrance and stops the wheelchair. Monitoring of the patient's well being condition is possible with the assistance of patient monitoring framework as shown in Figure 2.1.

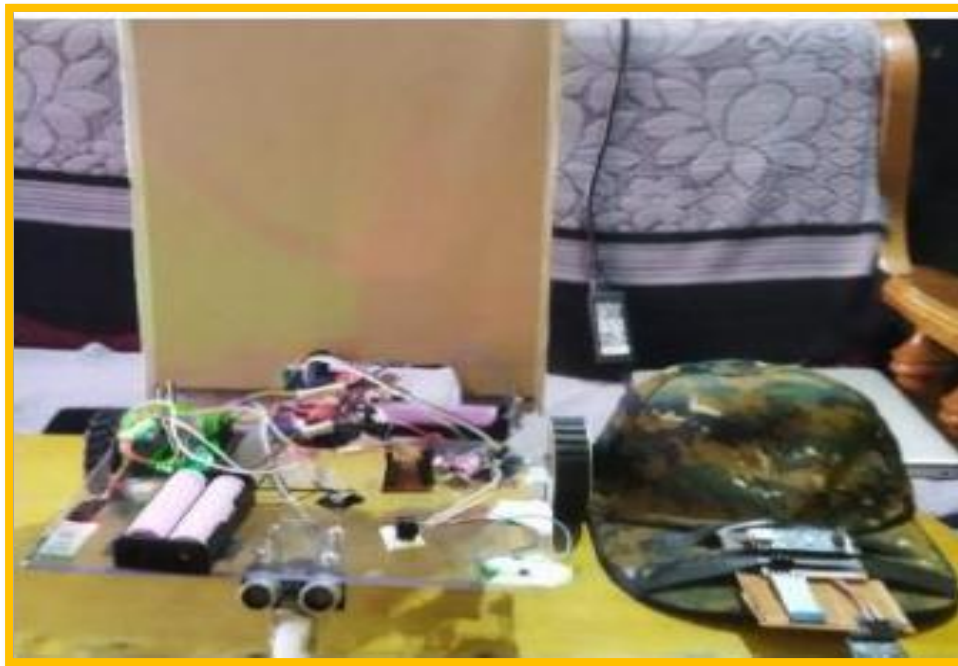


Figure 2.1 Prototype of wheel chair controlled by Head Motion

Conclusions

This work elaborates the design and construction of Smart Electronic Wheelchair with the help of MEMS Module. The circuit works properly to maneuver because the command given by the user. After coming up with the circuit that allows physically disabled to regulate their wheel victimization associate MEMS device application in their sensible phones and it's conjointly been tested and valid. The detection of any obstacle is with success controlled by the microcontroller. As the person switches on the circuit and starts moving, any obstacle that is anticipated to lie among a spread of four meters are detected by the unbearable device. This planned system contributes to the self dependency of otherwise able and older folks.

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3. Automatic Seed Sowing Machine

Introduction

Automation is a constraint in industries because it not only seeks to improve the quality of life for humans at both home and work, it allows the distribution of both quality products and services to be made available at faster rates and reduces downtime and human error. This proposed framework is to decrease seed manor time and increment the efficiency. Thinking about a case of a plant nursery, the time required is more for manor which is because of the seed bolstering process as seed nourishing is a talented activity. Pretty much every seed can develop so can't bolster at least two seeds in a single measure of a plate; henceforth causes loss of estates. The proposed work aims at minimizing the human efforts in plantation and to be done precisely. The mechanism is quite simple consisting of digging, feeding, and covering -up. The objective of this is to maintain some amount of distance between two seeds at the time of the sowing process most important is the effective use for automatic seed sowing with great competence and accuracy. A seed drill is a device used in agriculture that sows seeds for crops by positioning them in the soil and burying them to a specific depth while being dragged by a tractor. This ensures that seeds will be distributed evenly.

Proposed System

The Figure 3.1 shows that the block diagram of the proposed system. In the agricultural system, the more facilities to provides the farmer and accurate work. This system has a 4- wheel robot system. The seed sowing machine is developed which has a very little cost. Also, the unskilled farmer can be easily operated an automatic seed sowing system. The design and fabrication of a manually operated single-row Seed planter that is cheap, easily affordable by the rural farmers. The single-row Seed planter is very simple to use the various adjustments are made with ease, and it is maintenance-free. The seed sowing machine system, consist of battery-powered wheels and a dc motor inbuilt with those wheels.

In this system, the seed storage tank is used. when the number of seeds is lacking it detects the level of storage seed and indicates by the alarm. When any obstacle comes in the in-front of the machine or diverts path the seed sowing machine can detect this obstacle very easily. In each complete rotation of the rotating wheel, some seeds fall from this seed drum and the seed plantation process can take place smoothly as well as without wastage of seeds. This system provides the entire facility and farmer sow the seeds very easily. During the traverse process this machine will dig up the earth and plant the seeds at the same time. Therefore, it will greatly reduce the time spent in planting. The machine will carry seeds on board and can be used to

plant a variety of seeds. During the traverse process this machine will dig up the earth and plant the seeds at the same time. Therefore, it will greatly reduce the time spent in planting. The machine will carry seeds on board and can be used to plant a variety of seeds. 7,000.00₹ The Bluetooth-Controlled Seed Sowing Robot is a smart agricultural device that simplifies seed planting using wireless control. Powered by Arduino and solar energy, it ensures efficient, eco-friendly operation for modern farming.

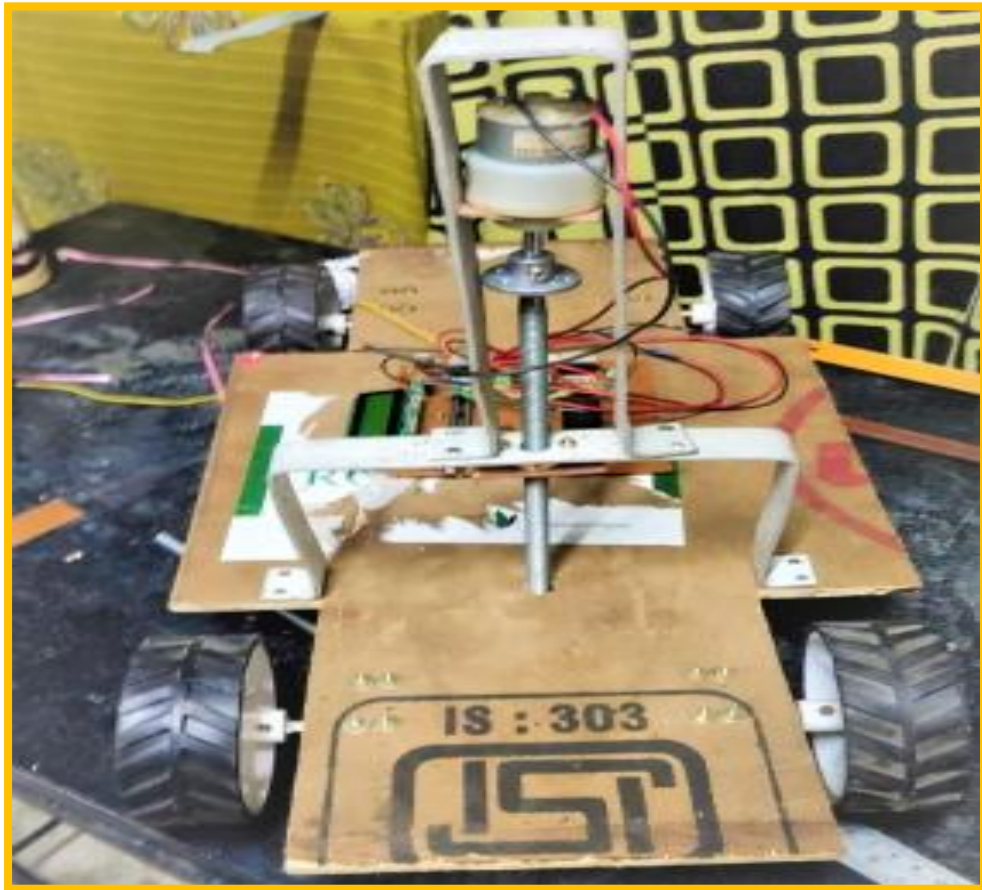


Fig. 3.1 Seed Sowing Machine Model

Conclusions

In each complete rotation of the rotating wheel, there are seeds that fall from this seed drum, and the seed plantation process has taken place smoothly and without wastage of seeds. This seed plantation machine has great potential for increasing the productivity of the planting. Also, any obstacle comes in front of the seed sowing machine the ultrasonic sensor detects that obstacle and indicates the buzzer. Hence there is a need to promote this technology and made it available to even small-scale farmers at affordable prices.

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4. IOT Based Advance Controlled Defense Vehicle

Introduction

Robotics plays an important role in military applications. Robotics with military applications have become a huge demand. This has given a big opportunity for the developers in develop a new invention for the welfare of the nation to the military services. The government has also made large investments in the defense system capable of safeguarding the citizens from the terrorist threats. One such invention is Manless Ground Vehicle (MGV) . This vehicle is electromechanical as well as artificial intelligence-programmed machine. This prototype takes the position of human and saves their life during war. The complexity and the limited control of wired communication are recovered using wireless technology. The control of the prototype is completely done at the control station. With this control signal the vehicle can be remotely operated. This paper describes a wireless controlled Unmanned Ground Vehicle, commando robot. It mainly controls using IoT and Wi-Fi access

The life of soldiers is sacrificed in the field for the wellbeing of the nation. The major places where the soldiers lose their life are in the field, the blast of land mines, wars, the traps of the enemies, unknown sudden threats of terrorists and so on. To protect the soldiers, they are replaced by Unmanned Ground Vehicle. There are dissimilar cases of robotic machinery used to detect bombs and land mines. Advantage is that the cost is less than the human labor. The robots can also be programmed again to perform different functions. This paper focuses on the designing of Man less Ground Vehicle as a prototype with multifunctional capabilities.

Methodology

Man less Ground Vehicle is designed using the proposed system. Raspberry pi3 is the master controller of the vehicle. The vehicle is projected to run all the detectors, communication system and the weaponry. The DC gear motors are made use of for moving the vehicle. These DC gear motors are driven by the driver modules for the maximum output by the motors. There are several sensors interfaced with Raspberry pi3. Each sensor has a vital part in different applications. The accelerometer constantly checks the stability of the vehicle. PIR sensor detects the movement of humans around the region. Temperature sensor gives the temperature conditions around the area.

A metal detector detects the metals and bombs on the path of the vehicle. Gas sensor detects the combustible, flammable, toxic gases and oxygen depletion around the region. Infrared sensor usually measures distance between the object and the sensor. Man less Ground Vehicle is used for depth sensing to avoid getting trapped into a pit. The ultrasonic sensor is used for distance

measurement of the detected object using ultrasonic waves. This concept is used in this vehicle to set up a radar system. This programmed processor monitors the region around the vehicle. These sensors give the output to the microprocessor. The advanced solenoid weaponry system is operated by electromagnetic flux. The solenoid is completely controlled by the commands delivered by the microcontroller. Robotic arm is attached to the vehicle for the displacement of objects or bombs. It also functions on the command signal of the microcontroller. The video camera is installed on the vehicle for live video streaming, around the vehicle as shown in Figure 4.1.

