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Design and Fabrication of Plant Cleave Machine

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Abstract:
This project deals with the design and fabrication of low cost cutting machine for oleander plants on a large scale in highway. In existing system, the cutting process of this poisonous plant takes much time and requires high man power to work and also requires high cost. To overcome these problems, we designed a semi-automated plants cleave machine to make the process more efficient. The mechanical part of the machine consists of rack and pinion, journal bearing and cutter blade. High strength rack and pinion is used to convert the rotary movement to linear. The cutter blade is designed to cut the plants at high speed. The electrical system of the machine contains wiper motor and IR sensor. The rack and pinion coupled with wiper motor rotates in clockwise direction. IR sensor follows the track consists of a white path drawn on black surface say road. This project mainly focuses on to eliminate the road disturbances for environmental practitioners, to reduce the man power and to make the process more effective. .

I. INTRODUCTION

In highway plants cutting we require maximum man power, more money and also it is more time consuming process. In cutting process we face various problems and these are not easily solved. The design of this machine is very simple also easy to implement. In this manner we are designing the plants Cutting Machine to reduce effort and time. We are using this machine for cutting purpose. This is user friendly cutting machine, anyone can handle this machine in any working condition. Skilled persons aren't required for operating this machine. Trimming branches that obstruct street signs reduces the risk of accidents and injuries. Not trimming branches interfering with power lines increases the likelihood of power outages and fires. Branches that are broken unintentionally by weather often produce large tree wounds that also increase the likelihood of structural damage to a tree

1. To design and fabricate plants branch cutting machine which is used to cut plants branches with less human effort and efficiently
2. Plants are disturbing the vehicle in highways. So plants are cleaved by the Plants Cleave Machine'.
3. The cleaved wastes are used as a fertilizer for the same plant.

In this project the machine track the white line by the sensor and it sent to the controller and on the other side it receive the power from the Rack and pinion and it transfer the power to the cutting blade.

II. SYSTEM DESCRIPTION

Frame

Frame is the main structure in the project and it carries all the external weight and its act as a driving frame for the line follower section. There are three common methods for making corners on angle iron frames: mitering, notching, and notching and bending a single length of angle iron. Mitering and notching both methods work, but with notching it is easier to get good results and this technique is more dimensionally tolerant because the joint gaps between the angle irons' length can be adjusted to bring the frame square and the side lengths equal. After welding and grinding, both methods will look equally good and be equally strong. In general, use mitered corners when you have a notching tool to cut perfectly matching corners.

Figure.1. FRAME

The third approach for making square and rectangular frames from angle iron lends itself to production work because it requires notching and bending, which is best done on a machine like an Ironworker.

Rack and pinion

A Rack and Pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called t;the pinion ; engages teeth on a linear gear bar called the rack; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion. For example, in a rack railway ,the rotation of a pinion mounted on a locomotive or a rail car engages a rack between the rails and forces a train up a steep slope. For every pair of conjugate involutes profile, there is a basic rack. This basic rack is the profile of the conjugate gear of infinite pitch radius.

Figure.2. Rack And Pinion

A rack and pinion with two racks and one pinion is used in actuators. An example is pneumatic rack and pinion actuators

that can be used to control valves in pipeline transport. The actuators in the picture on the right are used to control the valves of large water pipeline. In the top actuator, a gray control signal line can be seen connecting to a solenoid valve (the small black box attached to the back of the top actuator), which is used as the pilot for the actuator

PIC Controller

The name PIC initially referred to Peripheral Interface Controller. he PIC used simple microcode stored in ROM to perform its tasks, and although the term RISC was not used at the time, it shares some common features with designs. This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC architecture into an 40- or 44-pin package and is upwards compatible device. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface or the 2-wire Inter- Integrated Circuit bus and a Universal Asynchronous Receiver Transmitter(USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

Figure.3. PIC CONTROLLER

Early models of PIC had read-only memory (ROM) or field-programmable EPROM for program storage, some with provision for erasing memory. All current models use flash memory for program storage, and newer models allow the PIC to reprogram itself. Program memory and data memory are separated. Data memory is 8-bit, 16-bit, and, in latest models, 32-bit wide. The manufacturer supplies computer software for development known as MPLAB X, assemblers and C/C++ compilers, and programmer/debugger hardware under the MPLAB and PICK it series. Third party and some open-source tools are also available. Some parts have in-circuit programming capability; low-cost development programmers are available as well as high-production programmers.

Wiper Motor with Worm Gear

Wiper motors are devices in the wiper system that functions on a power supply in order to move the wiper blades in a smooth motion. Like other motors, the wiper motor rotates continuously in one direction which is converted into a back and forth motion. Its composition entails a lot of mechanical linkages each playing a role in initiating the movement. In order for the wiper motor to move it needs a power source. The different power sources are the car batteries, voltages (12volts DC), current (minimum of 1.6 amps at 70 rpm; 1 amps at 41 rpm), computer batteries (12volts output) and other battery supplies that doe does not exceed the limit of 12 volts otherwise the motor is bound Another thing to consider in the configuration of a wiper motor is the wiring and electrical terminals.

Figure.4. WIPER MOTOR

These wirings electrical terminal have the purpose of organizing the configurations for wiper motor speed or mode. The number of electrical terminals can range from five to 12 slots for low speeds, moderate speeds, high speed, very high speed, manual function, off mode, common terminal and the park switch. Wiring for the wiper motor has colors to distinguish the specific mode functioning for Yellow wires are typically meant for low speed modes while white wires indicate its use for high speed modes. Other wire colors are used to indicate other modes have to consider on how to mount the wiper motors.

