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Design and Fabrication of 8 Legged Spider Robot Controlled using Bluetooth

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Abstract: ***The 8 legged spider robot is used to move anywhere . Tyre's and Wheel's are the very commonly used part's in all the automobile vehicle's . And the Tyre's and Wheel's are easily get wear. And also need a periodic maintenance. The main purpose of our research is to make an alternative for the tyre's and wheels. So in this research are used to design and develop the 8 legged robot. This are the alternative for the wheel's and Tyre's. For this legged mechanism we have choosed the (Jansen's Linkage Mechanism) the Jansen linkage is a planner leg mechanism designed by the kinetic sculptor. Theo Jansen to generate smooth walking motion and the Legs are controlled by the Bluetooth. The Arduino board are connected with the Dc motor and Bluetooth relay. The leg's movement's are operated with the help of Arduino program .Then the Dc motor and Bluetooth relay are controlled by the microcontroller. The Arduino program is manually feed to Arduino based on the leg movement requirements. These leg's can move in wet and dry surface's.***

Keywords: Jansen linkage mechanism , Theo Jansen , Planer mechanism , Microcontroller , Arduino , Bluetooth, Tyre's and Wheel's.

I. INTRODUCTION

Generally the walking mechanism are developed by imitating nature like insects movement. In this we have used the Theo Jansen mechanism .Theo Jansen is the initial inventor of this design and has created the type of kinematic contraptions from 1990. The design of leg's could replace the tyre's and wheel's this may reduce the maintenance inspection and tyre life and eco friendly to environment. The legged robots has a number of legs which are articulated which can move in any direction's. These legged robot's can walk and climb in hill station and also in staircases and the energy consumption will very less and there is no loss in any energy and it will not produce pollution on the earth surfaces. In this robot the leg's was seperated into two pairs one there is four legs these four leg's were segregated into two pairs these four leg's are connected with the center shaft. Legged locomotion is superior to wheel's. This eight legged robot are most widely suits agricultural .The adhesion force seems to be related to approaching angle between the attaching elements and the surface the maximum adhension condition reached when the angle is around 30 degree , the sliding condition occurs when the angle is smaller and detachment occurs when the angle is bigger. Now a days everyone are showing emphasis on the new design of self-adaptive robotic system .

II. OBJECTIVE

The spider mechanism robot will moving in the directions of forward and backward and also avoiding the obstacles on the paths and the Arduino board is programmed to works on the input of user and Arduino is connected with Bluetooth.

III. LITERATURE REVIEW

1) Simulation of six legged walking robots in climbing and walking [2007] – In this book the principles and how the process should be carried and the design of the robot and the mechanism and the angles of legs are discussed . The author of the book is G . Rea.
2) Design and fabrication of spider by klan's mechanism [2018] – In this article the design used for robot and the protype of the robot the structure and function of the robot also explained and the mechanism used for robot is klan's mechanism which the mechanism is after came from the jansens mechanism . The author is M. Ashok raj kumar , the article published in international journel of emerging technologies . Volume 34.
3) Arduino based Bluetooth controlled robot [2016] – In this article the Arduino connections and the programming of Arduino board and the Bluetooth connections where discussed . And also the robot is developed using the connections Bluetooth controlled with the of Arduino. The author is Subakar Roy , the article published in international Journel of engineering trends and technology . Volume 32 .

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4) Intelligent system of spider robot for the various moving functions [2009] - In this article the legs movement the angles how they will move where analyzed and they developed the result of this robots is they can move in any directions . The author is Lee J.B , the article published in international symposium on robot and human interactive communication.
5) Sensors for the robots [1983] – In this article they where been discussing about the various kinds of sensors which are used for the robots function and which sensor is suitable for what are all the process where also been discussed . The name of the author is Berry , the article published in In proceedings of robot vivion and sensory controls.

