Multipurpose Agribot

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Abstract: **- Agriculture being one of the major occupations in India, it is very essential to discover and implement new idea in this field, though lot of work has been done in this area. It is unfortunate that, these ideas are not been implemented properly in actual field. This is due to high cost and is complicated for rural people. Multipurpose Farming Machine is basic and major equipment involved in agriculture for maximum yielding. Conventional method of planting and cultivating crops is a laborious process and hence for that reason there is a scarcity of labors, this result in delayed agriculture to overcome these difficulties, multipurpose agriculture equipment is designed. This Agricultural vehicle is an agricultural machine of a considerable power and great soil clearing capacity. This multipurpose system gives an advance method to sow, plow, water and cut the crops with minimum man power and labour making it an efficient vehicle. The machine will cultivate the farm by considering particular rows and specific column at fixed distance depending on crop. Moreover the vehicle can be controlled manually by driving the vehicle using seating arrangement. This agricultural vehicle will be running with batteries. Batteries will be charged using Solar Energy. So ultimate aim is to develop a agricultural vehicle which uses renewable sources for operation.**

Keywords: **agriculture, automated farming, multipurpose farming machine, solar energy**

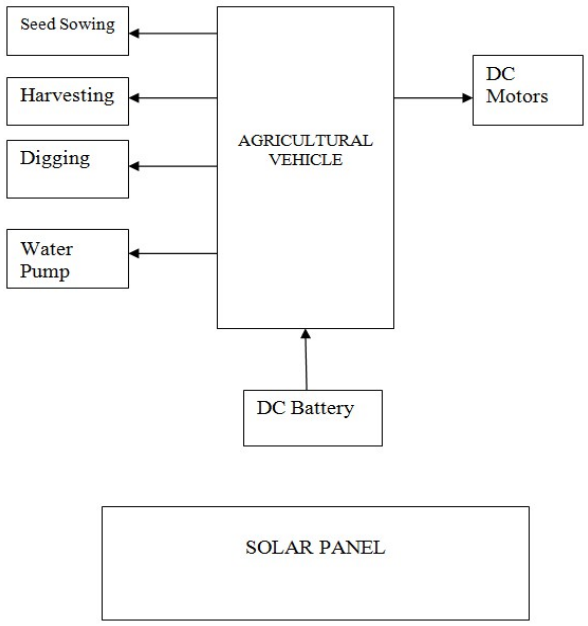
I. METHODOLOGY

First, we surveyed thoroughly about all the types of existing forms of Agribots. We then designed the chassis taking into account crops, seed spacing, soil parameters and costs. We also designed the tools for all the intended operations. Then we fabricated the chassis and tools according to the design.

The chassis structure was fabricated as per the design. The mild steel metal strips is welded together as a lap joint using arc welding. Then Motor clamps were mounted on the chassis through welding to attach the wheels. Wheels and motor was attached to the clamps. Roller has been fabricated using hollow cylinder, screw rod, fasteners and arm attachments and welded to the chassis. Seed sowing equipment was also fabricated and attached on chassis. Harvesting tool was also fabricated and mounted. A solar panel is connected to the battery for it to be charged thus fulfilling our objective of making the Agribots eco-friendly. All the operations were connected by the 8 channel relay as intended.

II. WORKING PRINCIPLE

This agribot was constructed using 8 channel relay system to select various operations using infrared remote ,solar panel to charge the battery ,DC motors to actuate the various operations and drive the vehicle Agribot can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring. Agribot - can also be used in livestock applications (livestock robotics) such as automatic milking, washing and castrating. Agricultural vehicles like these have many benefits for the agricultural industry, including a higher quality of fresh produce, lower production costs, and a smaller need for manual labor.



III. COMPONENTS AND EQUIPMENT'S

Material Used:

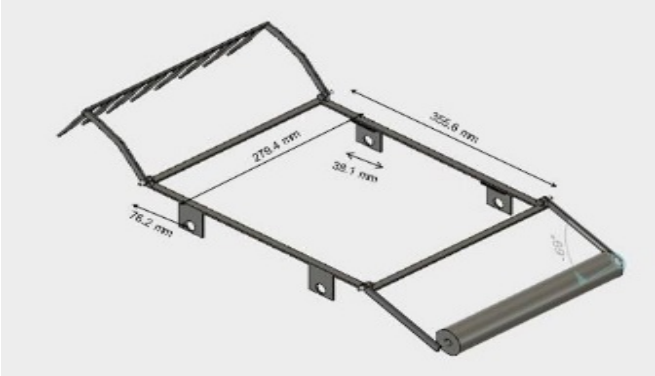
1. Mild steel frame
2. Fasteners
3. Battery (12v)
4. Dc motors (60 rpm)
5. Dc motor (10 rpm)
6. Wheels
7. Motor clamps
8. Flex board
9. Wheel grip belt
10. Cutting wheel
11. Mild steel cylinders
12. Welding rods
13. Solar panel
14. Relay board and remote

Equipment's

1. Tool Kit and Measuring Equipment
2. Arc Welding Plant
2. Cutting Machine
4. Saws

IV. BASIC DESIGN

The basic design has a chassis to which ploughing tool and roller is mounted. 4 motor clamps are mounted for the wheels with 2 motors. A wheel belt drive will come around the wheels to provide strength as well as to avoid the soil getting stuck on the wheels. A seed sowing equipment is also be mounted on the ploughing tool side. Two motors to drive the vehicle will be mounted with the wheels. 1 motor will be driving the up and down movement of the ploughing tool, 1 will actuate the seed sowing, 1 will be for the harvesting tool and 1 more to pump the water for irrigation.Chassis and all the tools are designed according to the crop requirements and cost.