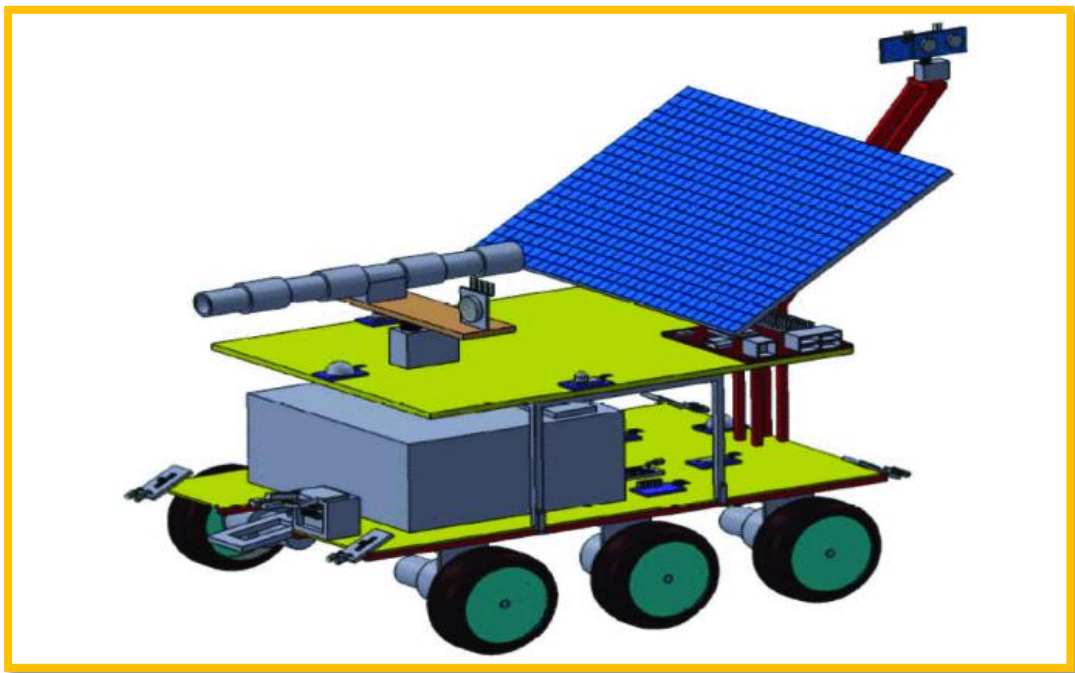


Figure 4. 1 Prototype design

Conclusions

The Unmanned Ground Vehicle is designed for defense purposes that almost fulfill the needs. The wireless controlled vehicle system is based on the Wi-Fi and Bluetooth functionalities. In this paper it is overcome with long range functionality using IoT. The defense system mechanism can be further improved while meeting the configurations in real time. The power source can be modified with nuclear source or with hydrogen as fuel for the entire system. The vehicle from large distance can be directly operated through the satellite communication services. The Man less Ground Vehicle is so designed that it is capable of withstanding any hostile situation. The soldiers are saved by using Unmanned Ground Vehicles during the time of war.

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5. Automated Plastic and Metal Sorting with Reward System

Introduction

As we move towards a more digitized future, it's directly proportional to extend urbanization. This is often the main reason for the generation of huge quantities of waste. As per the report revealed by World Bank, about 1.3 billion tons of municipal waste is generated per annum and it's expected to rise to about 2.2 billion tons per annum by 2025. Because of this waste lies cluttered within the surrounding, dumped on open lands and this becomes major downside for varied forms of disease inflicting bacteria and viruses that is why waste management is of vital importance. Segregation makes it possible to utilize and recycle the waste effectively. Therefore, the waste Management becomes a vital concern for the health and well-being of the society. Presently, the waste segregation is completed manually by installing different bins for grouping different form of waste like wet, metal and others. However, this methodology has tons of discrepancy; one is being the unawareness of the public towards waste management. Due to lack of proper segregation strategies, an oversized quantity of untreated waste is dumped as landfills. So, this paper aims to create automated segregator system primarily based on waste segregation which may determine the kind of waste and place them in respective bins accordingly and automatically. Implementing the system at domestic level can scale back the expenditure on waste disposal, manual effort needed for waste segregation and therefore the waste can be simply recycled, reused, and reduced. A trend of great increase in domestic solid waste generation has been recorded worldwide. This has been found because of overpopulation growth rate, industrialization, urbanization and economic growth that have ultimately resulted in raised solid waste generation.

Final stopping place of solid waste in India is disposal. Most of the waste from urban areas is land filled and dumped. The paper deals with the foremost blistering topic i.e., waste segregation. Efficacious management must be materialized for a better planet to live in. Hence, with this price effective paper proposal, we tend to try and bring in the change. An automation of this style not solely saves the manual segregators of the many health problems, however, conjointly proves to be economical to the state. Besides this, the system utilizes low value parts for the prosperous segregation of most kinds of waste. It also plays a major role in the reduction of environmental pollution. The automatic waste segregation process also helps to reduce the health issues and work stress of workers who manually segregate the wastes. This system keeps our surroundings free, clean, and green from the odour of trashes supports good environmental conditions and keeps towns more beautiful.

Methodology

As shown in the Figure 5.1 represents in this proposed system, the three bins were used to collect the segregated waste. Below Figure represents the architecture of the proposed system. The system contains 3 sensors that is IR sensor, metal sensor and moisture sensor and it has Arduino UNO microcontroller, 16*2LCD display, RFID Card Reader, Servo motors and 3 bins.

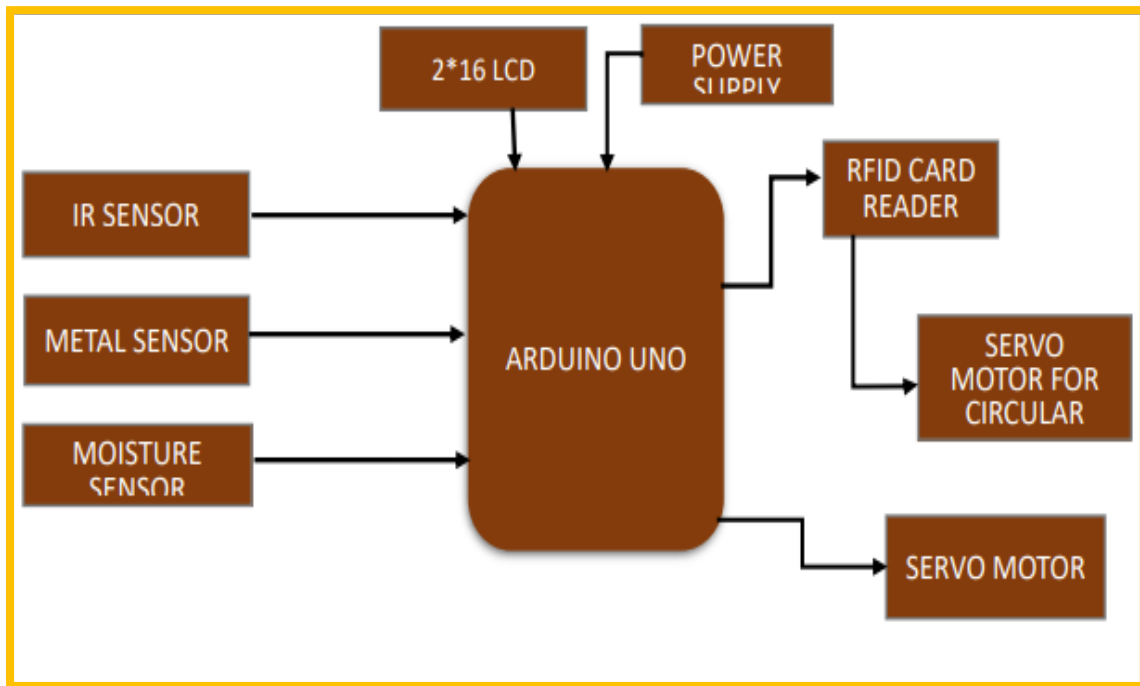


Fig.5.1. Architecture of Automated garbage segregation system

Conclusions

This paper enhances the cleanliness of the smart cities by the practical application of “automatic waste management and segregation system using IoT”. With urbanization and increasing population, disposal of waste is a major concern. This proposed system is an effective waste segregation system that has no human intervention or interference to separate dry, wet and metal waste. It provides timely collection and disposal. The proposed system can be deployed on a domestic scale in household or a large scale in public places. The simplest way in which this can be implemented practically and realistically is on the railway systems that accounts for the busiest of all transportation channels used by the public of India. This can be a small start that spreads awareness quickly and builds a platform for more recycling and helps in determining the true value of waste disposal.

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6. Water Pumping and Power Generation by Using Swing Action

Introduction

Energy is the ability to do work. It is a driving force of modern societies and generation and utilization of energy are essential for the socio economic development. Per capita consumption of energy levels are often considered a good measure of economic development. . For human power conversion systems to be useful in the context of developing countries, several constraints need to be considered like low cost, low-resource and limited-skills requirements, low maintenance, safety and comfort to humans, and environment friendliness. Human power conversion is easily achieved from children's play under conditions where the children are static relative to the moving playground mechanism, such as seesaw, swing, and merry-go-round. Where the children are in a dynamic state relative to a static mechanism (e.g., swing) it will be difficult to employ cost-effective human power conversion techniques due to considerations of safety and simplicity. A variety of mechanisms are used for conversion of human power to usable electrical or mechanical energy like springs, hydraulic components, electric generators, piezoelectric, compressed air systems, flywheels, and so on. Improving the efficiency of the conversion system is often essential in the case of individual human power conversion – generally would result in increased cost of the overall system.

Working Principle

During the forward stroke & backward stroke of swing some torque is induced in shaft. The shaft is mounted between two bearings. At one end of the shaft a large sprocket is attached rigidly, this sprocket pivots over shaft axis when the shaft is displaced. The larger sprocket is attached to a smaller sprocket using chain. The shaft in which smaller sprocket is mounted is connected with the spur gear arrangement. With this arrangement power is generated in the dynamo and stored in the battery. The construction of the swing model is shown in the Figure 6.1. When the seating of the swing set moves forward & backward some torque is induced in the shaft by the holding bars of swing set. This torque displaces the larger sprocket which is pivoted over axis of shaft causing the angular displacement. This angular movement is converted to rotational motion of smaller sprocket by chain attachment. The sprocket rotates the spur gear arrangement which runs the dynamo, thus producing the electricity. The electricity thus produced is stored in a battery by using electric circuits. Other side of shaft is connected with connecting rod and that is connected with reciprocating pump through which water is pumped with the help of to & fro motion.



Figure 6.1 Construction of the swing model

Conclusions

In upcoming days the demand of energy resources will be increasing every day's the aim of this paper is to develop the world by enriching by utilizing its resources more. Now time has come for using such innovative ideas and it should brought into practice. In this paper the mechanism is used to lift the water from one place to another with reciprocating pump. This paper is completely based on "simple pendulum". There are many sources to convert from mechanical energy to various forms. In this system no fuel or electrical energy is used. This paper gives the overview for the challenges and opportunities for energy lasting in coming decades, this work can make best use of existing technology to ensure reliability and efficiency under changing condition. It outlines the need for cost effective technology in rural region.

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7. IOT Based Automatic Paralysis Patient Health Care System with Embedded Speech Recognition

Introduction

A healthcare monitoring system for paralysis patients based on IoT technology represents a groundbreaking solution that harnesses the power of interconnected technology to enhance the care and well-being of individuals living with paralysis. This particular system is designed to help the patient to convey various messages to doctors, nurse and their beloved ones sitting at home or office over the internet. The system makes use of microcontroller based circuitry to achieve this functionality. It utilizes a hand motion recognition circuit and a receiver plus transmitter circuit. The hand motion circuit is used to detect finger movement. This innovative device combines sensor technology, data analysis and real-time connectivity to provide continuous monitoring and provides assistance to individuals who are living with paralysis. By seamlessly collecting and analyzing vital health data, this device offers the promise of improved quality of life, proactive healthcare interventions, and peace of mind for both patients and caregivers.