From these article we got an knowledge to explore our ideas and the process will be develop using the functions and methods to be handled and the design od the robots are also made with a unique process which is usefull to make the process more fast and easy to analyze and explore it.

IV. MATERIALS AND METHODS

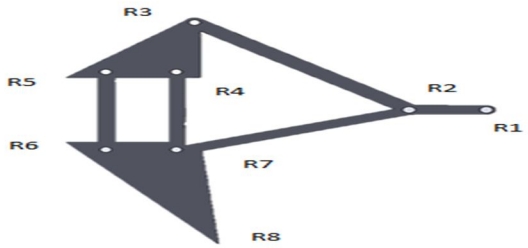
A. *The Method Used To Fabricate The Robot*

The 8 leg's Spider robot was developed using the following . The robotic system is divided into three sub system . The sub system which may includes ; the design , body structure , sensor and the control algorithm . the configuration of spider robot was made up plywood ; this is because of the weight of the plywood is less and the energy used to move the are also less due to less weight the leg's will move freely without any stress and those legs are connected with the help of long length screw and bolts are used to protect the position of leg's and easy to move without any trouble's and the angle will be maintain constantly . The eight leg's pair will be attached on the spider frame of a certain angle's that will enable it to maintain stability and the whole spider robot will be controlled by remotely .And to keep the spider design steady to avoid it from loosing balance and sloping over , So we need to assemble the leg pair's and the structure at the at angle from the conservative straight ahead . And the motor are fixed at the both center of the frame and the motor is connected with the shaft . Each side there is drive for four leg's and the these four leg's are separated into (2) two division's and they where connected with the center shaft which the drive is given from the motor. The drive from the motor is transmitted to legs with the help of driver gear to driven gear the driver gear is fixed in the motor shaft and the driven gear is fixed in the another two shaft which is connected with leg's . The are designed as per the degree of freedom and the one end of the leg's are connected with spider frame and another end is fixed with driven gear shaft . Then the motor is controlled with help of Arduino uno board which control's the motor as per user required and the Arduino board with connected with the Bluetooth and the connection between the Bluetooth and the Arduino board was Bluetooth resistor which will help's us to control the power from the battery and the battery is connected with the Arduino board and the Arduino board is already programmed manually as per user requirements the Bluetooth is connected the android . When the user control's the tilt button as per the requirements it send's the signal to the Bluetooth receiver and the receiver send's the signal to uno board and it transmit the power to the drive's .

