A Review of Snake Robot system For Future Approach

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Abstract- ***The development of technology has come up with the invention of Robots. They performing a various process in everyday life and variety of tasks in every field as Agriculture , aeronautics, production industries, military and space industries. probably the greatest achievement of robot is cooperation between the humans. Snake robots are robotic mechanism designed to move like biological snakes. The unique features of moving over or climbing all most all kind of terrains, muddy, rough, watery, narrow cracks, tall trees and his mobility. Snake robot can work as a wonder to reach challenging and cluttered environments where it is possible or too dangerous or narrow for human beings to operate, snake robots can be used in various fields like Agriculture, sanitation, Surveillance, Fire fighting, maintenance of complex, nuclear plants, pipe lines intelligent services, exploration, research, education, military, disaster management and rescue operation. Advantages of snake robot is long and flexible body, which gives them a potential to move and operate in challenging environment. The unique features, performances and degrees of freedom of snake robots make them the important topic for research. The purpose of this study to review the applications, methods and Future trends of snake robots.***

Keywords-Snake robots, Applications, Feature trends.

I. INTRODUCTION

Many scientific innovations have revolutionized the human life like discovery of fire and invention of wheel, electricity, Computers, airplanes, mobiles and Satellite etc and Robotics is one such boon of science.Robot is a automatic mechanical device which is used to handle and resembling a human or animal. Robots are guided by computer program or electronic circuit theory. They replace human and performing a repetitive and dangerous tasks. The use of robots in military combat raises ethical concerns. The possibilities of robot autonomy and potential repercussions have been addressed in fiction and may be a realistic concern in the upcoming days. Basically Robot is capable of performing tasks such as locomotion, sensing the harmful gas, sensing the humans beneath the surface metal detection. Robot is an autonomous vehicles comprising of wireless camera which can be used as a spy and Blue-tooth used to control it wireless. Snake robots which are specially designed and programmed for the purpose of locomotion(moving from one place to another).These specialized robots can move on difficult geographical reliefs like mountains or hilly surfaces, deserts, rough terrains, wild forest underground, underwater in narrow and difficult places like pipes, drains, gaps, holes, sewers, and climb tress, ladders etc, They can also face extreme difficult conditions some of these places are inaccessible or very difficult or life threatening to reach and where some of these places like small holes, pipes, cracks are beyond reach of normal human being, The locomotive robots can explore in many places easily. Due to this unique features robots are been widely used like space mission, military operations, rescue operations, Oil refineries. There are various design in snake robots like wheeled and legged like transport robots, human robots, animal robots etc. The king reptiles snake is blessed with unique features of moving over or climbing all most all kind of terrains, rough, muddy, watery, narrow cracks, tall tress and his features mobility inspired the research of snake robots. At present snake like robots can be mainly classified into three types: ground creeping snake like robots, under water swimming snake like robots and climbing snake like robots. The climbing robots can also be divided into inner climbing and outer climbing. The process of winding and climbing can be considered as the multi body coupling of the robot, As well as the result of the multi body dynamic coupling of the contact coupling between the snake body and the surface of the conductors. Two locomotion modes both results in climbing by snake like robot on high voltage transmission lines but their movement efficiency is low. The climbing improves the speed of inspection in straight lines.

Researches on snake robots has been conducted in many countries for several decades. The countries like Japan, Israel etc are already using snake robots successfully for Search, Rescue and military operations. where it may be too dangerous or narrow to operate for human beings. Snake robot is an innovation and we look forward to use wide range of applications. Wheel based mechanism constitutes backbone of most ground based means of transportation, On relatively smooth surface, such mechanisms can achieve high speeds and have good steering ability, unfortunately rougher terrain makes it harder, it not impossible such mechanism does not move. Snake is one of the creatures that exhibits a excellent mobility in various terrains. It is able to move through narrow passage and climb on rough ground. These property exhibits mobility is attempted to recreated in the robots that look and move like robots, The Snake robots have high degrees of freedom without using active wheels and they are able to locomote. Snake robots suits a wide