In this introduction, we will explore the key features benefits and potential impacts of this IoT based healthcare monitoring system the patient. This method is provided by electronic innovation, which reduce human needs and, as a result, improves people's well-being. As a result, a patients condition should be monitored on a regular basis. However, this is difficult task. This can be made easier by deploying IoT technology, which sends a message to a doctor or guardian regarding the patient's condition if any changes in health parameter occur. Thus, the patient is not required to remain in the doctor's presence at all the times. When the patient is at home or in another location, his condition will be continuously recorded. The Consistent monitoring of the patient's vital signs, such as basic needs and fall detection.

This study highlights the significance of healthcare systems are a critical component of each country's and public health. In today's fast-paced world, it is difficult for the people to the continually available for their loved one's who may require assistance as they are passing by a difficult time. Physiological parameters are measured constantly are at regular interval by patient monitoring system.

METHODOLOGY

The Arduino Uno serves as the central processing unit for collecting data from sensors and managing other components. By utilizing flux sensors, changes in the magnetic field caused by the movement of the patient's fingers can be detected. These sensors also have the capability to

activate alerts or notifications for caregivers or healthcare providers, indicating potential issues or emergencies. For emergency voice alerts, the APR33A3 module is employed for voice recording and playback functions, which can be transmitted through speakers. To enable communication features, such as sending SMS alerts during emergencies, the GSM 800C module is utilized. Additionally, the LCD Display provides real-time feedback on monitored parameters and system status. The firmware for the Arduino board is written to read sensor data, process the readings, and control output devices. The Arduino IDE is used for writing and debugging the code. Algorithms are developed to analyze sensor data and identify abnormal conditions or emergencies. Furthermore, the logic to trigger alerts or notifications based on predefined thresholds or patterns is implemented as shown in the Figure 7.1.

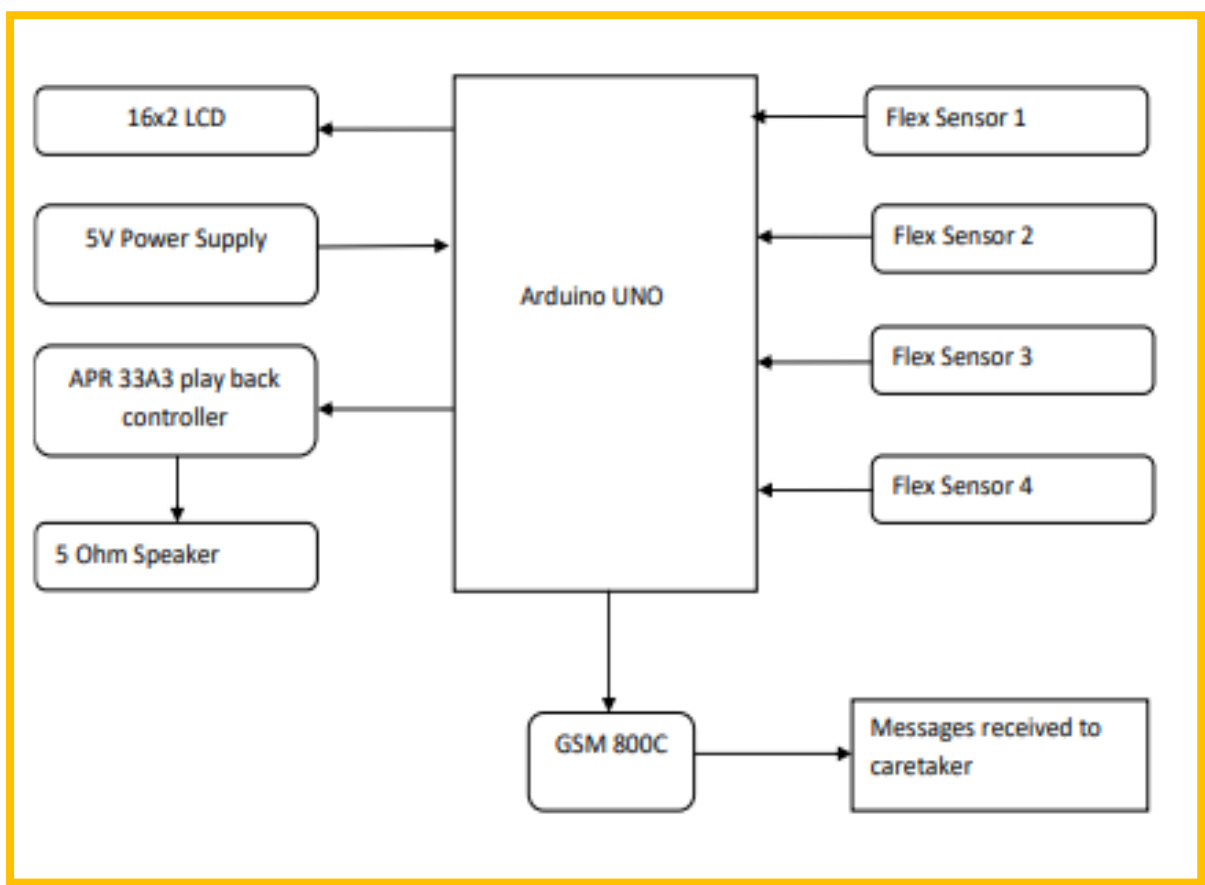


Figure 7.1 Schematic representation of Proposed System

Output

The outputs shown will aid patients in fulfilling their requirements. If they requires basic necessities such as water, food, wash room and if any emergency occurs they can fold their respective fingers that will be displayed on LCD. And also the caretaker will receive a message through Blink and voice note through speaker as shown in the Figure 7.2.



Figure 7.2 Working model with messages displayed on LCD

Advantages

1. It allows continuous real-time monitoring of patient's vital signs, movement, and environmental conditions.
2. Caregivers and healthcare providers have the ability to access patient information remotely, enabling timely intervention and reducing the need for constant physical presence.

Applications

1. This device can be utilized in hospital for communicating with doctors and nurses.
2. This device can be utilized in home or office for communicating with other people.
3. This system can be utilized by healthcare providers for remote consultations and telemedicine appointments, thereby minimizing the necessity for in person visits.

Conclusions

Though there already exists a several systems to monitor the paralyzed patient's condition, there are few systems that focus on communication of them. This system proves to be extremely beneficial for patients with paralysis. They are able to seek assistance by making specific movements, enabling them to lead a life similar to that of able-bodied individuals. This system bridges the gap between the patient and others via communication. This system is dependable and affordable and reduces the weight to make it more convenient for them to utilize. This system relieves their stress by revealing their thoughts and helps them to motivate as much as possible.

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8. Wireless Black Box for Cars

Introduction

In today's world as the population increases day by day the numbers of vehicle also increases on the road and highways. These results in accident that leads to the traffic jams and people do not get the help instantaneously. Road accidents constitute the major part of the accident deaths all over the world. This takes a toll on the property as well as causes human life loss because of unavailability of immediate safety facilities. Complete accident prevention is unavoidable but at least repercussions can be reduced. In highly populated Countries like India, everyday people lose their lives because of accidents and poor emergency facilities. These lives could have been saved if medical facilities are provided at the right time. In many situations the family members or the ambulance and police authority is not informed in time. This result in delaying the help reached to the person suffered due to accident. In order to give treatment for injured people, first we need to know where the accident happened through location tracking and then send a message to your related one or to the emergency services.

Design of System

Four sensors that are temperature sensor LM35, vibration sensor, gas sensor MQ3, accelerometer ADXL345 are the primary inputs. LCD display, GPS6MV2, GSM SIM800L are the primary outputs. To indicate motion of car we are using a motor. Initially the threshold detection level of sensors value is predefined. When the device is switched on, it displays "Wireless Black box". Now the user is prompted to give an input such that it exceeds the threshold of the sensors. Once this happens the SMS is sent to registered mobile number with the location of the accident place as shown in the Figure 8.1.

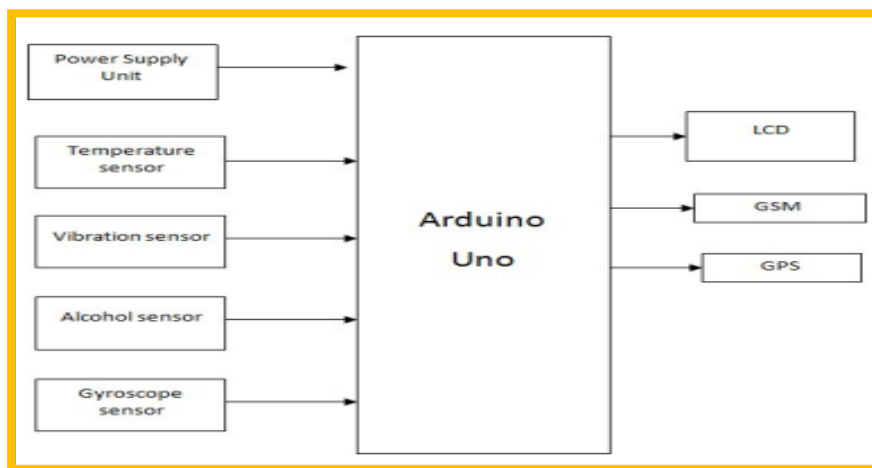


Figure 8.1 Block diagram of black box system

Methodology

The proposal and expansions of this paper are separated into two key parts which are hardware architecture and software details. In the hardware architecture, the design of the circuit was constructed and the prototype of the project was built. While in the software development, the whole complete prototype was operated via programming codes as shown in the Figure 8.2.

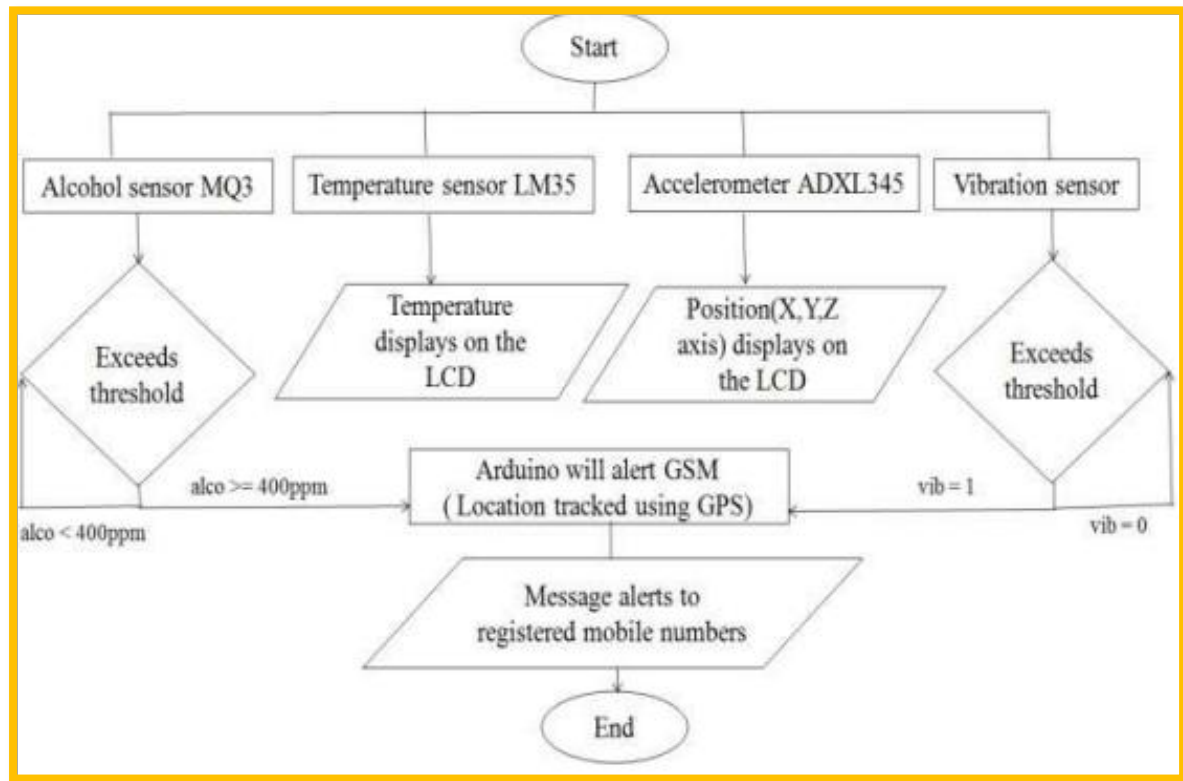


Figure 8.1 Flow chart black box systems

Conclusions

The sole purpose of this project was to develop a black box system for car accidental monitoring and alerting. The system has successfully overcome the drawbacks of the existing system by introducing alert messages. Finally, we conclude that system wireless black box using sensors, GSM and GPS tracking has been developed for car accidental monitoring and alerting which gives an intelligent solution to the problem. In future, by applying ultra-sonic sensors features we can detect the distance of a vehicles moving nearby our vehicles. This system can be interfaced with vehicle airbag system that prevents vehicle occupants from striking interior objects such as steering wheel or window.

