DESIGN AND FABRICATION OF LEGGED AGRICULTURAL SPRAY CUM GRASS CUTTING ROBOT BY SOLAR

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Abstract: Currently, the two most efficient leg processes are the system of Joe Klan that resembles a spider leg and the mechanism of the Jansen that resembles human leg. I chose the system of Joe Klan that has more benefits than the mechanism of Jensen. It was the main element used in all forms of mechanical transport since the wheel was invented back in the Stone Age. However, wheel has always had significant disadvantages with modifications in short-term evolution such as tiny stairs, obstacles, areas of agriculture and steep jagged rock piles. People look at the animal and human legs to overcome these disadvantages. Which have already been demonstrated to operate efficiently on land type and steep jagged rock piles. The primary goal of my project is to substitute the role of the wheels used in seed sowing, spray and grass cutter with an option to solve the problems of traveling in agricultural areas. In addition to assembling the components available on the market, some components need to be designed and the robot can be remotely operated to cut the grass in the agricultural field.

***Index Terms*–Klann leg mechanism, charge controller, sprayer and grass cutter.**

I. INTRODUCTION

Conversion of solar energy defines techniques dedicated to transforming solar energy into other (helpful) types of energy, including electricity, fuel and heat. We can get solar energy in the form of electrical power to run the robot. In Klan mechanism connections are connected by pivot joints and transform the crank's rotating movement into a foot movement comparable to that of walking animals. The proportions of each link in the system are defined in order to optimize the foot linearity for half of the crank's rotation. The crank closing rotation makes it possible to raise the foot to a predetermined top sooner than to return to the starting feature and repeat the cycle. Two of these linkages combined with each other at the crank and a half cycle out of cycle will allow a vehicle's body to move parallel to the floor.

Those legs can serve as a wheel replacement and provide motors that are better equipped to handle. The bicycle baring wheels that could walk have been an interest for many years. It'd be like a huge insect on the legs. A link was created that easily demonstrated its conception by the design norms and several small-scale prototypes. Connection applications go through human motors. The hyperlinks are connected by pivot jointing and transform the rotating movement of the crank into a foot movement similar to that of a walking animal. Two of these legs can be used as a wheel replacement and give the vehicles a better capacity to cope with the axle-driven wheels. Between the gadgets. The kinetic sculptor Theo Jansen has intended to simulate a soft Walking move with the help of Jansen's link system. In addition to some of their constraints, the Klan connecting mechanism offers many of the benefits of sophisticated walking engines. It may climb stairs or travel to fields presently not supported by rollers, but no longer involve micro-process or controllers or a large number of inefficient systems of actuators.

And with scrapers, liquid fertilizers are sprayed by the robot in a single move in various directions. This device can be operated effectively with the help of a 12 v dc motor, to create high pressure for the successful spraying of fluid fertilizer for lengthy distances in agricultural region. The grass cutting device can be operated at varying lengths in areas on the base of the robot to cut the grass. It has a distinct control switch for operation. It can accomplish multiple functions in a single robot pass.

II. LITARATURE SURVEY

Locomotion science began just a century ago when Edward Muybridge was commissioned by Leland Stanford, then governor of California, to see if or not a horse trampling all four feet simultaneously left the field. It's never Stanford wagered. After he had demonstrated wrong in Muybridge with the pictures from Scientific American that he had seen in 1878, the walking and running behavior of over 40 mammals, including human beings, was documented by Muybridge. Nevertheless, his photographic statistics are highly paid and remain a landmark in locomotive studies. The knowledge of walking machines also came from Muybridge's moment. About an early model of walking emerged. The body moved through a straight horizontal route with a connection while the feet went up and down to exchange assistance during a step. A few years earlier, the connection was designed by the famous Russian mathematician Cheby Shev. In the subsequent 80 or 90 years, the worker considered the construction of walking machines the task of creating connections that generated appropriate step-by-step motions by means of a power source.

Many of them were suggested, but their set movement patterns restricted their efficiency, as they could not adjust the terrain by setting the feet on the finest footprints to adapt to the differences. By the late 1950's, it had become obvious that links with steady measures now would not be enough and helpful walking machines needed control. One way of using a person once was to manipulate it. In the mid-sixties, Ralph Mosher used that strategy when he built a 4-legged General Electric walking truck. The Mosher machine was 11 feet high, weighed 3000 pounds and hydraulically powered. Each of the driver's arms was linked to a handle or lever controlling the four legs of one of the truck.

Whenever a truck leg was prompted by the driver to move towards an obstacle, force feedback let the driver feel the impediment as if it were his own arm or leg pressing. Mosher was able to deal with the machine with amazing agility after about 20 hours of practice. Desktop films operating under his control demonstrate it ambling along at about 5 MPH, climbing a stack of railroad ties, pushing a foundry jeep out of the mud, and maneuvering a big drum on some hooks. This walking machine was a landmark in legged technology, despite its reliance on a well-trained person for control.

