FOUR LEGS SPIDER BOT

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ABSTRACT

It's outstanding that creatures can reevaluate a rough terrain at speeds which are remarkably above practically possible with wheeled vehicles. Indeed, even a private , by getting down on each of the four legs if necessary, can travel or climb over terrain which is inaccessible for a wheeled or followed vehicle. It's therefore of immense enthusiasm to understand what machines for land locomotion can do if they're intended to imitate nature. Legged robots are often utilized for space missions on extra-terrestrial planets and in risky places, for instance, within an atomic pile , giving autonomous legged robots an excellent potential. Low power consumption and weight are further advantages of walking robots, so it's important to use the minimum number of actuators. During this context, the target of this project is to find out and style a prototype of the Theo-Jansen four leg strolling robot. The goal is to develop a replacement mechanical automated walker utilizing eight bar link mechanism. The essential Theo Jansen device may be a 13 bar framework that strolls when a crank is rotated. So, utilizing linkages we attempted to imitate nature and put together certain strolling robot which can suite off-road.

Keyword: *Spider Robot; Adaptive Controller; Wireless Sensor Network; Walking Gait.*

1. INTRODUCTION:

Mobile robots are ready to use their skills and do their tasks effectively where applied. On the other hand hole manipulators that are secured at their shoulder to the bottom have restricted vary of motion that depends on wherever these ar secured down. So mobile golems are superior to robot manipulators. In mobile robots, quality are going to be achieved by incorporating a mechanism. Relying upon the two broad classes viz. three-legged mechanisms and wheeled mechanisms, mobile robots incorporating them are classified as three legged robots and wheeled robots severally. It's well familiar that three-legged robots are superior to wheeled robots [1] then are within the main target of this analysis work. For locomotion of three-legged robots a three-legged mechanism is required. Terribly few three-legged mechanisms are developed until date [2]. Easy insect leg style, robot leg style that has been utilized in RIMHO golem [3], a pair of and three degree of freedom leg style that has been utilized in SCOUT I & II robots [4] etc. are few of the mechanisms used for locomotion of robots in past. In three-legged robots, quadruped robots are easy to biped and hexapod robots [1]. So during this paper quadruped structure is preferred over different three legged structures. Generally, quadruped golem consists of a part frame that forms base to carry effort system, management system and converter [4]. It's four legs as a locomotion part [4]. For locomotion of quadruped golem, movement of those legs with reference to part frame is to be controlled. The leg of a quadruped golem is actually a mechanism.

During this paper, four bar chain mechanism in changed type has been used as three-legged mechanism for the quadruped golem. The add this paper chiefly focuses on mechanical style, trot and pace gait locomotion analysis, fabrication and experimentation of quadruped golem. Conclusions derived from this analysis work are acknowledged at the highest.

1.1 Why legs mechanism?

The most advantage of legged robots is their ability to access places impossible for wheeled robots. By copying to the body of legged animals, it's going to be possible to enhance the performance of mobile robots. To supply more stable and faster walking, scientists and engineers can implement the relevant biological concepts in their design. The foremost forceful motivation for studying legged robots is? To offer access to places which are dirty? To offer access to places those are dangerous? Job which are highly difficult Legged robots are often used for rescue work after earthquakes and in hazardous places like the within of a reactor, giving biologically inspired autonomous legged robots great potential. Low power consumption and weight are further advantages of walking robots, so it's important to use the minimum number of actuators. During this context, an objective is about during this project to develop a six- legged mobile robot whose structure is predicated on the biomechanics of insects.

2. Mechanical Design of Robot:

2.1 Robot specifications:

Before starting design of any machine it is necessary to decide its specifications. Here also performance and physical specifications of quadruped robot are decided. Performance specifications describe task related specifications and physical specifications describe robot's dimensions and weight. In this research work, quadruped robot is in a position to steer with trot and pace gaits over flat terrain. Maximum targeted speed is 20 mm/s. Robot size and weight are fixed by finalizing actuation system, system and electrical converter. Maximum total weight of electrical converter and system is assumed to be 0.5 Kg. Dimensions of legs are proportional to dimensions of frame.