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9. Smart Agro Product Cleaner Cum Dryer and Packaging Machine

Introduction

A major part of the crop may lose by rain squalls. Any innovation to reduce drying times will speed the time to storage and thus protect the crop. Drying is one of the methods of preserving agricultural products after harvesting. Drying preserves foods by removing enough moisture from food to prevent decay and spoilage. Drying is the oldest method of preserving food. The main aim in drying agricultural products is to decrease water content to certain level, at which, microbial spoilage and deterioration chemical reaction are greatly minimized. Drying of agricultural products, the key is to remove moisture as quickly as possible at a temperature that does not seriously affect the flavor, texture and color. Dried foods are tasty, lightweight, easy to prepare and easy to store and use.

Conventional methods of drying such as sun drying, hot air convection drying requires more time to completely dry the product. Various studies recognize the problems associated with conventional convective drying. Drying is a process of removing moisture through simultaneous heat and mass transfer and is a classical method of food preservation that provides longer shelf life, reduced weight and volume. In order to solve all the problems that arise with drying, we designed a new dryer called smart dryer for the fast and efficient drying of agricultural products. Smart Dryer is a technology which works based on the principle of forced convection mechanism. Dry cleaning machines enable the use of chemicals in washing of the garments. There are two types of premium dry cleaning machines available Hydrocarbon Dry Cleaning Machine and Perc Dry cleaning Machines. Efficient and environmentally friendly, absorb heat from the air to dry the materials, without any pollution emissions, and save about 70% of operating costs compared with traditional drying technology. Long service life, our products have mature technology, stable performance, safe and reliable operation and low maintenance cost.

Mechanism of Smart Dryer

As shown in the Figure 9.1, the main components of smart dryer includes heat source, drying chamber, vacuum pump, solenoid valve etc. The ambient air from atmosphere enters in to the heat chamber where it absorbs the heat from heat source. Heat is generated by passing electric current through heating coil. The hot air rises up due to density variation and moves to the drying chamber through a solenoid operated valve. Now fresh air from atmosphere again enters into the heat chamber. The solenoid valve becomes open only when the temperature inside the

drying chamber becomes lower than the set value of temperature and remains in closed position when the temperature reaches the same value. The item to be dried is placed in the drying chamber and tightly sealed using lock nuts. The hot air from the heat chamber now enters into the drying chamber and vaporizes the moisture from the substance. This vapour will be sucked by a vacuum pump and exhausted to the atmosphere. Due to the continuous operation vacuum pump the temperature inside the chamber decreases and this will be sensed by temperature sensor. Now the solenoid valve becomes open and cycle continuous.

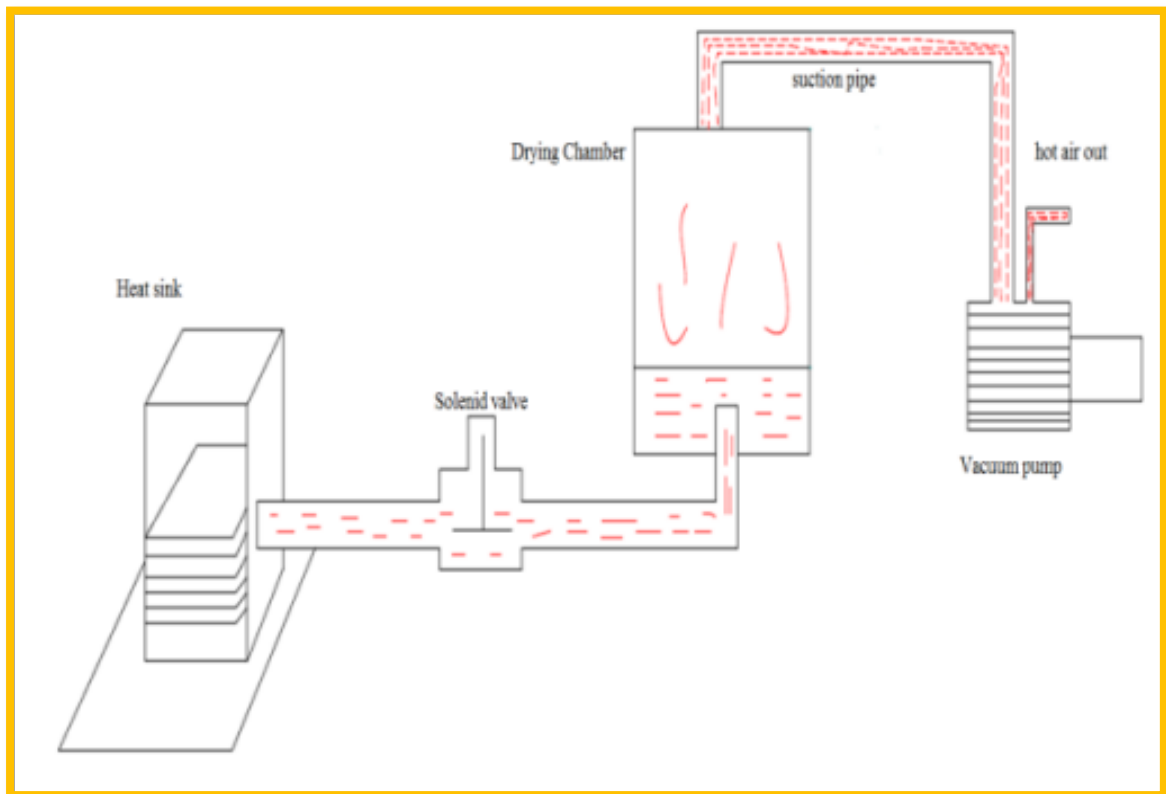


Figure 9.1 Layout of smart dryer

Conclusions

The technique of drying is probably the oldest method of food preservation ever practiced by mankind. Drying is a method of food preservation that works by removing water from the food. The removal of moisture prevents the growth and reproduction of microorganisms responsible for decay and reduces the moisture mediated deterioration reactions. Drying brings about substantial reduction in weight and volume of products minimizing packaging, storage and transportation costs. It enables storability of products under ambient temperatures.

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10. Voice Controlled Elevator

Introduction

Elevator has over the time become an important part of our day to day life. It is used as an everyday transport device useful to move goods as well as persons. In the modern world, cities and crowded areas require multi-floor buildings. The main purpose of this project is to operate the elevator by voice command. Therefore, we have decided to come up with a new idea, which is fascinating as well as helpful. We have tried to develop an elevator system that accepts the destination input via a voice recognition module and taking the elevator to the destination accordingly. Speech recognition is the method by which the elevator can be controlled using voice. Whenever it is with voice control, the first term that comes to the user's mind is Speech Recognition. Speech recognition is a technology in which the system will understand the words but not the meaning of the words. Speech is the best and ideal method to controlling the elevator. Automatic Speech Recognition is a technique by which a computer takes a speech signal and Converts it into words.

Proposed System

The proposed system consists of mainly two components viz., speech recognition system and Arduino. The main part of the project is the speech recognition system. The exchange of instruction from the user to the control mechanism is delivered by the speech recognition system. Arduino is competent to communicate with all input and output devices simultaneously. To move the elevator in the upward or downward direction according to the given user command DC motors are used. The input voice module to the Arduino and the Arduino receives the voice command specified by the user as input. The controller decides if the command for the lift is to move in an upward direction or downward direction, and the control mechanism moves the elevator according to the user's command. According to the input from the user, the Arduino decides which lift to be moved to the desired floor. In the proposed system, corroboration of the working of an elevator model is shown with the help of Arduino Board and with speech recognition module for visual information of the performed task LCD can be made available.

In this project, Arduino is utilised for processing the instruction and added components such as a voice recognition module along with, motor driver and LCD display. After power on the Arduino initialized the LCD and turns off the motor. The voice command given by the user is received by the voice recognition module. The Voice recognition module accepts voice command and it analyzes the analogue signal and compares it with stored data in external RAM,

then processes the command and gives it to the Arduino. The Arduino then receives the instruction from the voice recognition device and decides whether to move the elevator in the upward or downward direction. Motor is used for the motion of the elevator. Judging from the command the Arduino decides which lift is closer to the user's location and moves the elevator accordingly. The LCD display gives the floor positioning as shown in the Figure 10.1.

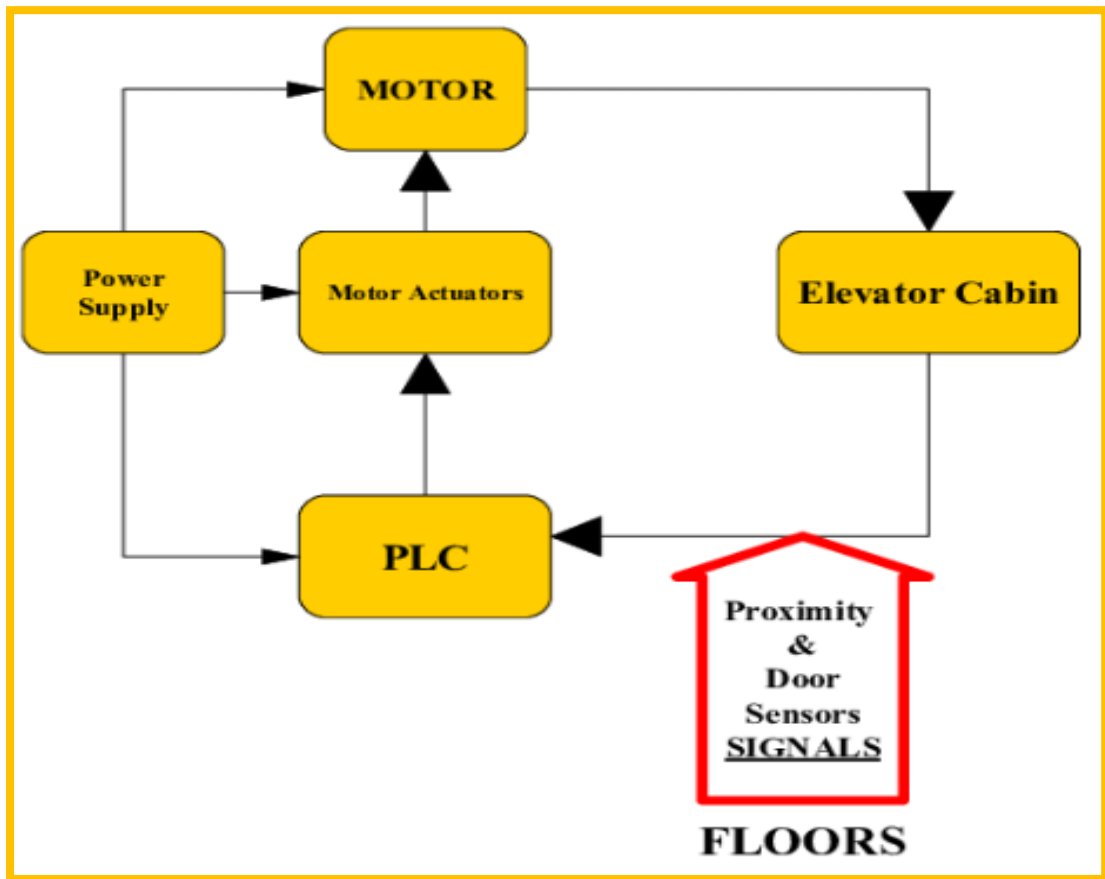


Figure 10.1 Schematic diagram of Voice controlled elevator

Conclusions

The voice-controlled elevator is of great use as it works effortlessly. This project tries to give commands using a voice recognition system, which can be used to modify the conventional elevator and make it more efficient and usable for physically challenged people. The prototype of the elevator is a useful instrument for research in the specialization of voice signal acknowledgement, computerization and control advances as well as useful in finding potential applications in this field. This project acts as a human-machine communication system.