III. KLANN LEG MECHANISM

The Klann connection is a planar system intended to simulate the legged animal's gait and operate as a substitute of the wheel, a mechanism of the arm. The connection comprises of the frame, a crank, two grounded rockers, and two couplers all linked through pivot joints. Joe Klan created it in 1994.

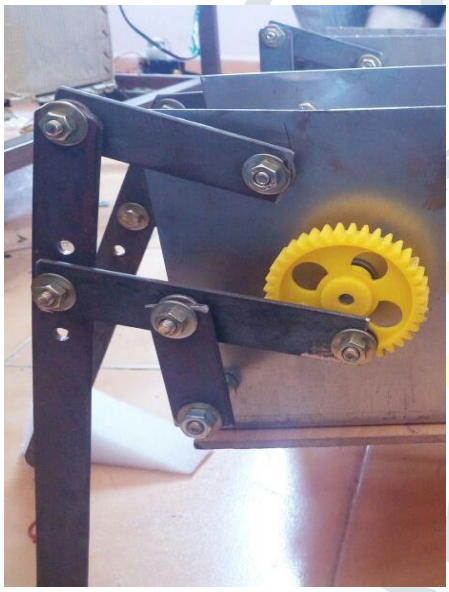

Fig3.1: Leg setup of proposed model

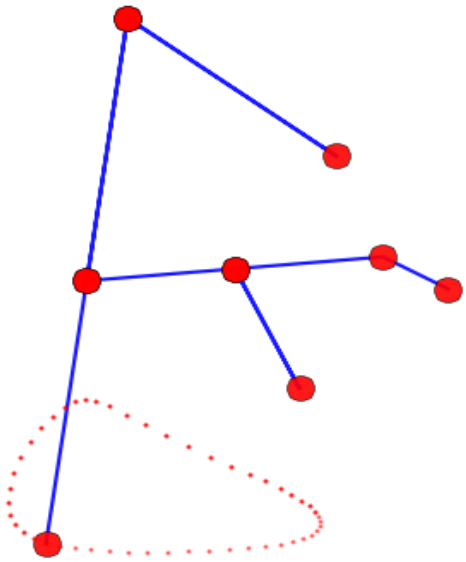

fig.3.2 Line diagram of leg mechanism

IV. FUNCTIONAL LINE DIAGRAM

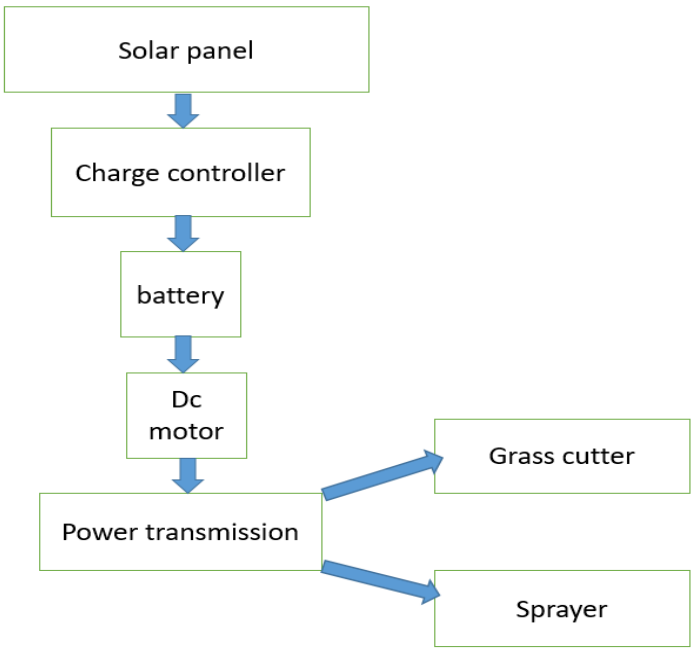

Fig 4.1 Functional line diagram

Solar panel: Solar panel is a semiconductor device that converts sun rays into electricity directly. It is produced of either series or parallel linked tiny photovoltaic cell depending on the necessity. Only DC is needed to transform this panel output to AC inverter. The battery will be charged.

Charge controller: A charge controller or charge controller is mainly a voltage and/or presently controller to prevent overcharging of batteries. It controls the voltage and current from the battery photovoltaic panels. Most of the "12 volt" panels bring out about 16 to 20 volts, so the batteries will be broken from overloading if there is no regulation.

Battery: Battery is a tool used to store the type of electrical current generated by the solar panel, composed of one or more externally connected electrochemical cells. A redox reaction converts high-energy reactants to lower-energy products when a battery is connected to an external electrical charge, and the free-energy difference is delivered as electrical energy to the external circuit. Historically, the word "battery" referred specifically to a device made up of various cells, but the use has developed to include equipment made up of a single cell.