V. DESIGN CALCULATIONS

Maximum Speed
Diameter of wheel – 65mm
Speed of motor driving the wheels – 60rpm
Circumference of wheel (c) – 204.2035 mm [πd]
Speed of the vehicle – 12.252 m/min

Roller

Volume of hollow cylinder:28.128cc
2washers:9.899cc
Screw Rod:21.944cc
Two roller attachment arms:7.2cc
Total Volume:67.171
Density:7.87g/cc
Weight:600g

Ploughing Tool

Blade support: 7.62 cc
8 Blades: 15.24 cc
Attachment Arm : 7.2 cc TOTAL VOLUME : 30.0
Density : 7.87g/cc
Weight:236.572g
Rake angle:67.79^{o}
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Chassis

2 strips 14 in 21.336cc
2 strips 11 in 16.764cc
Total volume:38.1cc
Density :7.87g/cc
Weight:236.572g

Total weight on chassis

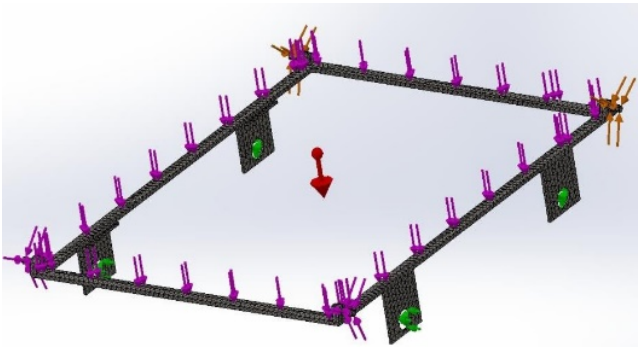
Roller	: 600g
Ploughing Tool	: 240g
Seed Sowing Equipment	: 200g
Harvesting Tool	: 150g
Battery	: 700g
Miscellaneous	: 3kg

(Motors, circuit board, pump, solar panel etc.)

TOTAL WEIGHT : 5-6 kg

Design Analysis

Based on the total weight acting on the chassis, analysis was done on Solid Works.
Total load applied on the chassis: 10 kg
Chassis material: Mild Steel
Type of stress analysed: Von Misses Stress
A uniformly distributed load of 10 kg was applied as shown.

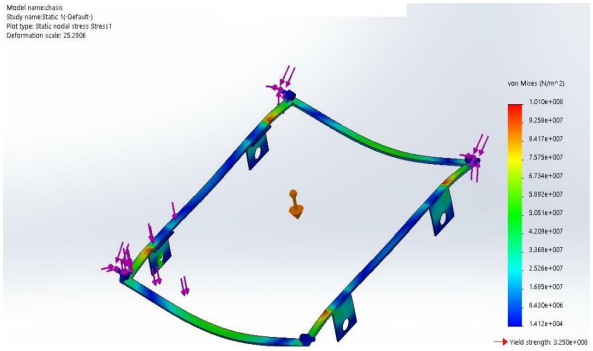


The maximum deformation was found out to be 1.407

Displacement

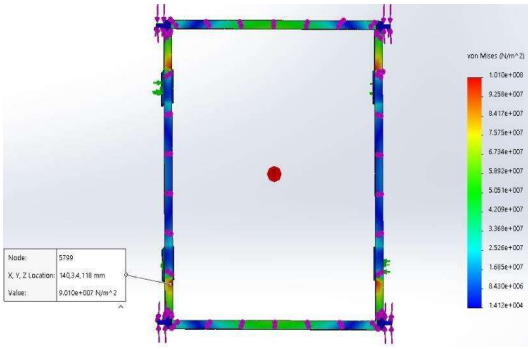
Stress

Analysis of Von Mises stress is as shown



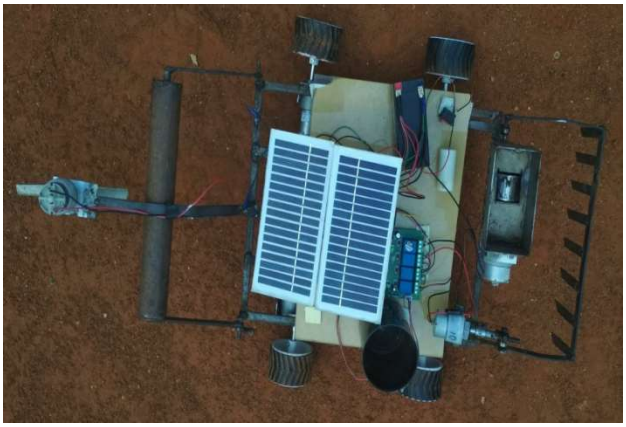
Strain

It was found that the proposed chassis structure was able to withstand a load upto 10 kg with 1.4 mm deformation only . Since the agribot requirement was only 6 kgs the design fabrication was justified



VI. RESULTS AND DISCUSSIONS

After fabrication, we tested the agribot to ensure that the vehicle is operating as intended. The results of all the operations are as follows. Vehicle was able to move smoothly on flat ground. The vehicle also moved freely on soil. It was even able to move on grassy land. All the 5 operations were working properly by using remote control. Ploughing tool was able to dig the soil and vehicle was able to overcome the torque resistance of the soil. Rolling operation was also smoothly performed by the vehicle. Seed sowing and harvesting equipment is also working. Battery is also charging perfectly from the solar pan



VII. CONCLUSION

The agribot developed can perform 5 operations ploughing, seed sowing, harvesting, rolling and irrigation. All these operations can be performed by a single machine without any need of driver. This would reduce the cost and make it simple to be used which would be helpful for the farmers. If this model is adopted in real applications it would really improve the agriculture sector drastically.

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