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11. Smart Digital Ration System

Introduction

One of the most disputed topics connected to malpractice is the PDS (Public Distribution System), which is also known as the ration distribution system. Rice, ragi, sugar, red gram dal, wheat, and cooking oil are regularly provided to those living below the poverty line (BPL) on a monthly basis through the Public Distribution System of India. The old ration card, which is often used by the government to supply food grains and other items to a specific class of people in society at a discounted rate, is replaced by the smart ration card. The project's goal is to effectively automate the process of item distribution. The project aims to halt fraud and inconsistencies produced in distribution stores. Here, the system needs to accomplish the following: Verify beneficiaries' Smart Ration Cards; prevent anomalies in the distribution of food; notify recipients' mobile devices via SMS notice; maintain inventory in the distribution center.

Proposed Methodology

The main goal of the suggested strategy is to lessen forgeries from ration shops while also making it simple for people to receive their supplies. help decrease manual labor as well. In the proposed system, an RFID-based smart ration card system will be created that allows users to enter their information online. Additionally, there is no manual labor. When a user requests a ration, he or she presents the smart ration card, which is then scanned to determine whether the user is legitimate or not.

Working

Above Figure 11.1 depicts the block diagram of the smart ration card system. From the block diagram above, it is clear that the project makes use of a NODE MCU controller. The IoT Firebase, LCD, and RFID reader are all controlled by the controller. The customer must present the ration RFID tag card to the RFID reader kit in order to purchase any ration items. The reader will be able to identify the single number that the user will have. The microcontroller will receive the recognized RFID number and use it to compare the input number with the database. Name, address information, the card's expiration date, and other facts are encoded into the controller so that it can identify the information arriving from RFID by comparing it to the database. Once the user has been recognized, the microcontroller will determine whether the user has already purchased the monthly ration item. If not, the LCD panel will show the ration item that will be distributed. The user must first enter the information for the item he wants to buy before the items can be distributed. In this setup, the transmitting pin of the RFID reader is

coupled with the reception pin (RX0) of the NODE MCU. The NODE MCU's transmission pin (TX1) and receiving pin (RX0) are connected to the Wi-Fi shield's transmitting pin and receiving pin, respectively. The system is connected to the Firebase through the internet using a Wi-Fi shield. A 5V, 1A dc adapter is used as the power source because the node MCU requires a 3.3V, 1A dc supply. The RFID module can also be powered by a 5V, 1A dc source. Consequently, the RFID module is connected to a second 5V, 1A dc adapter. As a ration card, the RFID tag is employed. An 8-bit hex code is produced when the tag is swiped through an RFID reader.

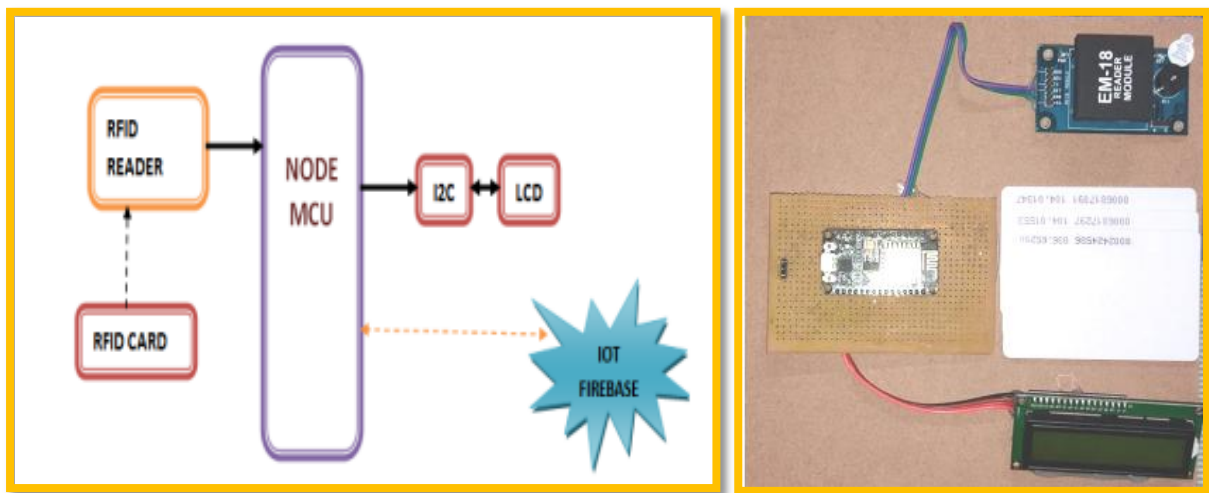


Figure 11.1 Block diagram of smart ration card system and its development

Advantages

- Portable Can be easily carried anywhere
- Reduced Cost
- Wi-Fi Enabled
- Easy monitoring

Conclusions

In this work, a smart ration card system that makes use of cloud services and RFID technologies is proposed. As all the data is automatically updated in the cloud-based database, this method effectively reduces errors caused by manual monitoring of ration data. Additionally, the government will be able to monitor customer activity and transactions thanks to this system. Although the system will reduce the security flaws and fraud found in the current PDS, its initial cost is significant. A web interface is provided so users can log in and view their previous transactions, further enhancing the suggested system.

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12. Leg Operated Pesticide Sprayer

Introduction

Agriculture plays a vital role in sustaining human life and economies across the globe. Pesticides are an integral part of modern farming to protect crops from pests and diseases. However, conventional pesticide sprayers are either hand-operated or motorized. Hand-operated sprayers require significant effort and lead to operator fatigue, while motorized sprayers are costly, require fuel, and are not environmentally friendly. The 'Leg Operated Pesticide Sprayer' project addresses these limitations by developing a cost-effective, eco-friendly, and energy-efficient alternative. The design utilizes leg power for operation, allowing farmers to spray pesticides more comfortably while reducing manual fatigue. This concept is inspired by the ergonomic advantage of using stronger leg muscles instead of arms, thereby enhancing efficiency and reducing strain.

In rural areas, where access to electricity and fuel is limited, such a device offers immense benefits. Farmers can operate the sprayer by pedaling a mechanism similar to a bicycle. The rotational motion of the pedal is converted into a pumping action, creating pressure within a spray tank. This pressure drives the nozzle to spray pesticides evenly over crops. This project promotes sustainable farming practices by minimizing dependence on external energy sources. It is simple to fabricate using locally available materials, making it affordable for small and marginal farmers. Moreover, it enhances productivity by allowing longer spraying durations without physical exhaustion.

Working

The project was executed through four main phases:

1. **Research & Literature Survey:** We analyzed existing pesticide spraying methods, focusing on their drawbacks such as operator fatigue and high operational costs. Studies on pedal-powered machines provided insights into mechanical design and energy transfer systems.
2. **Design & Analysis:** The design was conceptualized as a tricycle-like mechanism with a pedal system. The pedaling motion drives a reciprocating pump that pressurizes a pesticide tank. CAD modeling was done using Fusion 360 to finalize dimensions and ensure ergonomic efficiency. A gear system was introduced to enhance pressure generation with minimal effort.
3. **Fabrication:** The prototype was constructed using mild steel for the frame, a standard agricultural pump, and a pesticide tank. Bicycle components were used for the pedal

system. The spray nozzle was mounted with adjustable height for targeting different crops. All parts were assembled in the workshop, followed by basic surface treatment to resist corrosion as shown in Figure 12.1.

4. **Testing & Validation:** Field tests were carried out in a small agricultural plot. Parameters measured included spraying range, flow rate, pressure consistency, and operator comfort. Adjustments were made to optimize nozzle output and reduce leakage.
5. CAD model created with a tricycle frame and mounted pump system. Ergonomics checked for optimal pedaling posture.
6. Spraying range tested up to 5 meters. - Flow rate measured at 3 liters per minute. Operator fatigue comparison showed 50% less effort than hand pumps.



Figure 12.1 Working model

Conclusion

The Leg Operated Pesticide Sprayer successfully provides a sustainable alternative to traditional spraying methods. The use of leg power reduces operator fatigue, making it ideal for long-duration field work. Field testing confirmed uniform spraying performance, ease of operation, and portability. The design is affordable, utilizing locally available components and simple fabrication processes. This device empowers small-scale farmers to enhance crop protection without relying on costly motorized sprayers or electricity. Future improvements may include a multi-nozzle system for larger coverage and a foldable design for easier transport.

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13. Renewable Pendulum and Solar Power Generation

Introduction

The growing global demand for energy, coupled with the adverse environmental impact of fossil fuels, has led to an urgent need for alternative and renewable energy solutions. Renewable energy sources such as solar, wind, hydro, and biomass have gained significant attention due to their sustainability, availability, and low environmental footprint. However, despite these advancements, energy storage and continuous power supply during intermittent renewable availability remain key challenges. The “Renewable Pendulum & Solar Power Generation” project presents an innovative hybrid energy system that combines the principles of mechanical and solar energy harvesting. This dual system utilizes the oscillatory motion of a pendulum to generate electricity mechanically, while simultaneously harnessing solar energy through photovoltaic panels. The integration of these two methods ensures that energy can be generated even when solar power alone is insufficient, such as during cloudy days or nighttime operations. The pendulum-based generation system works by converting the kinetic energy of a swinging pendulum into electrical energy using an alternator or generator mechanism. The concept is inspired by traditional clocks and amusement park rides, where consistent oscillatory motion can be maintained with minimal input energy. This system leverages gravitational potential energy and momentum to maintain pendulum swings, making it an efficient supplementary energy source.

Parallely, the solar power system uses photovoltaic (PV) panels to capture sunlight and convert it into electricity. The PV panels are positioned optimally to maximize sun exposure throughout the day. Together, these systems form a hybrid renewable energy solution capable of powering small devices, charging batteries, or serving as an emergency backup system. This project aims to address energy needs for rural and remote areas where grid electricity is unreliable or unavailable. The mechanical component ensures partial energy generation without depending on weather conditions, while the solar component provides clean, renewable energy during daylight. Additionally, the system is designed to be portable, cost-effective, and easy to maintain, making it suitable for deployment in underdeveloped regions or disaster-hit zones. Environmental sustainability is a core motivation behind this project. By combining solar and mechanical energy harvesting, the system reduces dependence on non-renewable resources and contributes to carbon footprint reduction. The project also serves as an educational tool to

demonstrate hybrid renewable energy concepts and encourage further research in integrated energy solutions.

In summary, this project showcases the potential of hybrid systems to achieve continuous, reliable, and sustainable energy generation. It bridges the gap between solar intermittency and mechanical reliability, offering a practical solution for low-power applications and contributing to the broader goal of a sustainable energy future.