B. *Degree of Freedom [DOF]*

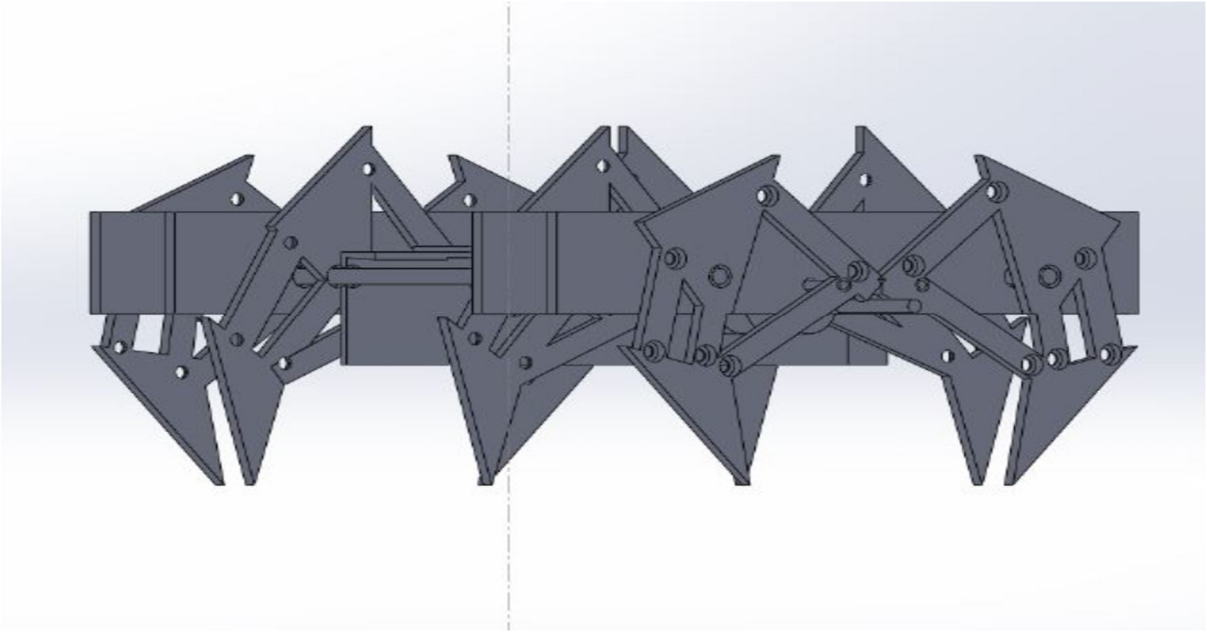
The degree of freedom DOF is the Jansen leg a 1 degree of freedom planar linkage of eight links , seven revolute joints one of them involving three binary links and three independent loops . The centers of the revolute joints of the binary links define the line segments R1 R2 , R2 R3 , R4 R7 , R5 R6 , R7 R2 ; This makes the digitigrade locomotion of great interest for the development of walking platforms when the length of the binary link connecting the revolute joint centers R5 R6 is increased by 20% with respect to its standard value in first row column " single link " the link mechanism that turns the rotational movement of crank into stepping movement this will helps to move in forward direction and reverse direction .

C. *Leg Mechanism*



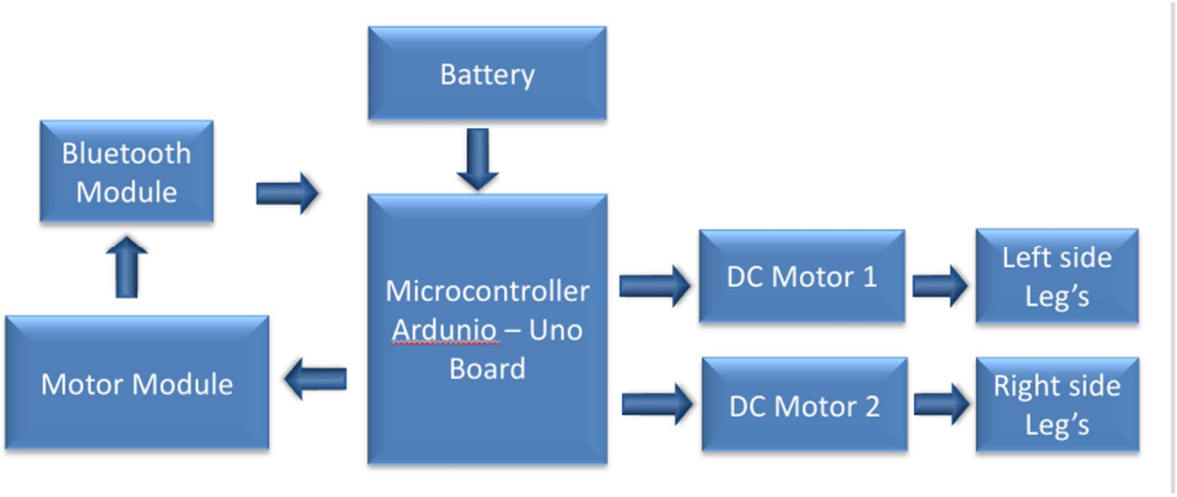
D. Design

The Design is designed using the Solid works Software.