range of applications. The rescue operations in earthquake areas. The snake robot could crawl through destroyed building prior to the arrival of rescue personnel. The snake robots used for surveillance and maintenance of complex and possibly dangerous structure such as power plants. In city it could inspect sewage system looking for leaks or aiding fire- fighters. Compare with wheeled and legged module robots the snake robots have high stability and good terrainability. The exterior can be completely sealed to keep dust and fluids out. After Earthquake many people are buried under ruins. Rescue is very important in present day snake robot is very useful in tool in climbing into ruins to detect the people. In such cases collapse of houses and building in large areas is almost inevitable. Hence searching for victim and subsequent rescue operations from the rubble of collapsed building are major problems that must be faced and planned well ahead from natural disaster. However these operations is very difficulty for human workers and even for drained police dogs. Further these places where most of the victims are trapped and most cases it is inaccessible using traditional methods and existing technologies. Snake acquire many advanced motions and features capabilities, Their body can function as a "fingers" where grasping objects However it is their long slender and smooth articulated body shape that makes them especially suited to enter and move inside the small cracks, gaps such as encountered in the disaster sites. snake robots follow the all forces it touching and know the environment. force feed back control is used to cross obstacle. In order to inspect narrow and unstructured environment such as disaster site snake like robots should have rugged the construction, but at the same time be sufficiently sensitive to detect contact with environment. In addition control adopt the robots for all environmental conditions. Robots are enhanced to be robust and sturdier giving the guarantee of success in the risk prone environment. Similarly more recently the development of Automated Guided Systems has resulted in the induction of autonomous robots in the industrial scenario which have been successfully used for fulfilling roles such as in logistics and materials handling At the same time, a lot of work has been directed towards the development of intelligent navigation systems which allow maximum workspace adaptation and flexibility. Similarly work has also been directed towards the development of improved ultrasonic and optical or vision based sensors for compatible utilization with the advanced navigation guidance systems. However the soft robots performs the variety of tasks and operations. They replaced a human in many ways.

Snake robots have following characteristics:

1) Information acquisition from surroundings,

2) Prolonged operation without human intervention

3) Physical &Emotional stabilization by him

4) Transportation of victim

5) Detection and identification of human bodies

6) Equipped with multitude of sensor

II. LITERATURE REVIEW

Shigeo Hirose et al(2002)

These paper introduced a new paradigm called snakes and strings for rescue applications. It can be advantageous applied to assist the snakes like robots and built mobile robot system that move around the disaster area. Snakes stand can skillfully move around debris and stings means robotic system using stings or tethers, These papers shows the mechanical implementation of robots like snake using control algorthim more reliable and efficient.

Pal Liljeback et al(2008)

This paper shows the mathematical3D model for kinematics and dynamic motions of modular snake like robot. The robot is actuated by using pressurized air. Control strategy was proposed by robot based or hypothesis at different grit pattern based on equation. The hypothesis is validate through the simulation of mathematical model. observations of locomotion of physical robot gives a crude qualitative validation and friction. They describes the important parameters for locomotion.

Mark Yim et al(2011)

The author investigates the paper and expressed the robot is used for space applications, perform a variety of tasks and well as suited conditions. They serve a different tools, saving space, saving weights, They introduce the self-reconfigurable modular robot, Poly-bot has a significant potential in space manipulation and number of characteristics suited to perform space exploration. In an energy efficient mode in open environments to over come large obstacles.

Julian Colorado et al(2010)

The paper used a Biological inspired methods to demonstrate lateral undulation planar gilts for efficient control high speed motion as a terrain surface. Dynamic model of simulation in non wheel snake robots has discussed, Speed boundary is performed in various manner simultaneously. A multi functional robot is developed for experimentation and analysis of efficient serpentine locomotion.

Joseph C.Koo et al(2006)

The author investigates the problem of locomotion process and large amount of coordinate is used to make sure that desired movement occurs. They simplify the control of snake robot and produce the important locomotion strategies. A model of snake like robot was built in rigid body dynamics simulator. The results shows a feature for

rubble field obstacle navigation. It can reduce the time to such paths and feasible. The robot learning algorthim performs well in allocation and wiper level motion planner would be able to chart around course around obstacle.