Objectives

- To design and fabricate a hybrid renewable energy system combining pendulum motion and solar energy harvesting.
- To ensure continuous energy generation regardless of solar availability.
- To convert mechanical oscillations into usable electrical energy efficiently.
- To demonstrate the feasibility of hybrid systems for small-scale power generation.
- To make the system cost-effective, portable, and suitable for rural and remote applications.
- To promote renewable energy adoption through innovative design and functionality.

Working

As shown in the Figure 13.1 the development of the Renewable Pendulum & Solar Power Generation system was carried out in five comprehensive phases, ensuring a structured and efficient approach:

- 1. Literature Review and Conceptual Framework:** The initial phase involved a detailed study of existing renewable energy systems, particularly hybrid models combining mechanical and solar energy. Research papers, patents, and case studies on pendulum-based energy harvesting and photovoltaic technologies were reviewed. The limitations of standalone systems highlighted the need for a hybrid approach that could balance solar intermittency with mechanical reliability.
- 2. System Design and Simulation:** The hybrid system was conceptualized as a compact, portable unit combining a pendulum assembly and a solar panel array. The pendulum system was designed with a robust frame to support continuous oscillations, and a gear assembly connected to a small generator. This mechanical setup aimed to convert the pendulum's kinetic energy into electricity effectively. For the solar subsystem, a 50W monocrystalline PV panel was selected based on efficiency and size constraints. The PV panel was mounted on an adjustable stand to allow manual orientation toward the sun,

maximizing energy capture. The overall system design was modeled in Fusion 360 to visualize the assembly, check for interferences, and ensure structural stability. Simulations were run to estimate energy outputs from both subsystems under ideal and real-world conditions.

3. **Material Procurement and Fabrication:** Materials such as mild steel for the frame, a precision pendulum rod with a heavy bob, bearings for smooth oscillations, a 12V DC generator, and the PV panel were sourced from local suppliers. The frame was fabricated using standard workshop tools, with attention to balance and durability to maintain pendulum swings. The pendulum was fitted with a ratchet and gear system to convert bidirectional swings into unidirectional rotation for the generator. The PV panel was mounted securely with provisions for tilt adjustments. A charge controller and a 12V battery were integrated to store generated electricity and supply steady output.
4. **Testing and Data Collection:** The prototype was tested under various conditions to assess performance. For the pendulum system, tests measured oscillation duration, energy output per swing, and total energy generated over time. For the solar system, energy generation was monitored throughout the day under varying sunlight intensities. Combined system tests evaluated total power output, charging efficiency, and the ability to power small loads (LED lights, mobile chargers). Data collection was facilitated by connecting the system to a multimeter and data logger, recording voltage, current, and power outputs at regular intervals. Observations highlighted the strengths of each subsystem and areas for improvement, such as enhancing pendulum swing duration and optimizing solar panel orientation.
5. **Result Analysis and Optimization:** Results indicated that the pendulum system alone could generate up to 5W under optimal conditions, while the solar panel produced 40–50W during peak sunlight. Combined, the system provided sufficient energy to charge a 12V battery and power low-wattage devices for several hours. Optimization involved refining the pendulum bob weight, reducing friction losses, and upgrading the charge controller to handle hybrid inputs efficiently. These changes improved energy conversion rates and system reliability.

Summary of Progress

1. **Design:** CAD models for pendulum frame and solar mounting system completed. Electrical circuit diagram designed for hybrid input management.

2. **Experiments:** Pendulum tested for swing duration and energy output. Solar panel performance evaluated under different light conditions.
3. **Results:** Hybrid system achieved a combined average output of 45W.

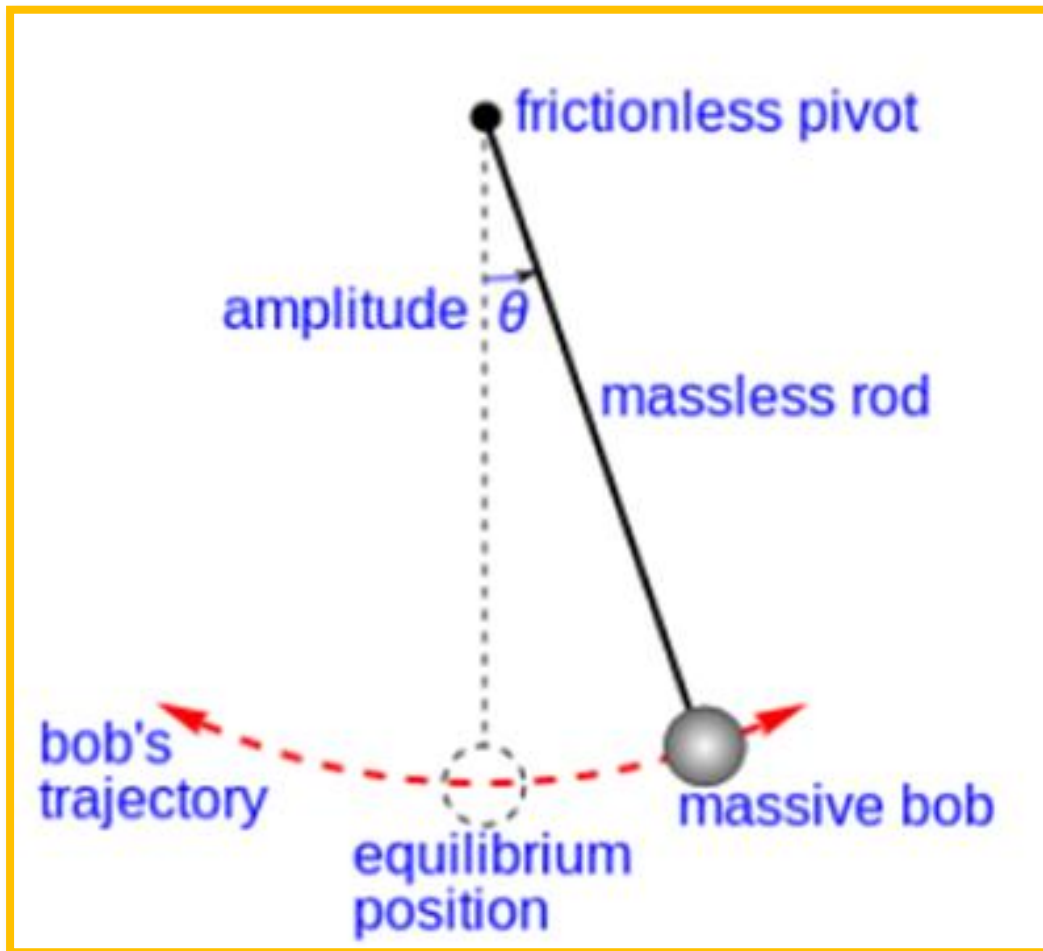


Figure 13.1 Block diagram

Conclusion

The Renewable Pendulum & Solar Power Generation system successfully demonstrates the feasibility of hybrid renewable energy harvesting. The prototype provides a sustainable and continuous energy source by combining mechanical and solar methods. Testing confirmed the system's capability to generate and store electricity efficiently for small-scale applications. Its portability and low-cost design make it ideal for rural and emergency scenarios. Future work can explore automated pendulum driving mechanisms and enhanced solar tracking for improved energy outputs. This project contributes toward sustainable energy solutions and encourages further research in hybrid renewable technologies.

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14. Arduino Based Obstacle Avoiding RC Robot Car

Introduction

In recent years, the field of robotics has gained immense popularity due to its wide range of applications in industries, defense, healthcare, and domestic environments. Among various robotic systems, autonomous vehicles and obstacle avoidance robots hold significant importance in advancing automation and artificial intelligence. These systems mimic human capabilities to perceive and navigate through their surroundings, making them highly valuable in environments where human intervention is limited or dangerous. The Arduino Based Obstacle Avoiding RC Robot Car is a compact, low-cost robotic platform capable of detecting obstacles in its path and maneuvering around them autonomously. Built using an Arduino microcontroller as the brain of the system, this robot utilizes ultrasonic sensors to detect obstacles and control its movements accordingly. The addition of RC (Remote Controlled) capabilities allows the user to switch between manual and autonomous modes, making the system versatile for various scenarios.

Working Principle

The Arduino Based Obstacle Avoiding RC Robot Car operates on the principle of real-time environment sensing and decision-making using ultrasonic sensors and a microcontroller. The robot is designed to navigate autonomously in an environment by detecting obstacles in its path and avoiding collisions as shown in Figure 14.1. It also allows remote control operation using a Bluetooth module, making it a hybrid system capable of switching between manual and autonomous modes.

- 1. Sensing (Obstacle Detection):** The robot uses an HC-SR04 ultrasonic sensor mounted at the front of the chassis. This sensor works on the principle of sonar (Sound Navigation and Ranging). It emits ultrasonic sound waves at a frequency of 40 kHz. When these waves hit an obstacle, they reflect back to the sensor.
- 2. Processing (Decision-Making):** The Arduino Uno microcontroller acts as the brain of the robot. It processes the data received from the ultrasonic sensor and makes real-time decisions. The programmed algorithm checks if an obstacle is detected within a predefined threshold distance (e.g., 20 cm). If no obstacle is detected, the robot continues moving forward. If an obstacle is detected, the robot stops, evaluates its surroundings by slightly rotating left and right (sensor scanning), and decides the best direction to turn. It then steers the wheels accordingly using the motor driver module (L298N) to avoid the obstacle.

3. **Action (Movement Control):** The robot uses DC motors connected through the L298N motor driver module. This module enables the Arduino to control the motors' direction and speed by sending logic signals. The wheels are driven based on the decisions made by the Arduino, allowing the robot to move forward, backward, or turn left/right.
4. **Remote Control (RC Mode):** In RC mode, the Bluetooth module (HC-05) allows the user to send commands to the Arduino from a smartphone app. The Arduino processes these commands and controls the motors directly, giving manual control over the robot's movement.
5. **Power Supply:** The system is powered by a 7.4V Li-ion battery pack, which supplies energy to the Arduino, motors, and sensors. Voltage regulation is used to ensure safe and consistent operation.

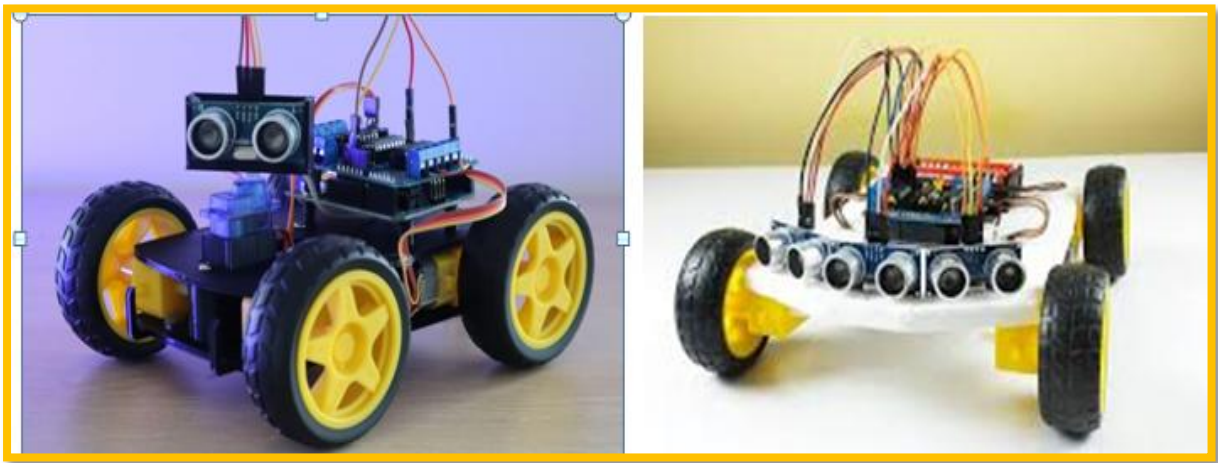


Figure 14.1 Working model

Conclusion

The Arduino Based Obstacle Avoiding RC Robot Car successfully combines autonomous navigation and manual control capabilities. The system demonstrates efficient obstacle detection and real-time response using ultrasonic sensors and Arduino-based processing. The RC functionality provides additional flexibility for user control. The low-cost and modular design make it suitable for educational robotics, prototype development, and small-scale applications. Future improvements could include the addition of IR sensors for line-following capability and camera modules for advanced navigation. This project serves as a stepping stone toward more complex autonomous robotic systems and encourages further exploration in embedded systems and AI.