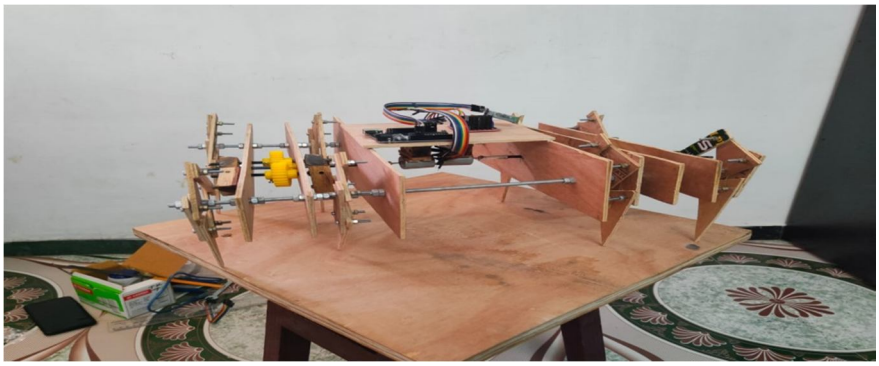
FIG

E. Block Diagram Of Spider Robot

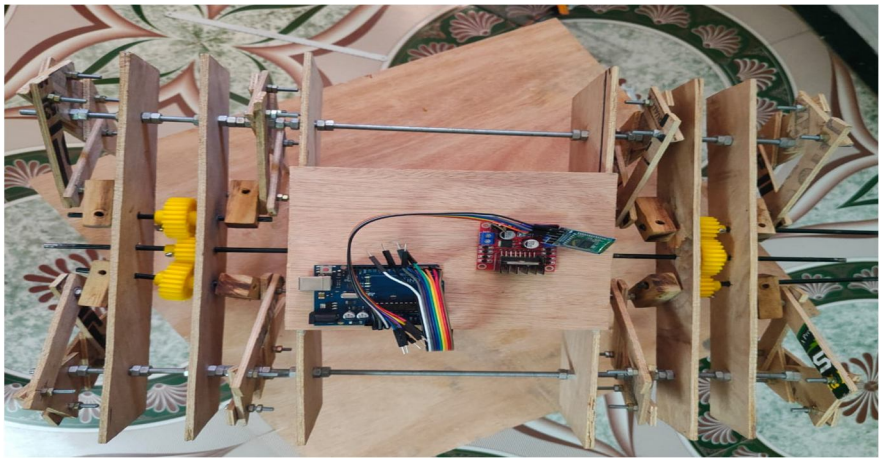


FIG

F. Result Of 8 Leg Spider Robot



FIG



FIG

V. CONCLUSION

In conclusion , this paper is reviewed some studies relating to spider robots and the design and fabrication process is highlighted and the mechanism is explained and also the how the robots will function is explained broadly and the areas of application of real life in this world and the system where detailed . The spider robot system will move alternative for tyre's and the mainly can function in the agriculture lands and hill stations which is very easy move and the maintenance cost also will be also low , so we can implement for vehicles which are used in agriculture land's and for patrolling.

VI. FUTURE SCOPE

The future scope could be many making useful things in agriculture area's and the patrolling services and in the hill stations. When the wheels are struggling to move there are the legs can move easily and the wear of materials is less and the handling cost is also less there is no human stress it can be operated easily from the particular places where they got connectivity. It can perform very well as a platform with the ability to handle stairs and obstacles to wheeled or tracked vehicles.

VII. ADVANTAGES

1) It can step over curbs, climb stairs , or travel into the area that is currently not accessible by the wheels.
2) It has a Bluetooth controls which is very helpful to operate the robot easily at a particular places.
3) It has less maintenance and construction cost.
4) A comparable walking mechanism would be one which moves at a constant velocity V, and where the foot of walker traces out a similar circular path with constant velocity V at all points on the path.
5) The most obvious advantages of the foot over the wheel is that the foot may step over inconsistencies in the terrain.
6) This results in the less loss of energy during locomotion and allows the vehicle to maintain a constant velocity and height over variable terrain.

