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Design and Analysis of Future Concept Solar Powered Agricultural AI-Vehicle

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ABSTRACT: *Agriculture in India dates back to Indus Valley Civilization and even before that. As per 2018, agriculture employed more than 50% of Indian work force and contributed 17-18% to country's GDP. Almost 140 million hectare of land used as agricultural area in India. Indian agriculture includes a mix of traditional to modern farming techniques. The traditional way of farming highly requires human power, more time, and more efforts for the work.*

In India, there is lots of solar energy is produce due to the geometric and atmospheric conditions, also as per data analysis the country's solar installed capacity reached 37.627 GW as of 31 March 2020. For the agricultural purpose, this AI based vehicle work similar like Tractor but it is autonomous and solar powered. Agricultural Tractors working on traction engine with high torque ranges from 20-60 Kw, so it requires more fuel for operation, also it requires the technical person to perform the desired operation on field. This AI based vehicle overcome this problem as it works totally automatic with the use of Line Following method and the powertrain of this AI based vehicle is totally designed on the electric motor based. For the two axel, four wheel, this vehicle uses four BLDC motor with varying capacity as per requirement with series and parallel connection. The pack of rechargeable Li-ion batteries are used for the power supply to the motor and the required amount of energy for charging the batteries are produced from Solar system which is mounted on the vehicle itself.

KEYWORDS: Solar Energy, Line Follower Robot, Agricultural Vehicle, Li-ion Battery, BLDC Motor, Agriculture in India

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I. INTRODUCTION:

The main part of Indian culture is agriculture. In India, more than 140 million hectare of land is under use of agriculture. In Indian agricultural system, most common problem is weather and the others are human power, money, import-export and many more. To overcome the problems occur by human sources many of the farming tools are developed, but the use of those tools are much more difficult and cannot done by a farmer in India.

The Future Concept Solar Powered Agricultural AI Vehicle is the vehicle is use for the various farming applications like plowing, seeding, fertilizing, cutting and many more with the desired tools attached to the vehicle just like tractor, but this vehicle is working autonomously. This AI based vehicle is running on solar energy with the help of electric motors and pack of batteries.

II. OBJECTIVE:

The Future Concept Solar Powered Agricultural AI Vehicle is the conceptual vehicle that useful in agricultural work and development. The Future Concept Solar Powered Agricultural AI Vehicle is work on the electric motors to solve the problem of fuel consumption. The traditional tractor is work on fuels like diesel on produce air pollution also the fuel consumption of traction engine is more due to the production of high torque. The Future Concept Solar Powered Agricultural AI Vehicle is also power by solar energy to charge the battery pack of vehicle. Solar panels are uses for converting solar energy into electric energy and the obtaining electric energy is use for charging the batteries. This vehicle is come with another future concept device Navigator Quad-Copter. This drone or quad-copter is use to direct vehicle autonomously. This vehicle is the conceptual vehicle and mainly use in agriculture area but after some required modifications and research it can be uses in many other fields like delivery of goods in critical situations as lockdown or curfew, in medical industries, in rescue operations, in factories for transportation and many more.

III. METHODOLOGY:

Principle: The Future Concept Solar Powered Agricultural AI Vehicle based on the working principle of electric motor. The each motor of the vehicle is power by pack of Li-ion batteries with desired amount of

capacity. Solar batteries are also come in picture for the more use of solar energy after few changes in the control system. The battery pack of the AI vehicle is charge by using solar panels, which is mount on the vehicle itself. For two axle, four-wheel model, 4WD (Four-Wheel Drive) principle is used. For each wheel, there is single BLDC motor for the smooth operation and for acquiring the desired power. 4WD principle is required in this vehicle for smooth working of vehicle in difficult area of farming land. The vehicle is not stuck in any area due to the 4WD.

Design: The Future Concept Solar Powered Agricultural AI Vehicle having very simple design. In this vehicle, there is only ladder frame chassis with solar panels mount on it. The each wheel of vehicle is power by separate BLDC motor for acquiring exact amount of power to run the vehicle. In this The Future Concept Solar Powered Agricultural AI Vehicle, solar batteries or Li-ion batteries are use. Solar batteries are uses for the direct conversion of solar energy to electric energy. For the use of Li-ion batteries, separate electronic circuit is use for conversion of solar energy to electric energy, but the Li-ion batteries provide more lightweight structure and low maintenance. There is attachment link for attaching the other machines that are uses in agriculture area. The vehicle is come with two-axel, four-wheel drivetrain. This drivetrain is work on the principle of Four Wheel Drive concept and more detail in Individual Wheel Drive concept.