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15. Anti-Sleep Alarm for Drivers

Introduction

Road accidents due to driver drowsiness and fatigue are among the leading causes of fatalities worldwide. According to global road safety reports, a significant percentage of highway accidents occur because drivers momentarily fall asleep behind the wheel. Long-distance driving, especially during nighttime or monotonous road conditions, leads to reduced alertness and increased reaction time, making drivers vulnerable to accidents. This highlights an urgent need for systems that can monitor driver alertness and provide timely warnings to prevent mishaps.

The Anti-Sleep Alarm for Drivers is an innovative safety device designed to detect signs of driver drowsiness and provide immediate alerts. The system is lightweight, wearable, and affordable, making it accessible to all vehicle owners. It operates by monitoring key indicators of drowsiness, such as head nodding, eye blinking rate, or changes in head orientation. When these indicators cross a predefined threshold, the system activates an alarm to alert the driver and prevent possible accidents.

Several technologies have been explored globally to tackle this issue. High-end systems in modern vehicles employ advanced computer vision and artificial intelligence (AI) to monitor facial expressions and eye movements. However, such systems are expensive and require complex infrastructure, making them unsuitable for budget-conscious markets or retrofitting in older vehicles. The proposed device bridges this gap by offering a simple yet effective solution that combines basic electronic sensors with microcontroller-based processing.

Objectives

- To design a wearable anti-sleep alarm system for drivers that detects drowsiness in real time.
- To utilize motion or infrared sensors to monitor head movements or eye closure durations.
- To provide an immediate audible, visual, or vibratory alert when drowsiness is detected.
- To develop a cost-effective solution suitable for all vehicle types, including older models.
- To promote road safety by reducing accidents due to driver fatigue.
- To explore the integration of Bluetooth/GSM modules for advanced alerting systems.
- To ensure the device is lightweight, portable, and comfortable for long-term use.
- To test and validate the system's performance in real-world driving conditions.

Working

As shown in the Figure 15.1, the working of the Anti-Sleep Alarm for Drivers is based on the principle of detecting driver fatigue through physical indicators and providing immediate alerts. The system architecture comprises three main components: sensors, microcontroller-based processing, and alert mechanisms.

- 1. Sensor Module (Detecting Drowsiness):** The device employs sensors to monitor driver behavior. Two common approaches are: Head Motion Detection (Accelerometer or Tilt Sensor) which has A 3-axis accelerometer (e.g., MPU6050) or tilt sensor is attached to a lightweight headset or cap. It continuously monitors the orientation of the driver's head. When the head tilts forward beyond a certain angle for a specified duration (indicating a nodding-off gesture), the system registers this as a sign of drowsiness. The second is Eye Blink Detection (IR Sensor) alternatively; an IR sensor placed near the eye detects the open and closed states of the eyelids. By calculating the PERCLOS (Percentage of Eye Closure) metric, the system identifies if the eyes remain closed for longer than normal blinking time (~1 second).
- 2. Processing Unit (Arduino Microcontroller):** An Arduino Nano/Uno acts as the brain of the system. It receives data from the sensors, processes the readings, and applies threshold algorithms to determine if the driver is becoming drowsy. The algorithm flow is as follows: Continuously read sensor data (tilt angle or eyelid state). If the data crosses the predefined threshold (e.g., head tilt $>30^\circ$ for 2 seconds, or eyes closed >1.5 seconds), trigger an alert. Reset the system once the driver regains alertness (head upright or eyes open). This real-time processing ensures immediate response and minimal lag between detection and alerting.
- 3. Alert Mechanism:** Once drowsiness is detected, the system activates one or more of the following: Buzzer Alarm: Emits a loud sound to alert the driver, Vibration Motor: Creates physical vibrations in the wearable device. LED Flash: Provides a visual alert in low-light conditions. Bluetooth/GSM Module (Optional): Sends alerts to a Smartphone app or emergency contacts if the driver does not respond to alarms. The combination of audio, visual, and tactile alerts ensures higher chances of waking the driver or regaining their attention.
- 4. Power Supply:** The device uses a rechargeable Li-ion battery, making it portable and suitable for continuous use during long drives. Power consumption is optimized by putting the microcontroller in sleep mode during inactive states.

5. **System Integration and Testing:** The system is assembled on a compact PCB for durability and portability. It is tested on simulated driving conditions to fine-tune the sensor thresholds and minimize false positives (e.g., normal head movements or long blinks). Field testing ensures the device functions effectively without causing distraction.



Figure 15.1 Working model

Conclusion

The Anti-Sleep Alarm for Drivers is a proactive and cost-effective solution to a critical road safety issue. By monitoring key indicators of driver drowsiness using sensors and providing immediate alerts, the system significantly reduces the likelihood of accidents caused by fatigue. Its lightweight, portable design ensures driver comfort and ease of use, while the low cost makes it accessible to a wide population. The prototype demonstrates reliable performance in detecting head tilts and prolonged eye closures, triggering alarms effectively. Future advancements can incorporate AI for more sophisticated detection and integrate Smartphone apps for additional safety features. Overall, this project contributes to safer roads and highlights the role of simple electronic systems in saving lives

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16. Door Operating Power Generating System

Introduction

The world today is witnessing an ever-increasing demand for energy, coupled with concerns about depleting fossil fuels and environmental degradation. To address this challenge, the focus has shifted toward developing alternative methods of energy generation, particularly those that harness energy from everyday human activities. The Door Operating Power Generating System is one such innovative concept that taps into a commonly performed action—opening and closing doors—to generate electrical energy. Every day, millions of doors are opened and closed in homes, offices, schools, and public places. The kinetic energy involved in this simple act often goes unused and dissipates into the environment. This project proposes a solution that captures this energy and converts it into electricity, which can then be used to power small electronic devices, charge batteries, or even contribute to the building's lighting system.

The system works by converting the mechanical energy of door movement into rotational motion using a gear and pulley mechanism. This rotational motion drives a generator or dynamo, which in turn produces electrical energy through electromagnetic induction. The energy generated during each door operation may be small, but over time and with frequent use, it can accumulate into a significant amount, especially in high-traffic areas like malls, offices, or railway stations. One of the key advantages of this system is its simplicity and cost-effectiveness. Unlike solar panels or wind turbines, it does not require large installations or favorable weather conditions. It makes use of existing infrastructure (doors) and can be easily retrofitted without significant modifications.

Additionally, it encourages energy conservation and environmental awareness by demonstrating how energy can be harvested from routine human activities. This project aligns with the principles of green energy and sustainable development, offering a practical and scalable solution for urban and rural areas alike. It is particularly relevant in regions where power outages are frequent, as it provides a small but reliable supplementary energy source. Moreover, the project promotes innovation in renewable energy harvesting and serves as an educational tool for understanding energy conversion principles. In summary, the Door Operating Power Generating System is a creative and efficient way to harness kinetic energy from daily life, contributing to a cleaner and more sustainable energy future. Its affordability and ease of implementation make it suitable for widespread adoption in both developed and developing countries as shown in the Figure 16.1.

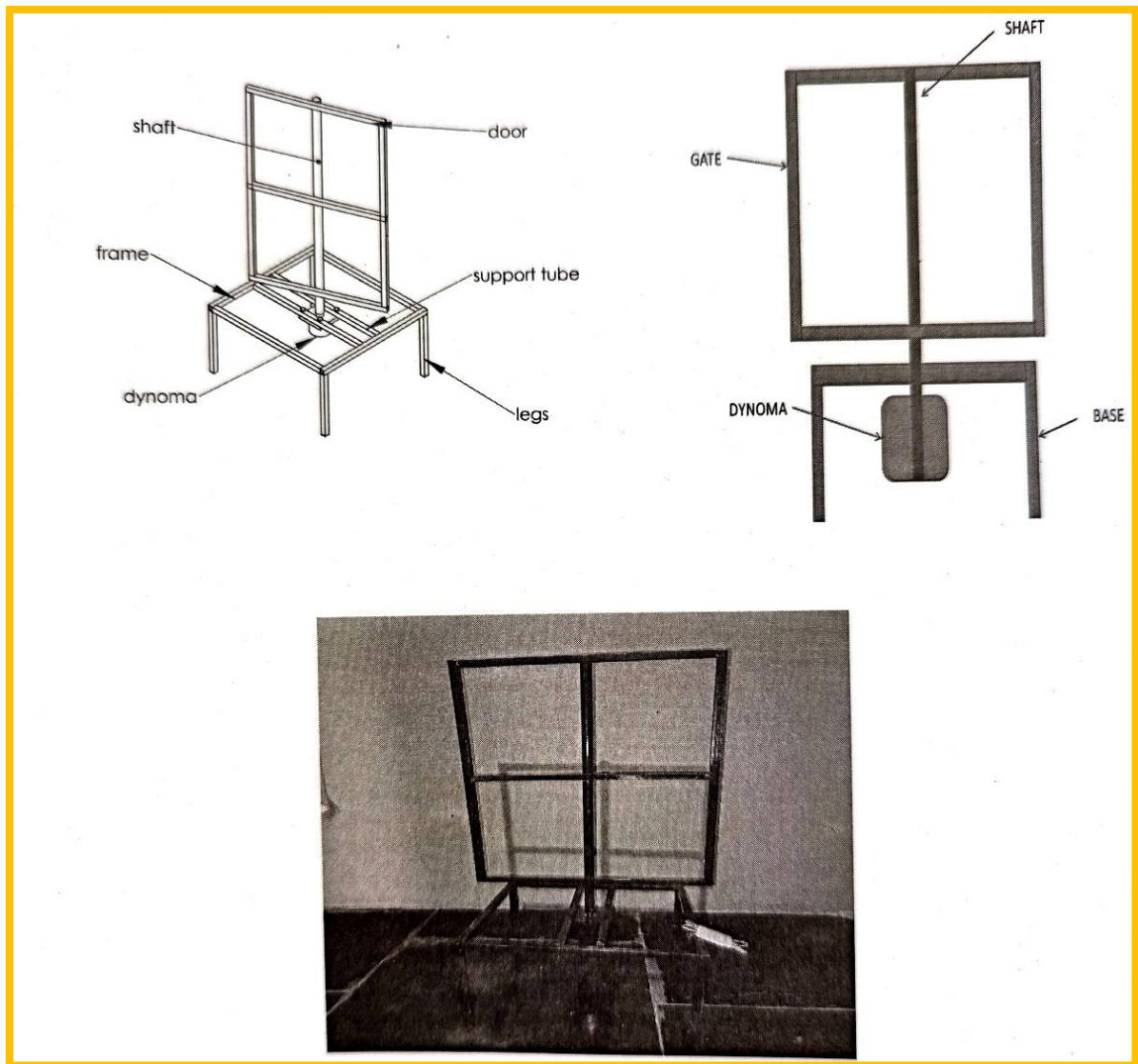


Figure 16.1 Working model

Conclusions

The Door Operating Power Generating System effectively utilizes the mechanical motion of doors to generate electricity, offering a sustainable and eco-friendly energy solution. The prototype demonstrates how simple mechanical systems combined with electrical components like dynamos and batteries can harvest energy from daily activities. Testing revealed that the system can power LED lights and charge small devices with regular door usage. Overall, this project contributes to the development of micro-energy harvesting technologies and inspires innovative approaches to renewable energy utilization in everyday life.