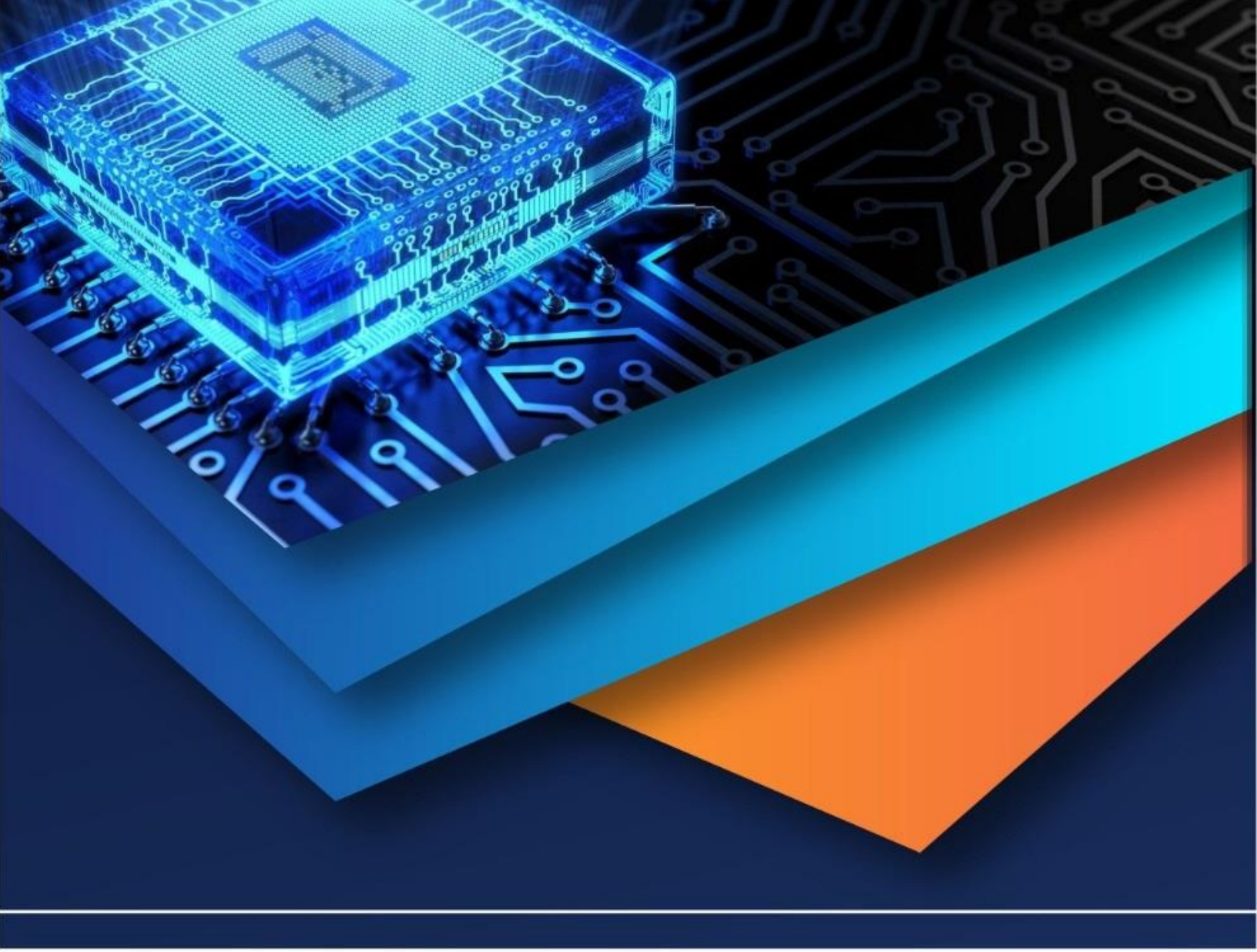
LIMITATIONS

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