Zhang,Yabin ding et al(2012)

In this paper, a vision-based control strategy techniques is used to perform high speed pick-and-place tasks on automation product line. Relevant control software is Developed. Using Delta robot to control a sucker to grasp disordered objects from one moving conveyer and then place them on the other in order. CCD camera gets one picture every time the conveyer moves a distance of *ds*. Objects position and shape are got after image processing. Target tracking method based on "Servo motor + synchronous conveyer" is used to full-fill the high speed porting operation real time. Experiments conducted on Delta robot sorting system demonstrate the efficiency and validity of the proposed vision control strategy.

Lu-Yan-Hui et al(2015)

In these work author described the Snake robots serpentine locomotion effect is simulate and analyse using ADAMS software Relationship between motion programmable and mechanical structure characteristics together with serpentine gain parameters. Simulation results shows the density ratio influence on the motion performance and energy consumption. The underwater snake robot have greater density, speed, output power. Increasing oscillation performs the improve forward speed of robot, Consideration of density ratio and serpentie gait parameters simultaneously makes the virtual prototype more simulate the movement and force of prototype snake like robot.

Pettersen et al(2013)

The objective of the paper shows a research has been evaluated in understanding of snake robots locomotion through analytical equation of

motion. The two mathematical model techniques has been taken for snake robots to investigate the stabilization and control properties. Average theory is used for derive the properties of velocity dynamics of snake robots using lateral undulation. furthermore straight line path follows the controller was proposed and cascaded system was employed to prove the controller stabilizes the straight path.

Frantisek Trebuna et al(2015)

These paper deals the concertina locomotion of snake robots using mathematical model and derived by using the homogenous transformation matrices. Simulation results has evaluated using MAT-LAB. The critical point is easily evolved by required torque of first static segment in order and other to move forward direction. Results shows the different simulation of snake robots, They expose the uniqueness of kinematic configuration using revolute as well as prismatic joint.

Nidhi Choudhary et al(2015)

In these paper author express the features of snake like robots and its applications in various fields. It can wonder to reach challenging and cluttered environments, They performs the activity in variety of fields as Nuclear plants, Pipelines, Intelligent services, Education, mining, Disaster management, The unique features of Degrees of freedom in snake robots makes them accountability, Worth investment and applicability.

Hadi Kavani et al(2011)

In these paper author shows the 16 link snake robots in serpentine locomotion using two friction models, They investigate the both Columns and viscous friction model. Dynamic and kinematic motion of snake robot is evaluated by using set of equations and the results are performed, Using Taguchi method optimum parameters effects the performance of snake are determined. The WEBT software is used for modelled of snake. ANOVA results explained the important of friction model and obtained the results of 52% and 32% impress in robots.

Jure Bezgovsek et al(2008)

The paper work shows the development of snake robots and mimics the movement, They design and developed the 6 link and the torque actuators modified the shape of snake robot, It is controlled by personal computers. In experimental investigation velocity, Head Trajectory of robot is analysed the feedback information contains the position, indication of obstacles. In closed loop control system is used for tracking .

Kamleswari et al(2013)

This paper concludes the functionality of snake robot in heart surgery, Instead of others they are opening up you rib cage for heart operation. snake robots have tiny cameras, scissors, Forearms and even advanced sensors is used in the work, They able to progress the snake robots have little hands inside the patient as if surgeon has been shrunken and works on heart valve, Improvement of mechanical design is reliable in various ways. Design process of thinner wire is used for hold purpose. The current implement work gain the efficiency of robotic technology.

Wang Wei et al(2013)

In these paper author investigate the methods of snake like robot climbing a High voltage Transmission line. The motion of mechanism of robots helps for clamping the obstacle navigation. Models of kinematics and kinetics coupled with robot and line environment, They put forward position algorthim to Track and improved the robot clamping obstacle navigation, Through the simulation

method of dangling the obstacle is used for winding obstacle navigation.

Shang-Wei Yen et al(2008)

These paper describes the design of Bio-metric snake module at different kinds includes wheeled arm, non wheeled arm, and non wheeled cubic arm. By using mechanism Software they have assembled the three module. several scenarios have been test and analysis is perform using surveying biometric materials. According to the simulation results the effect of motion of robot is caused by different configuration of unit module. Parameters of locomotion modes and condition of environments.

Lee Vuen Nee et al(2015)

This work shows the development of laboratory scale like robot for pipeline inspection service. It is faster and mobility in horizontal pipeline based on Lego-mind strom. Bluetooth connection is used for real time data transmission. These wheeled type robot is closed drive mechanism for this PIR in order to improve the ideal speed of inspection process. From experiment PIR is proves they able to detect at high accuracy of 90% and 70% of Transverse and longitudinal cracks.

