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# Design & Construction of Pipe Climbing & Inspection Robot

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***Abstract:*** ***This project describes the concept, design and prototype implementation of a pipe climbing-robot. Pipe climbing robots became a stimulating area for research within the last years. Several robots are developed to unravel this given problem. Every construction has its own advantages and disadvantages. The goal of this work was to style another pole climbing robot that uses a replacement clamping principle. Pipe climbing robot has many applications in industrial field as we all know in industry , there are many chemicals that are harmful to human health and therefore the pipelines of which are needed to be inspected frequently. Human can't be allowed to try to to such operations, hence this robot are often very useful in such tasks of inspection. Boilers even have the similar conditions, as temperature and pressure inside the boilers is extremely high, hence to see the pipelines this robot are often used at such places.***
***Keywords: Pipe climbing robot, DC motor, Wireless Control***

## I. INTRODUCTION

The design is inspired by the human-climber's action which relies on a strap around his waist. A climber may push his weight back to supply more torque around his waist to make higher force on his foot. The principle of the development is that the middle of mass features a fix distance to the pole, representing the body of the climbing man, which has the effect that the traditional force between the wheel and therefore the pole is high enough to drive upwards.

Robots which will climb poles are under development and are expected to be utilized in the inside/outside maintenance of buildings, observations of disaster scenes from a height, pruning trees, and more. As an alternate , we developed and analyzed a climbing method the climbing man, which has the effect that the traditional force between the wheel and therefore the pole is high enough to drive upwards.

Robots which will climb poles are under development and are expected to be utilized in the inside/outside maintenance of buildings, observations of disaster scenes from a height, pruning trees, and more. As an alternate, we developed and analyzed a climbing method. Based on this definition a really flexible walking machine, which may walk on very rough and steep terrain shouldn't belong to the category of climbing robots. within the following climbing robots are going to be distinguished into 3 classes supported their locomotion ability:

*1)* Wheeled-driven or chain-driven machines,
*2)* Legged locomotion,
*3)* Locomotion based on arms and grippers.

Since the top of the 80ties climbing robots are examined for various sorts of application scenarios everywhere the planet. E.g. at the top of the 80ties and start of the 90ties in Japan several national projects concerning climbing robots for specific application scenarios are developed. These include cleaning robots for glass walls, ship hull cleaning robots, rescue robots for fire brigades, inspection robots for steel tanks and wall. Most of the developments were stopped because there still exists adhesion problems. Also the value for the event of such machines were too high. At the top of the 90ties mainly in Europe several different prototype machines are developed for various sorts of applications just like the inspection of pipes and ducts within the petrochemical industry, maintenance and inspection add the development and nuclear industry or cleaning robots for huge class walls.

### *A. Problem Statement*

Design and develop a prototype model of showing the concept of automatic pipe climbing robot which can show the working of application of robot climbing vertically over a pipe. Also fabricate the model of an equivalent which can show the working desired by pipe climbing robot.

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## II. LITERTURE REVIEW

*A. Cengiz Yilmaz, Prof. Dr. Roland Y. Siegwart[1]*

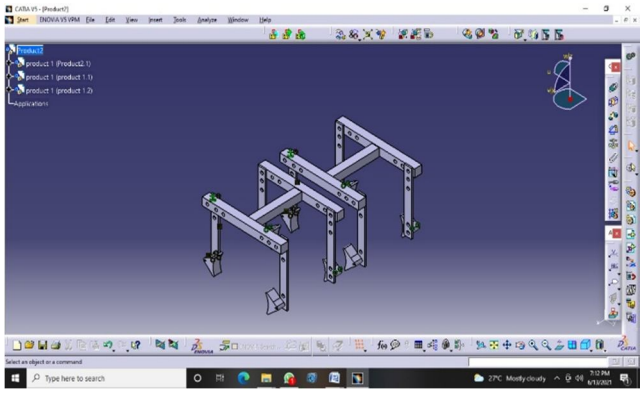
This is a search project within the field of pole climbing robots for the autonomous systems Lab at the ETH Zurich. the subsequent thesis describes the analysing and therefore the design of a pole climbing robot that uses a replacement clamping principle. At the start former designs are compared. After the analyzing of the new mechanism, further development steps are shown with the main target on the chassis, where computer simulations are used. Finally the development of a scaled prototype together with his characteristics is presented.