IR Sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather

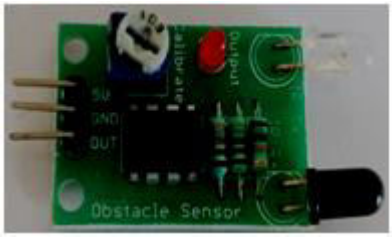

Figure.5. IR SENSOR

than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received. IR sensors are used in radiation thermometers to measure the temperature depend upon the temperature and the material of the object.

III. SYSTEM IMPLEMENTATION

This project is working under two section Mechanical and Electrical. The process begins with Electrical section and the output is sent to the mechanical section to perform a desire tasks. The electrical section consist of tracking device and after tracking the signal is to the controller on the basics of line follower device.

The mechanism begin with tracking the white line in the divider by the Infrared senor and it sent the signal to the controller and by connecting the motor diver for driving purpose and the controller check the signal and move the machine by tracking device and other work of the controller is comes under the mechanical

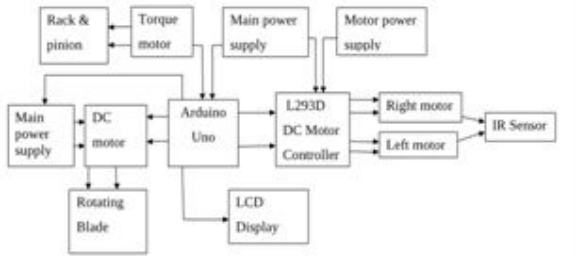

Figure.6. BLOCK DIAGRAM FOR WORKFLOW

Tracking device and other work of the controller is comes under the mechanical section with rack and pinion mechanism is used for movement. The rack and pinion is placed in vertical position and it connected to the motor which is used for blade. By the movement of rack and pinion the transmission is happen between controller and the cutting motor and the brief working for line follower mechanism is line following robot is one of the self-operating robots. That detects and follows a line drawn on the area. The line is indicated by white line on a block surface or block line on a white surface. This system must be sense by the line. This application is depends upon the sensors. Here we are using two sensors for path detection purpose. That is proximity sensor and IR sensor. The proximity sensor used for path detection and IR sensor used for obstacle detection. These sensors mounted at front end of the robot. The microcontroller is an intelligent device the whole circuit is controlled by the microcontroller. And the rack and pinion working is followed by Rack and pinion combinations are often used as part of a simple linear actuator, where the rotation of a shaft powered by hand or by a motor is converted to linear motion. The rack carries the full load of the actuator directly and so the driving pinion is usually small, so that the gear ratio reduces the torque required. This force, thus torque, may still be substantial and so it is common for there to be a reduction gear immediately before this by either a gear or worm gear reduction. Rack gears have a higher ratio, thus require a greater driving torque, than screw actuators. A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called the pinion engages teeth on a linear "gear" bar called the rack rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

Developed Hardware

Sensor unit:
This section contains IR diodes, potentiometer, Comparator (Op-Amp) and LED's. Potentiometer is used for setting reference voltage at comparator's one terminal and IR sensors are used to sense the line and provide a change in voltage at comparator's second terminal. Then comparator compares both voltages and generates a digital signal at output. Here in this line follower circuit we have used two comparator for two sensors. LM 358 is used as comparator. LM358 has inbuilt two low noise Op-amps.

Control unit:
PIC Controller is used for controlling whole the process of line follower robot. The outputs of comparators are connected to digital pin number 2 and 3 of controller. Arduino read these signals and send commands to driver circuit to drive line follower.

Driver unit:
Driver section consists motor driver and two DC motors. Motor driver is used for driving motors because controller does not supply enough voltage and current to motor. So we add a motor driver circuit to get enough voltage and current for motor. controler sends commands to this motor driver and then it drive motors.

Figure.7. PROTOTYPE OF DESIGN AND FABRICATION OF PLANT CLEAVE MACHINE

IV. RESULT

In this design, we used sensors to track the white line in the highway divider and the controller moves the machine at the same time the Rack and Pinion mechanism is used for movement of cutting blade in a vertical portion and the relays are used to control the movement of Rack and Pinion and the wiper motor to run the machine When the signal is get from sensor the controller react as the program at the same time by the movement of Rack and Pinion the cutting blade is operated.

V. CONCLUSION

Thus the plant cleave machine is tested in highway divider and range of sensor is observed and the outcome of controller is calculated. The maximum cleaved plants are checked and the power generated by the blade is calculated. The function of controller is obtained and the mechanism of Rack and pinion is observed The maximum movement of Rack and pinion is calculated and the maximum rpm of the motor which is used for cutting blade is tested and the battery package is observed to withstand the whole process. By observing the whole process the time consumption is less comparing to existing model and human work is less and by conclusion this process help more production for highway road maintenance is more easy than existing model.

VI. FUTURE WORK

The future scope for this machine is very wide. In market separate machines are available for individual operation and also these machines are costlier. Some more number of operations can be combined. And some of the operations can be done by manually handling. If wheels are provided to machine then it can moved from one place to another place. By using worm gears automatic feeding of straw can be done in straw cutting operation. This project has scope in production industries and mechanical workshop where bar cutting operation is carried out, since company demands higher production at cheaper cost. Mechanism of three bar cutting will help the industries to cut multiple bars at a time and automation makes it easy. Humans efforts are less by undertaking atomization in machine because most of machines needs the men for holding the bar and another to cut the bar. This project will give the idea of design and atomization

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