DC engine: DC engine is one of a class of electrical rotating devices which transforms electrical direct current into mechanical energy. Dc motor that can provide the energy needed to rotate spur gears.

Power transmission: here rotary gear movement that can be transformed through shafts and connections into the robot's walking movement.

Grass cutter: which can be mounted on the bottom of the robot by dc motor. Cutting blade with sharp edges that can be cut in the areas of agriculture. Grass cutter with adjustable bolt connected to the robot, which can help adjust the height of the floor level of the cutter.

Sprayer: A sprayer is a tool used to spray a liquid where sprayers are frequently used for water projection, weed killers, crop quality equipment, chemicals for pest maintenance, as well as ingredients in the production and production line. A sprayer in agriculture is a piece of machinery used to apply herbicides, pesticides and fertilizers to farm crops. This sprayer can spray the liquid fertilizers on agricultural land in two directions in the robot's single run. Which sprays in a minute 3.5L of liquid fertilizers and effectively covers up to 3 m in each direction.

V. WORKING PRINCIPLE AND OPERATION

Solar panel installed at the robot top. The Solar Panel initially observes the sun rays and transforms solar energy through photo volcanic cells into direct current. Using the charging device, this converted DC current stored in the battery. The charge controller is a tool that can be opposed to solar panel overloading of the battery. This stored energy in the battery that could be used to operate the engines, sprayer and grass cutter as well. Here used 12 volt Johnson motors that can be used to give the robot the movement. The Motors

will offer rotary motion and it will be transformed through crank and connections to walking movement, which reflects the mechanism of the Klann. The primary reason to use this system is to overcome obstacles, irregular surfaces and steep jagged rock piles to replace the wheels in the agricultural areas.

Used field star sprayer that delivers 3.5 liters of liquid fertilizers per minute in agricultural areas that cover up to 3 meters of range. This sprayer that sprays in two directions at a moment the liquid fertilizers. Grass cutter is one of the primary devices that can be installed at the robot's bottom. Which on Bolt is pivoting that can be adjusted. We can adjust the grass cutter clearance from the ground level by using this adjustable Bolt. Grass cutter in agriculture areas can efficiently cut grass while robot moves. The robot's primary tasks are spraying liquid fertilizers in the direction and grass cutting that can be accomplished concurrently in the robot's singe pass on the agricultural field.

VI. EXPERIMENTAL SETUP AND RESULT

6.1. Experimental setup of proposed model

VII. RESULTS OBTAINED

- Access irregular agricultural surfaces.
- Spray liquid fertilizers at the same moment in two directions and cover up to 3 meters in each hand. Spray 3.6 liters per minute of fluid fertilizer.
- Cutting the grass on the farms.
- Limited handling of weight material in agricultural land.

VIII. FUTURE SCOPE:

Although the concept is quite ancient, many of the future scope could make it beneficial to monitor farms using camera, in-increase in capacity-bearing liquid fertilizers and storage capacity. We can control the robot from the phone itself by using PLC and it becomes user-friendly. And handling of chemical and hazardous material.

REFERENCES

1. Soyguder S, Alli H; Design and prototype of a six-legged walking. International Journal of Industrial Robot, 2007; 34(5): 412–422.
2. Lovasz E Ch, Pop C, Pop F, Dolga F; Novel Solution for Leg Mechanism. Int. J. of Applied Mechanics and Engineering, 2014; 19(4): 699-708.
3. Inoue H, Noritsugu T; Development of Walking Assist Machine Using Linkage Mechanism. An International Journal of Robotics and Mechatronics, 2010; 22(2): 189-196.
4. M.Y. Hussain, Islam-ud-din, and M.Anwar, "Dehydration of Agriculture Products by Mixed Mode Solar Dehydrator" International journal of Agriculture and Biology, ISSN Online: 1814-9596.
5. Hemant Ingale, N.N.Kasat, "Automated Solar based Agriculture Pumping" International journal of Advanced Research in Computer Science and Software Engineering, volume2, Issue 11, November 2012, Pages407-410.
6. K.Ganesh, S.Girisha and G. Amirtha Kannan, "Embaded Controller in Farmers Pump by Solar Energy" International journal of Instrumentation, Control and Automation, Volume 1, Issue 2, 2011, Pages 77-81.
7. Ms. Rutuja A. Yadav, Ms. Nayana V. Chavan, Ms. Monika B. Patil, Prof. V .A. Mane. Automated Solar Grass Cutter in International Journal of Scientific Development and Research (IJSDR). Vol.2, February 2017.
8. Bidgar Pravin Dilip, Nikhil Bapu Pagar, Vickey S. Ugale, Sandip Wani, Prof. Sharmila M. Design and Implementation of Automatic Solar Grass Cutter in International Journal of Advanced Research in Electrical(IJARE). Vol.6, April 2017.