Chassis: The chassis of the AI vehicle has made with high-grade carbon steel for acquiring the stronger structure, which will help in agricultural operations, also the weight of overall vehicle is maintain due to the steel properties. The chassis of the AI vehicle is having ladder frame structure, so it acquires more strength. On the top of the chassis, there will be only solar panels for the charging the batteries and the other parts of the traditional vehicle will be eliminate for the smooth and soft operation of vehicle, as the vehicle is fully automated, there is no need of traditional control panel of the vehicle.

Four-Wheel Drive Concept: Four-wheel drive refers to a two-axle vehicle drivetrain capable of providing torque to all of its wheels simultaneously. It typically linked via a transfer case providing as additional output drive shaft and, in many instances, additional gear ranges. The Future Concept Solar Powered Agricultural AI Vehicle is work with Individual-wheel drive (IWD). Individual-wheel drive is another type of four-wheel drive and, it is generally refer to the electric vehicle. In Individual-wheel drive, each wheel of electric vehicle is drive by its own electric motor. This Individual-wheel drive have drastic effects, as in better handling in tight corners.

Solar Battery: Solar batteries are uses to store solar energy or in other words solar electricity. Rechargeable solar batteries are uses in off-grid PV systems to store excess electricity. Some solar battery banks use wet cells, while others use sealed or gel cell batteries.

Lithium-ion solar batteries having extremely high life cycle and it also have high charge and discharge capabilities that help harvest more energy from solar panel. Lithium-ion solar batteries are good for off-grid systems. Lithium iron phosphate (LiFePO4) batteries are good substitute for conventional batteries.

Working Technique: For the surveying of the agricultural land and the mapping of agricultural land, there is another future concept model is come in picture, which is navigator quad-copter. The navigator quad-copter is use to develop a virtual realistic map of the agricultural land for the AI vehicle. The map is created by the camera mounted on drone or quad-copter and further it will be sent to the AI vehicle's monitoring system and the monitoring system of Artificial Intelligent vehicle create the imaginary lines on the land for the performing the task by AI vehicle. The actual Artificial Intelligent vehicle is follow that line and performs the required task. At the crucial point\s, the control of the AI vehicle is transmit to the user and the user can access the control by using simple mobile application, which is developed for the simulation of AI vehicle, and it is make as easy as the simulating game.

Navigator Quad-Copter Basic Principle: Navigator Quad-Copter is work on cloud technology. The drone makes the survey of total area with the in-built camera and crates the virtual map of that respected area, further this virtual map will be send to the respected vehicle via cloud technology. The Navigator Quad-Copter having transmitter band to send the collected data. This collected data is receive by the vehicle using appreciate receiver link which is present on that vehicle itself.

IV. RESULT AND DISCUSSION:

This research paper provides the conceptual idea about automation in agricultural area. To overcome the problems in farming industry, this AI vehicle makes the farming process very easy due to the automation system include in it. This AI vehicle is conceptually working on electric motors and solar power, this powertrain is helpful for avoiding conventional fuel consumption, air pollution due to fuel consumption, requirement of human efforts and many more. Solar power in India is a fast developing industry. The country's solar installed capacity reached 37.627 GW as of 31 March 2020. In last four years, solar power installation in India is jump from 12,289 MW to 37,627 MW. In agricultural area, solar power is use only for solar pumps. To develop the agriculture industry, use of renewable energy sources have to be increase. The economic contribution of agriculture to India's GDP plays a significant role, hence to improve the technology, which is use in agricultural area is key role to increase the socio-economic fabric of India. Automation and smart work mode is the main

sector to improve the work quality in agricultural industry. This paper is about to solve the problem of farmer by using the advance and future concept technique to do work with traditional farming machines and tools.

V. CONCLUSION:

To improve the quality of work and reduce the stress of work in agricultural industry, the automated machines are very useful. This AI based agricultural vehicle provides the smart work mode to the farmers and reduce the efforts in farming applications or operations. This AI vehicle is design with unique conceptual idea. The vehicle is pollution less or less carbon emission vehicle, also this AI vehicle run on solar power. The emission of carbon contain product is less due to use of electric motors as powertrain of this vehicle. To acquire the power this vehicle is come with individual wheel drive technique. To operate the vehicle with the desired agricultural tools the navigator quad-copter is use for automation of this vehicle. This paper concludes that, the use of renewable power sources in agricultural industry is effective for the improvement in farming operations. This conceptual AI vehicle is provide the solution for automation in agricultural industry in little manner.

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