*B. Yasuhiko Ishigure, Haruhisa Kawasaki [2]*

A climbing robot with a postural adjustment mechanism for conical poles is presented. The climbing method driven by servomotors with a warm-wheel reduction mechanism can rest on a tree by using its own weight with none energy expenditure. to understand both straight climbing and spiral climbing for conical poles, a postural adjustment mechanism is required to maneuver the steering mechanisms of the active wheels smoothly. We present the planning of the robot's two link arm mechanism with 1 DOF because the postural adjustment mechanism.

## III. SYSTEM ARCHITECTURE

The prototype model contains eight legs mounted in four rows, each leg has its separate motor for driving purpose. Also the spring arrangement is provided for gripping the pipes having different diameters. The frame has hinge joint for opening and shutting the model. once we fix the robot over any pole and press the toggle the all the six motors start working and moves the robot in forward or reverse direction consistent with the input . The forward or backward motion of the motor is depend upon the polarity of the motor, which is modified with the assistance of toggle switches.



## IV. SYSTEM DESIGN

*A. DC Motor*

Almost every mechanical movement that we see around us is accomplished by an electrical motor. Electric machines are a way of converting energy. Motors take electricity and produce energy. Electric motors are wont to power many devices we use in lifestyle. Motors are available various sizes. Huge motors which will take a lot of 1000's of Horsepower are typically utilized in the industry. Some samples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills. Samples of small motor applications include motors utilized in automobiles, robots, hand power tools and food blenders. Micro machines are electric machines with parts the dimensions of red blood cells, and find many applications in medicine. Here we are using 2 DC motors one for clamping purpose i.e. for vice, second for linear movement the pipe.

*B. Features*

RPM=100 rpm
5 kg torque-DC motor
Voltage-12v

*C. LEGS*

A leg is allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines.

*D. Spring Arrangement*

Springs are flexible machine elements used for controlled application of force (or torque) or for storing and release of energy . Flexibility (elastic deformation) is enabled thanks to cleverly designed geometry or by using of flexible material.

*E. Fasteners (Nut and Bolt)*

A nut may be a sort of fastener with a threaded hole. Nuts are nearly always utilized in conjunction with a mating bolt to lock two or more parts together. the 2 partners are kept together by a mixture of their threads' friction, a small stretching of the bolt, and compression of the parts to be held together. Bolts use a good sort of head designs, as do screws. These are designed to interact with the tool wont to tighten them. Some bolt heads instead lock the bolt in situ, in order that it doesn't move and a tool is merely needed for the nut end. the primary bolts had square heads, formed by forging. These are still found, although far more common today is that the hexagonal head. These are held and turned by a spanner or wrench, of which there are many forms. Most are held from the side, some from in-line with the bolt.

*F. Advantages*

*1)* Saves manual effort
*2)* Good gripping power.
*3)* Can climb on pipes of variable diameters

*G. Applications*

*1)* Pipe inspection in chemical systems
*2)* Ship cleaning/inspection
*3)* Welding robot
*4)* Airplane cleaning and inspection
*5)* Oil tank inspection
*6)* Nuclear plant inspection
*7)* Steal bridge inspection
*8)* Cleaning and Inspection of glass wall