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17. Automated Solar Panel Orientation System

Solar energy has emerged as one of the most promising renewable energy sources due to its abundance, sustainability, and eco-friendly nature. With the growing global emphasis on clean energy, solar photovoltaic (PV) systems are increasingly being deployed for residential, commercial, and industrial power needs. However, a major limitation of traditional solar panels is their fixed orientation, which restricts their ability to capture maximum sunlight throughout the day. Since the sun moves across the sky from east to west, fixed panels are optimally aligned only for a short duration, resulting in significant energy losses. The Automated Solar Panel Orientation System addresses this limitation by enabling solar panels to track the sun's movement dynamically. This system employs a mechanism that adjusts the tilt and azimuth angle of the solar panel in real-time, ensuring that it always faces the sun perpendicularly. By maximizing the panel's exposure to sunlight, this system significantly increases energy generation efficiency, making solar installations more productive and cost-effective. Tracking systems are classified into two types: single-axis trackers, which adjust the panel in one direction (usually east-west), and dual-axis trackers, which adjust both tilt and rotation to follow the sun more precisely as shown in the Figure 17.1.



Figure 17.1 Working model

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18. Line Follower Robot

Introduction

Robotics has become one of the most influential fields of modern engineering, enabling automation in industries, smart transportation systems, and even daily life. Among the basic yet highly practical robotic systems is the Line Follower Robot (LFR), which autonomously follows a predefined path marked on the floor using a contrasting line (usually black on white or vice versa). This simple yet effective concept forms the foundation for more advanced robotic applications such as automated guided vehicles (AGVs), warehouse logistics robots, and autonomous delivery systems. The Line Follower Robot is a mobile machine designed to detect and follow a visual line embedded or drawn on the floor. Its functionality is achieved through the integration of optical sensors, a microcontroller, and motor driver circuits. The sensors continuously scan the surface beneath the robot, and based on the detected contrast, the microcontroller processes the information to control the robot's movement.

The growing demand for automation in industries and transportation systems makes LFRs an ideal entry point into robotics and embedded systems. LFRs demonstrate how electronic sensing, decision-making, and actuation can work together to achieve autonomous mobility. Moreover, these robots serve as an excellent educational project, introducing students to key concepts like sensor interfacing, embedded programming, and control algorithms. In industrial environments, LFR technology is applied in AGVs that transport materials along pre-defined routes without human intervention. These systems increase efficiency, reduce labor costs, and enhance safety. The simplicity of LFRs makes them suitable for environments where predefined paths suffice, eliminating the need for complex navigation algorithms. The project presented here is a two-wheeled differential drive robot controlled by an Arduino Uno microcontroller. It uses infrared (IR) sensors for line detection, an L298N motor driver module for controlling the motors, and a power supply from rechargeable batteries. The control logic ensures the robot stays aligned with the line by continuously adjusting the motor speeds depending on the sensors' feedback.

This system is cost-effective, easy to build, and scalable for more complex applications. Future improvements can include multi-path recognition, intersection handling, and obstacle avoidance, taking the basic LFR closer to industrial-grade AGVs. In summary, the Line Follower Robot project provides a practical demonstration of automation principles, embedded system design, and robotics. It shows how simple components working in harmony can perform

tasks autonomously, paving the way for more advanced innovations in robotic systems as shown in the Figure 18.1.

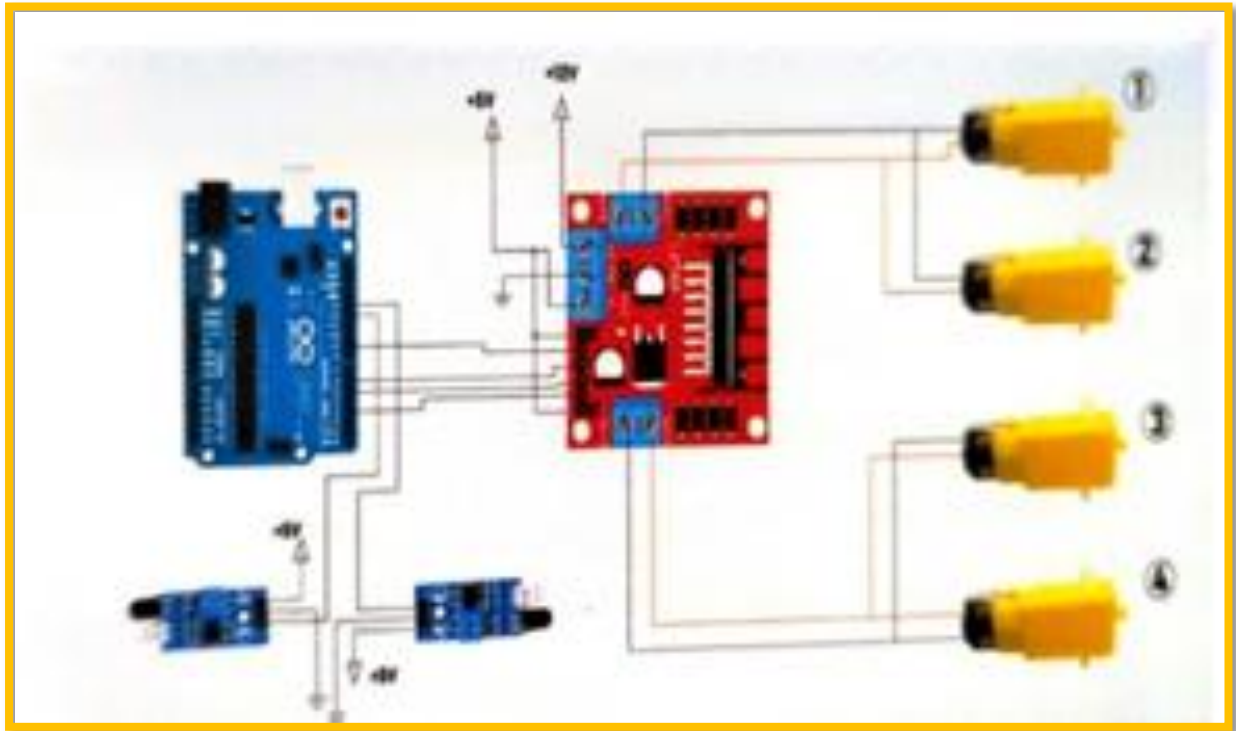


Figure 18.1 Connection of line follower robot

Conclusions

The Line Follower Robot project successfully demonstrates an autonomous system that navigates a predefined path using infrared sensors and microcontroller-based decision-making. The robot efficiently detects contrasts between black lines and white backgrounds, allowing it to follow straight and curved paths reliably. Its low cost and simple design make it an ideal educational tool for introducing robotics and embedded systems to students. Testing confirmed its effectiveness in various path configurations, showcasing its potential for industrial applications like automated guided vehicles (AGVs) and logistics systems. Future enhancements such as obstacle detection, multi-path handling, and advanced control algorithms (PID) can make the system even more robust and versatile. Overall, this project highlights the practical application of automation technologies in solving real-world challenges and paves the way for innovations in autonomous mobile robotics.

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19. Spring Assist Peizo Generator

There have been a lot of peizo based and generator motor based generators. The major disadvantage of these generators is that they only generate energy for a brief moment only when the peizo is pressed. There is no recurring energy generation unless a constant movement is applied externally. Well we here propose a system that generates energy for quite longer duration using a spring assisted mechanism. The system makes use of 2 peizo generators in orders to generate small energy charges when pressed. The system has 2 peizos mounted on opposite sides of a flexible metal strip. One peizo plate is mounted on the bottom surface while other one is mounted on top surface opposite it. The flexible rod is attached with 2 springs on either sides, one on top and other at the bottom. These springs are each connected to respective peizo sensors. Finally we attach a suitable weight at the corner end of the flexible metal strip. When we apply force to push the strip and leave it the flexible strip oscillator up and down for quite some time due to spring mechanism. This alternately pushes each peizo plate for a short duration of time. This allows for recurring charge generation from peizo sensors for quite some time. Finally we hereby use a small electric circuitry with an electric led to indicated power generated by glowing the led as shown in Figure 19.1

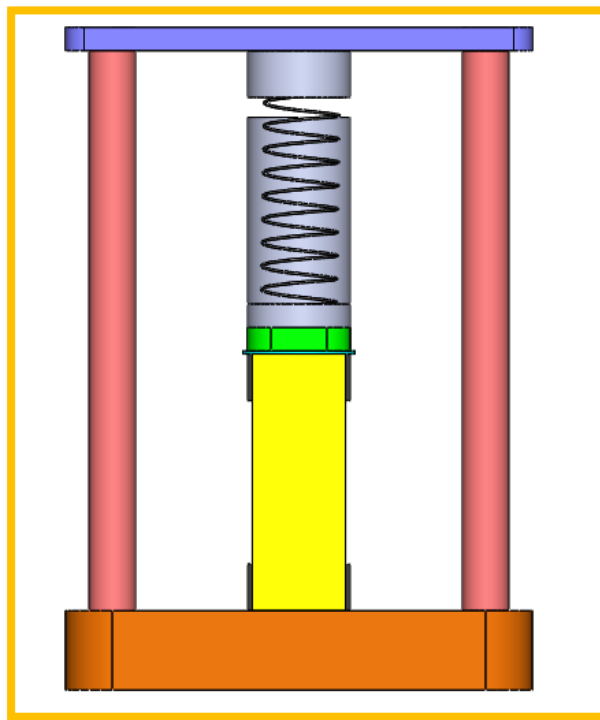


Figure 19.1 Schematic diagram of model

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20. Levitating Frictionless Vertical Windmill

In the recent year, the significance of wind generation is found to be multifold due to huge demand and supply gap in electrical energy system. Maglev wind turbines have several advantages over conventional wind turbines. For instance, they're able to use winds with starting speeds as low as 1.5 meters per second (m/s) because of negligible friction achieved with the help of magnetic levitation created and due to the assistance from magnetic field. Also, they could operate in winds exceeding 40 m/s. Hence maglev wind turbine has a great future potential in terms of energy generation. In this respect the current project work would like to address certain design issues and proposes to design, fabricate and test a prototype of magnetically levitated vertical axis wind turbine providing stated advantages, the prototype will be fabricated and tested for the outcome as shown in the Figure 20.1.



Figure 20.1 Schematic diagram of model

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Group Photo of AIMSS - Special Task Team

Program Educational Objectives (PEOs)

The Graduates will be able to

- PEO1:** Acquire core competence in Applied Science, Mathematics and Mechanical Engineering fundamentals to excel in professional career and higher study
- PEO2:** Design, demonstrate and analyze the mechanical systems which are useful to society.
- PEO3:** Maintain professional & ethical values, employability skills, multidisciplinary approach & an ability to realize engineering issues to broader social context by engaging in lifelong learning.

Program Specific Outcomes (PSOs)

- PSO1:** Able to apply the basic principles of Mechanical Engineering in various practical fields to solve societal problems by engaging themselves in many state/national level projects.
- PSO2:** Able to analyze and design basic mechanical system using relevant tools and techniques.
- PSO3:** Able to resolve contemporary issues of industries through industry institute interaction and alumni social networks

Program Outcomes (POs)

- PO1: Engineering knowledge-** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: Problem analysis-** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3: Design/development of solutions-** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4: Conduct investigations of complex problems-** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5: Modern tool usage-** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6: The engineer and society-** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7: Environment and sustainability-** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8: Ethics-** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and team work-** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: Communication-** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11: Project management and finance-** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12: Life-long learning-** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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