Gianni Ferreiti et al (2007)

The Paper using DRTS tool to conceived the support of design and development of the controller of Dexterous Robot Arm a lightweight 7DOF space robotic arm. They develop real-time simulators of complex electromechanical systems by exploiting the most powerful non real-time modeling and control design tools. Interface blocks to be included within the Simulink and Dymola Model and validation work carried out on a joint prototype in the early phase of the arm development process could be fully included in the real-time simulation model, achieving quite accurate and reliable results. The end of real DEXARM controller can be interfaced to drive the arm real-time model for tuning, testing and checkout purpose. effort has been devoted to create a human machine interface able to support the input of motion commands and force disturbances.

Dipak Patil et al(2015)

The main objective of project is to used as Border security service by camouflage technology and has been successfully accomplished by wireless using Blue-tooth module driven by an Android App. PIR sensor principle to detect men direction and distance of obstacle. By using PIR Sensor transmitter receiver we can detect the obstacle coming in path. Gas sensor and metal detector are also being used for sensing the toxic gases and the metal weapons if any. In this system camera is to transmit the data from border to the official area or headquarters. In the scanning path if any obstacle or enemy is detected then firing starts and control action take place. It is possible to provide 24 hour security**.**

Ankitapatel et al (2014)

This paper shows a controlled robot system in economical solution and used for different sophisticated robot applications. control system consists of Touch screen and Zig-bee modules, a microcontroller that collects and controls the robot. Spying area in military ground where enemy stay can be took before taking any action. Robot with a camera attached to it. This proposed design and implementation touch screen controlled spy robot by using Zig-Bee technology will be used to control robot using the touch screen from certain rang of distance using wireless communication multiple flying robot Protocol can easily control the multiple flying robot.

III. SNAKE INSPIRED ROBOTS

3.1 Survey of functions

Snake have a wide range of locomotive capabilities, ranging from crawling and burrowing to climbing and even swimming, while all snakes have a similar structure, they do not exist in size and aspect ratios, snakes range in length from between 8000mm for reticulated pythons and anacondas, to substantially less than 250mm long for smaller varieties. Snake body are elongated forms that consist of a long back bone made of any vertebrae.snake inspired robot consisit of 100-400 vertebrate and the design of each vertebrae allows small motions in both lateral and vertical directions.they do not allow any twisting however and thus act as a compliant universal joints.each vertebra allows rotation of 10-20 degrees in the horizontal plane and between 2-3 degrees in the vertical plane and vertebra allows motion in both lateral and vertical directions.

3.2 Advantages of snake inspired robots

Due to their elongated form and lack of legs,snakes have compact cross section and thus can move through very thin holes and gaps, Like wise Snake inspired robots have much thinner cross sections than other robots with equivalent size and capabilities, In addition to that Robot have thinner cross section, Snakes also have the ability to climb up and over obstacles that are much taller than their body height. That is done by lifting the front half of their long bodies, Snake inspired robots can lift its body up and over obstacles much larger than most legged or wheeled device. The properties much desirable when moving through complex and cluttered environments. Snakes have redundant that rely on the same kind of joint and structure repeated many times. If one joint fails the snakes can continue to locomote. simplicity of the design also means that the snake does not have any fragile appendages that can easily break.

Snakes used by Gaits for locomotion. Because their bodies are constantly in contact with ground at many different

points. It is difficult to knock them over especially lower center of mass and doesn't lift the bodies of the ground much during locomotion. The locomotion use of relies on the large amount of contact between posterior and ground. the large surface gives the snake good traction characteristics in variable environments. Whereas one leg or wheel in a Tradiational kind of robot may slip, the large contact surface of a snake inspired robot would make this occurrence less likely. Snakes are very versatile and can act as both locomotors and manipulators, they can use their bodies to wrap around the objects to grasp them. This can be seen in the climbing action across tree Branchesor when a constrictor is clenching its prey. Since one Structure can do both things, the need for mechanisms to Achieve different tasks is eliminated. Despite frictional opposition to their locomotion, Snakes actually have been shown to consume a comparable amount of energy to other biological forms with similar sizes, weights and speeds. this can be explained by the fact that snakes do not perform a significant amount of lifting their body in their motion and they also do not consume as much energy by moving different appendages like legged animals.