3. COMPONENTS:

3.1 FRAMES AND BASE PLATE:

The model consists of a base plate and 4 frames which are fixed vertical to the bottom plate. The base plate and therefore the frames are made from aluminum. Mild steel is lightweight, ductile and malleable metal with appearance ranging from silvery to dull gray, depending on the surface roughness. It is nonmagnetic and does not easily ignite. A fresh film of mild steel serves as a good reflector (approximately 92%) of visible light and an excellent reflector (as much as 98%) of medium and far infrared radiation. The yield strength of low-carbon steel is 7–11 MPa, while aluminum alloys have yield strengths starting from 200 MPa to 600 MPa

3.2 MOTOR:

DC motor is any of a category of rotary electrical machines that converts DC electricity into energy. The most common types believe the forces produced by magnetic fields. Nearly all kinds of DC motors have some internal mechanism, either electromechanical or electronic to periodically change the direction of current flow partially of the motor.

3.3 GEARS:

Gears are very important for transmission. Gears are also useful in speed reduction. Two sets of gears are used for effective transmission. Each set consists of a smaller gear and two bigger gears. Smaller gear consists of 36 teeth and a bigger gear consists of 60 teeth, thereby giving a speed reduction ratio of 1.68. The gears are spur gears and are made of nylon plastic gears.

Spur gears or straight-cut gears are the only sort of gear.

3.4 BATTERIES:

A chargeable battery, accumulator, or accumulator may be a sort of electrical battery. It comprises one or more electrochemical cells, and may be a sort of energy accumulator. It is referred to as a storage cell because its electrochemical reactions are electrically reversible. Rechargeable batteries are available many various shapes and sizes, starting from button cells to megawatt systems connected to stabilize an electrical distribution network.

3.5 LINKAGE:

A mechanical linkage is an assembly of bodies connected to manage forces and movement. The movement of a body, or link, is studied using geometry therefore the link is taken into account to be rigid. The connections between links are modeled as providing ideal movement, pure rotation or sliding for instance, and are called joints. A linkage modeled as a network of rigid links and ideal joints is named a kinematic chain.

4. TECHNICAL SPECIFICATIONS:

4.1 FRAME:

Length : 130 mm
Breadth : 110 mm
Thickness : 2 mm

4.2 BASE PLATE:

Length : 320 mm
Breadth : 300 mm
Thickness : 2 mm

4.3 SPUR GEAR:

Pinion Diameter : 30 mm
Pitch : 3 mm
Thickness : 10 mm

Gear Diameter : 120 mm
Pitch : 4 mm
Thickness : 10 mm

4.4 LEG:

Length : 225 mm
Breadth : 30 mm
Thickness : 3 mm

4.5 LINK:

Link 1
Length : 148 mm
Breadth : 12 mm
Thickness : 3 mm

Link 2
Length : 43 mm

Breadth : 12 mm
Thickness : 3 mm

Link 3
Length : 73 mm
Breadth : 12 mm
Thickness : 3 mm

Link 4
Length : 24 mm
Breadth : 12 mm
Thickness : 3 mm

4.6 SHAFT:

Length : 110 mm
Diameter : 12 mm

4.7 CONTROL BOARD STAND:

Length : 100 mm
Breadth : 120 mm
Thickness : 29 mm

4.8 DC MOTOR:

12 Volt, 7 Ampere
500 rpm , Permanent Magnet DC Motor.

4.9 BATTERY:

12 Volt, 7 Ampere
Lead Acid, Rechargeable Battery, Work for Two hour.

5. FABRICATION OF ROBOT:

After development of CAD model, dimensions of robot hardware components and overall dimensions of quadruped robot are fixed. Robot hardware components viz. torso frame and legs are fabricated from PVC foam sheet (Sun board) material.

5.1 ROBOT ASSEMBLY:

Quadruped robot is assembled from robot hardware components, actuators (servomotors in the given case), control system (controller board and servo shield in the given case) and batteries. Assembled quadruped robot is shown in figure 10 below.

