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# Design And Development Of Klann Mechanism Robot For Material Handeling

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**ABSTRACT**

**As the wheels are ineffective on rough and rocky areas, therefore robot with legs provided with klann mechanism is beneficial for advanced walking vehicles. It can step over curbs, climb stairs or travel areas that are currently not accessible with wheels. The most important benefit of this mechanism is that, it does not require microprocessor control or large amount of actuator mechanisms. In this mechanism links are connected by pivot joints and convert the rotating motion of the crank into the movement of foot similar to that of animal walking. The proportions of each of the links in the mechanism are defined to optimize the linearity of the foot for onehalf of the rotation of the crank. The remaining rotation of the crank allows the foot to be raised to a predetermined height before returning to the starting position and repeating the cycle. Two of these linkages coupled together at the crank and one-half cycle out of phase with each other will allow the frame of a vehicle to travel parallel to the ground. This project is useful in hazardous material handling, clearing minefields, or secures an area without putting anyone at risk.**

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## I. INTRODUCTION

It has been established that off-road vehicles with legs exhibit better mobility, obtain higher energy efficiency and provide more comfortable movement than those of conventional tracked or wheeled vehicles while moving on rough terrain. So there is necessity to analyze & develop these leg mechanisms in order to meet various applications. Klann mechanism is one of these leg mechanisms which consist of six-links which is used as an alternative for wheels.

Each wheel is replaced by two Klann mechanisms whose cranks are 180 degrees out of phase. To provide mobility for the mechanism required number of links and dimensional synthesis of links is required. This mechanism is used as a replacement of wheels finds applications in planetary exploration, walking chairs for the disabled and for military transport, rescue in radioactive zones for nuclear industries and in other hostile environments.

Legged robots are widely used for variety of applications, especially in the area of rescue and search operations for their ability to handle uneven terrain. Legged robots are designed and programmed to respond to various needs based on the task and offers better stability, maneuverability with energy efficiency. However any changes in the gait configuration based on the task leads to numerous opportunities as well as research challenges. Legged animals depending on the task or behavior can coordinate wide range of components and systems to adapt effectively under various conditions such as running, walking, chasing and attacking. By using one degree of freedom based on reconfiguration planar mechanism such as Klann linkage, simple control schemes can be proposed as an alternative method in Klann based reconfigurable design and implementation is presented, where a robot changes its structure morphology by changing its components and subassemblies parameters to adapt to multi-terrain and multi-task by producing six theoretically useful walking patterns.

Objective:-

- **i.** Main purpose of work is to use klann mechanism over wheel or roller mechanism for robots.
- **ii.** Reducing human efforts: Soldiers does not need to overview the danger area personally.
- **iii.** Fully automated work.
- **iv.** Pollution free work.
- **v.** Zero Maintenance cost.

 

Scope:

Though the idea is pretty old, the future scope could be many making it useful in hazardous material handling, clearing minefields, or secures an area without putting anyone at risk. The military, law enforcement, explosive ordinance disposal units, and private security firms could also benefit from applications of mechanical spider.

It would perform very well as a platform with the ability to handle stairs and other obstacles to wheeled or tracked vehicles. Because of the self-organizing feature, the improved approach treats the tasks, the robots, and the around environment as a self-organizing system, which can be automatically changed while the tasks are moving and the robots are tracing tasks. The improved approach can deal with arbitrary number of robots and tasks in dynamic environments subject to tasks being movable. The considering of the robot directions made the approach more reasonable and widely application in real world. The addition of a path tracker guarantees the tracking paths of the robots being smooth and easily applied in real robots.

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.

**Advantages:**

- Klann Mechanism makes legged mobility easier.
- It directly converts a rotation into a gait.
- Easy to build.
- Initial cost is reasonably low.
- Construction expense is low.
- Heavy load can be carried.
- It can be run in rough surfaces.
- Easy to control.
- Maintenance is less.

Application:-
It would be difficult to compete with the efficiency of a wheel on smooth hard surfaces but as condition increases rolling friction, this linkage becomes more viable and wheels of similar size cannot handle obstacles that this linkage is capable of. Toys could be developed that would fit in the palm of your hand and just large enough to carry a battery and a small motor.

Eight leg mechanical spiders can be applicable for the making of robots. It has a wide range of application in the manufacturing of robots. A large version could use existing surveillance technology to convert your television into a real-time look at the world within transmitting range.

It would also relay commands from the remote to the spider bike additional frequencies could be used to operate manipulators for retrieving the mail during unfavorable weather or taking the dog out.

It can also be used for military purpose. By placing bomb detectors in the machines, we can easily detect the bomb without harmful to humans. It can be used as heavy tanker machines for carrying bombs as well as carrying other military goods.

It is also applicable in the goods industries for the small transportation of goods inside the industry. The mountain roads or other difficulties where ordinary vehicles cannot be moved easily can be replaced by our six-leg mechanical spider.

## II. LITERATURE REVIEW

[1] R.Arjunraj et. al, This Paper Concluded that It would be difficult to compete with the efficiency of a wheel on a smooth hard surface but as the roughness of the path increases this linkage becomes more viable and wheels of similar size cannot handle obstacles that this linkage is capable of. Further, pivoting arms could be used to optimize ,The height of the legs for the waterline, Increase the platform height, Reduce the vehicle width, It allows the legs to fold up compactly for storage.