## V. CONCLUSION AND FUTURE SCOPE

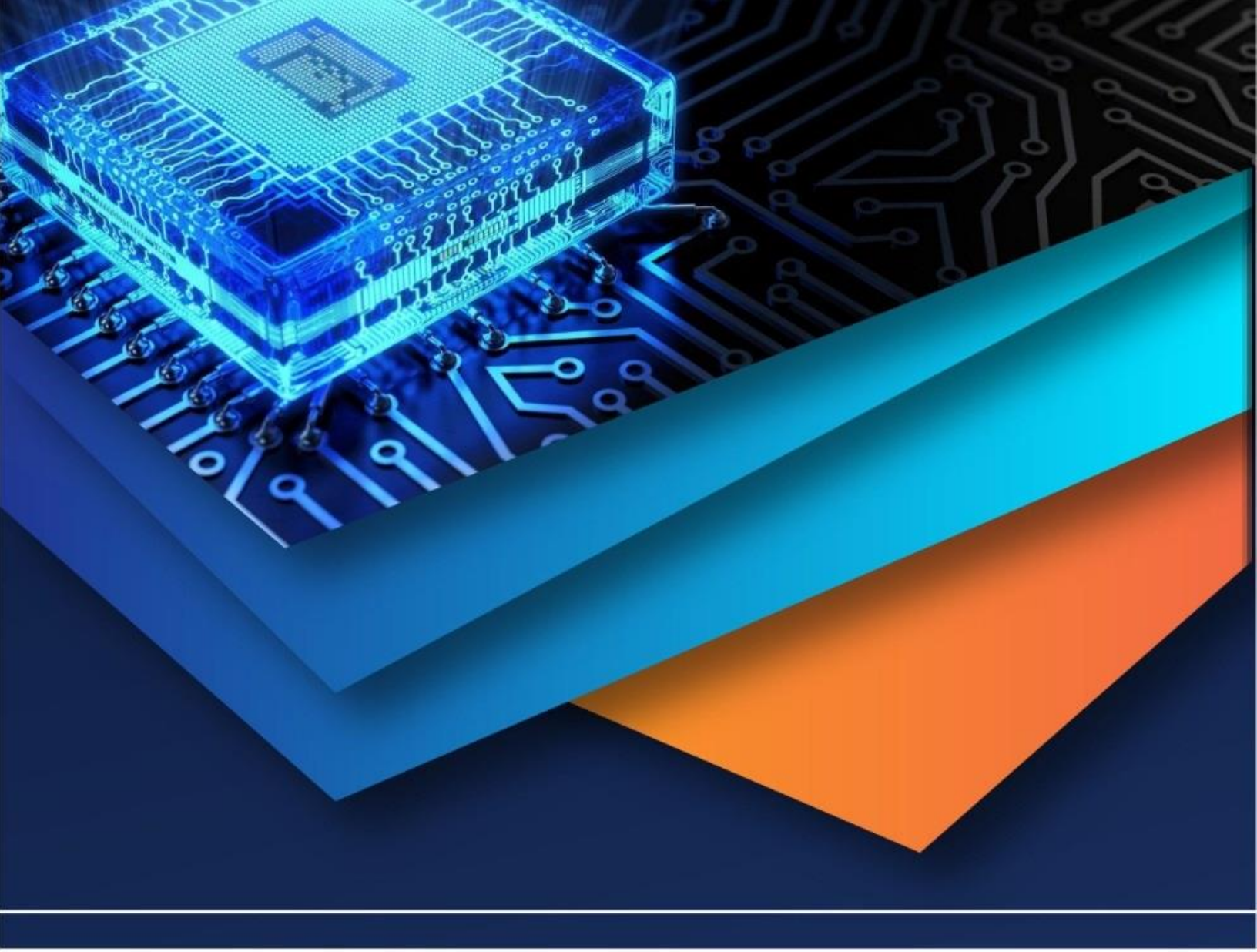
We developed a completely unique climbing robot which may move in upward and downward direction. Also it can remain stationary supported its own weight. So we've really made a pleasant experience with this work and have learned tons of latest things during this section, which were alien on behalf of me at the start . I even have the knowledge to style and produce a mechanical construction for research and also for my interests within the free time. From now of view the goal is attained.

There's large scope for further development within the robot we designed, we've discussed a number of the points below:

*1)* Microcontroller are often designed to raised the control of the robot movement.
*2)* Obstacle detection and path finding are often integrated within the project prototype.
*3)* Further improvements like appropriate mechanism for turning the robot, performing lateral motion are often implemented.

## REFERENCES

[1] Bretl, Tim, Jean-Claude Latombe, and Stephen Rock. "Toward autonomous free-climbing robots." Robotics Research. The Eleventh International Symposium. Springer Berlin Heidelberg, 2005.
[2] Salice Peter1, Jayanth M2, ArunBabu M.K3, Ashida P.V4, Akhil K.T5 “Design and Construction of a Tree Climbing Robot." International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 4, April 2015
[3] Saltarén, R., et al. Climbing with Parallel Robots. INTECH Open Access Publisher, 2007.
[4] Fauroux, Jean-Christophe, and JoëlMorillon. "Design of a climbing robot for cylindro-conic poles based on rolling self-locking." Industrial Robot: An International Journal 37.3 (2010): 287-292.
[5] Feeder Pipe Inspection Robot with an Inch-Worm Mechanism Using Pneumatic Actuators, Changhwan Choi, Seungho Jung, and Seungho Kim, International Journal of Control, Automation, and Systems, vol. 4, no. 1, pp. 87-95, February 2006.
[6] A Compact and Compliant External Pipe-Crawling Robot, Puneet Singh and G. K. Ananthasuresh, IEEE Transactions On Robotics, Vol. 29, No. 1, February 2013.
[7] Rapid Pole Climbing with a Quadrupedal Robot, G. Clark Haynes, Alex Khripin, Goran Lynch, Jonathan Amory, Aaron Saunders, Alfred A. Rizzi, and Daniel E. Koditschek, IEEE International Conference on Robotics and Automation. May 2009.



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