Figure: ASSEMBLED ROBOT

5.2 PROPERTIES OF ROBOT ASSEMBLY:

1. Total weight of quadruped robot assembly = 1.71 Kg.

2. Overall height = 291 mm , Overall length = 352 mm, Overall width = 280 mm.

6. MAIN MODEL;

Figure: MAIN MODEL

7. APPLICATIONS:

7.1 LOAD-CARRYING TIPPER AND TRUCKS FOR MINING INTEGRATED:

Linkage A detailed study of this robot has been done by Patnaik. He explores and analyses the Jansen linkage as a permanent replacement for the wheels of load carrying tippers and trucks used in Linkage A detailed study of this robot has been done by Patnaik. He explores and analyses the Jansen linkage as a permanent replacement for the wheels of load carrying tippers mining. The main aim of his research is to mining. The main aim of his research is to get rid of the issues related to the graceful movement of vehicles at mining sites, which is usually addressed by making roads separately for it, a time consuming and dear process.

Patnaik has chosen Jansen l remove the problems associated with the smooth movement of vehicles at mining sites, which is commonly dealt with by making roads separately for it, a time consuming and costly linkage over other

linkage over other mechanisms since it has the ability to bear huge loads while mechanisms since it has the ability to bear huge loads while keeping its body steady.

7.2 SPORTS GROUND/PITCH MARKING ROBOT MARKING ROBOT:

In most countries pitch marking is done with the help of rollers and droppers. From marking to painting, pitch marking is bot. In most countries pitch marking is done with the help of rollers and droppers. From marking to painting, pitch marking h a time consuming and tedious process .The removal of wheels is an h a time consuming and tedious process. To simplify this process researchers and engineers have started working on making robotic models of various kinds. Parekh et al. have proposed a robot without wheels based upon Jansen's mechanism for locomotion The removal of wheels is an added benefit because the terrain of sports fields is not uniform everywhere. The robot model could carry much more weight than its own weight, provided the weight is evenly distributed. The robot is capable of marking the added benefit because the terrain of sports fields is not uniform everywhere. The robot model could carry much more weight than its own weight, provided the weight is evenly distributed. The robot is capable of marking the sector with chalk powder, paint and water colour. The operator just has to feed in the distance to be marked by the robot and refill the paint tank when it is empty and the rest is handled by it. The authors propose with the help of some modifications the robot could also be used for ploughing, seed sowing and gardening chalk powder, oil paint and water colour. The operator just has to feed in the distance to be marked by the robot and refill the paint tank when it is empty and the rest is handled by it. The authors propose with the help of some modifications could also be used for ploughing, seed sowing and gardening in the future.

7.3 STAIR-CLIMBING ROBOT:

Liu et al. have built a prototype which mimics the human ankle and easily climbs stairs of different step heights. The robot is eight legged and is based on the Jansen's mechanism. The robot does not crawl or bump over stairs but smoothly like trajectory, while keeping Liu et al. have built a prototype which mimics the human ankle and easily climbs stairs of different step heights. The robot is eight legged and is based on the Jansen's mechanism. The robot does not crawl or bump over stairs but smoothly climbs stairs with human foot like trajectory, while keeping itself steady. The prototype is built with plastic materials but the authors plan to use metallic materials in future as it would reduce the deformations caused earlier due to use of plastic s believe that this invention would enable itself steady. The prototype is built with plastic materials but the authors plan to use metallic materials in future as it would reduce the deformations caused earlier due to use of plastic material. The author s believe that this invention would enable various applications especially for high speed stair climbing. Various applications especially for high speed stair climbing. A similar robot with the objective of enabling applications like rescue, information collection/detection and assistance A similar robot with the objective of enabling applications like rescue, information collection/detection and assistance has also been developed by Chord.

8. CONCLUSIONS

Our investigation showed that different elliptic circles for strolling, climbing, venturing in a place and moving back by utilizing the cyclic movement of the linkage centre. This paper is to contemplate about the Theo-Jansen four leg strolling robot. The goal is to assemble a new mechanical automated walker utilizing eight bar interface system. In future we need to utilize this robot to perform diverse kind of activities consequently by utilizing sensors. If we are making this robot using high heat resisting material at that point we can utilize this robot in atomic power plant or set up with high radiation level.

9. FUTURE SCOPE

This mechanism can be made more flexible by using different link lengths for front, middle and hind legs. Intelligence can be induced by introducing Sensors and vision to improve the effectiveness of this robot in future. Range of motion and moments available at each joint are the greatest concern as it is important for achieving stance and insect like walking.

10. REFERENCES

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