[2] Sheikh, Farrukh Iqbal, Pfeifer, Rolf, This Paper concluded that in such a robot, the change in the dynamics of the single legged hopper can be induced by the change in coupled stiffness and damping of the system, i.e., stiffness and damping of the ground coupled with the stiffness and damping of the robotic leg. It is experimentally shown by in-place hopping of a robotic leg on various grounds (stiff, less stiff and soft) that the leg can effectively adapt to changes in coupled stiffness and damping by the rate and the amplitude at which the leg length changes.

[3] Jaichandar Kulandaidaasan Sheba et .al This Paper Concluded that This paper presents the design of a novel reconfigurable Klann mechanism capable of producing a variety of useful gait cycles. Such an approach opens up new research avenues, opportunities and applications. The position analysis problem that arises when dealing with reconfigurable Klann mechanisms was solved here using a bilateration method, which is a distance-based formulation. By changing the linkage configurations, our aim was to generate a set of useful gaits for a legged robotic platform.

## III. METHODOLOGY

Study of existing system – we studied the existing different mechanism systems on the basis of their applications, advantages, disadvantages, modes of transmission and area of contacting surface of system with ground.

Literature survey – we studied recent research papers related to klann mechanism mentioned in references and studied their outcomes.

Study of klanns mechanism – The Klann linkage is a planar mechanism designed to simulate the gait of legged animal

 

and function as a wheel replacement. The linkage consists of the frame, a crank, two grounded rockers, and two couplers all connected by pivot joints.

Design of parts -
Following are the required components to design

i. Motor
ii. Spur gear
iii. Arm
iv. Crank
v. Supporting links
vi. Arm linkages
vii. Forcing link

Selection of motor and designing of gears – we will select desired motor and design gear pair on basis of requirements.

Fabrication – According to design we are going to develop the actual model in workshop.

Experimentation & testing - The study of actual demonstration of model will be done.

## IV. CONSTRUCTION OF KLANN'S MECHANISM

The main objective of our project is to replace the function of wheel in order to overcome the difficulty of travelling in uneven terrain. In this mechanism links are connected by pivot joints and convert the rotating motion of the crank into the movement of foot similar to that of animal walking. The proportions of each of the links in the mechanism are defined to optimize the linearity of the foot for one-half of the rotation of the crank. The remaining rotation of the crank allows the foot to be raised to a predetermined height before returning to the starting position and repeating the cycle. Two of these linkages coupled together at the crank and one-half cycle out of phase with each other will allow the frame of a vehicle to travel parallel to the ground.

It has been a hobby for a number of years to develop a bicycle without wheels that could walk. It would move on legs and resemble a large insect. A linkage was developed that satisfied the design criteria and several small-scale prototypes were built that demonstrated the concept. Applications for the linkage go beyond human-powered machines. The links are connected by pivot joints and convert the rotating motion of the crank into the movement of a foot similar to that of an animal walking. Two of these legs coupled together at the crank can act as a wheel replacement and provide vehicles with a greater ability to handle obstacles and travel across uneven terrain while providing a smooth even ride.

Initially it was called the Spider Bike but the applications for this linkage have expanded well beyond the initial design purpose of a human-powered walking machine. This linkage could be utilized almost anywhere a wheel is employed from small wind-up toys to large vehicles capable of transporting people. The relationships for the linkage have been established and are covered by several patents. The simplicity and scalability of the walking device, along with a little imaginative engineering, lead to numerous possibilities. The Klann linkage is a planar mechanism designed to simulate the gait of legged animal and function as a wheel replacement.

## V. DESIGN OF KLANN MECHANISM ROBOT FOR MATERIAL HANDELING.

The all components of Klann mechanism robot is designed in CATIA software.. The CATIA model is as shown in following fig.

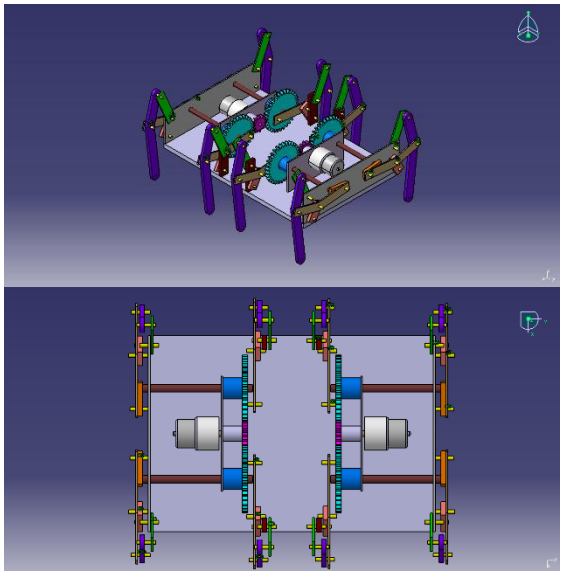

fig. 3D CAD Model

## VI. CONCLUSION

This project can step over curbs, climb stairs, or travel into an area that are currently not accessible with wheels but does not require microprocessor control or multitudes of actuator mechanisms.
It would be difficult to compete with the efficiency of a wheel on smooth hard surfaces but as conditions increase rolling friction, this linkage becomes more viable and wheels of similar size cannot handle obstacles that this linkage is capable of.
Pivoting suspension arms could be used to optimize,

- The height of the legs for the waterline.
- Increase the platform height.
- Reduce the vehicle width.

Also it allows the legs to fold up compactly for storage and delivery. Thus, all the principles and mechanisms involved in a walking robot using are studied and the practical difficulties in fabrication of a working model are understood. If implemented properly, automobiles moving on legs using Klann Mechanism have the potential to change mobility as we know it.

## VII. ACKNOWLEDGMENT

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