3.3 Robot with Passive Wheels

The first category of snake inspired robot designs to be covered is arguably the most well known. Snake-inspired robots with passive wheels. Since their introduction by Shigeo Hirose, A number of current robots designs executed lateral undulation using passive wheels to mimic snake motion. Lateral undulation Motion is considered one of the fastest ,most common modes of the travel for snakes and is employed by both land bound snakes and swimming snakes. Serpentine motion is also one of the most recognizable snake locomotion gaits by the general public. It is described by a series of s-shaped, sinusoidal-like curves that the body forms while in execution .In most robots ,this motion is usually mimicked by the utilization of serpenoid curve ,introduced by Hirose, and using passive wheels to resist lateral movement of the robot's segments.

3.3.1 Active cord mechanism (ACM-III)

The ACM III Introduced by S.hirose consisted of 20 links and was capable of only 2d motion. At the core of hirose's theories about snake locomotion was the fact that the scale pattern produces anisotropy in the friction coefficients between the lateral and tangential frictions on their ventral surface. This concept is the basis for forward propulsion using serpentine gait. In order to mimic the function the scale snake perform pattern in robot. the small wheels on caster on the bottom of each link facing the tangential direction of the length of robot. this results in very low friction coefficient in tangential and forward direction. Link were connected using powered joints that allow the rotation relative to one another and locomotion was accomplished by propogating wave through propagating a wave in the form of serpenoid curve through the robot. locomotion was accomplished through changing shape like real snake. robot was mostly demonstrated the serpenoid curve developed by hirose. each joint is actuated by servo system that consist of 10W DC motor and potentiometer..tactile sensor allowed the robot to react to it environment and achieved a forward velocity of 375mm/s.

3.3.2 ACM-R3

Hirose later his applied results with the ACM Robots an improved design called the acm-r-3. The difference of previous design were that capable of 3d motion and it has large wheels. additional functionality system they can roll against contacted obstacles. links are connected at all components within a shell that had a orthogonal axes of rotation on each end.

Fig. 3.1 ACM R-3

The design provided a market improvement over the first ACM because it was self contained it had on board power and self controlled. It is to be more functional in actual search and rescue applications it had a width and height of n110mm diameter passive wheels. It had a total length of 1755mm and weighed 12 kg. The maximum twist angle of any joints was 62.5deg in each direction. Hirose accomplished by using servometer that could provide maximum of 19.1 Nm of Torque and joint speed of 36Deeg/s. It the robot equipped with sensor not however the robot was commanded by operator with an F/C Controller. It contains battery for power. The design provided an extra DOF such that robot could lift up over obstacles. The design however required a flat enough surface to allow the wheels to roll in order to achieve locomotion.

3.3.3 ACM-R5

The ACM-R5 was an amphibious designed by Hirose. Joint between each segment or module of the robot consisted conducted by the general categories by snake inspired robot design. Robots with passive wheels & robot based on undulation using linear expansion and using vertical waves. The universal joint acted as a bone and bellows acted as a integument, an enveloping layer, universal joint had one passive twist joints at the intersection point of two bending axes to prevent

mechanical interface with bellows. It consisted of nine segments with 2 DOF joints between segments.

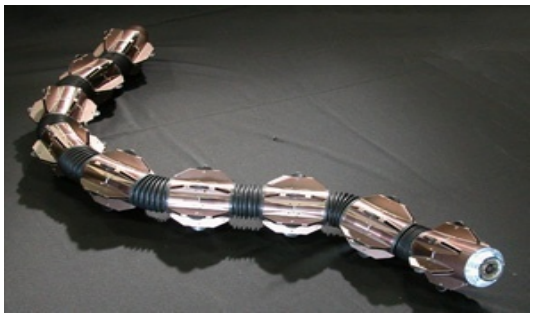

Fig. 3.2 ACM-R5

To generate propulsive force the robot need a resistive property to allow it to glide freely in a tangential direction, Due to the inclusion of pedals and passive wheels around the body of each segment,the robot obtained that the resistance property on both ground and in water. The robot total weight was 7.5 kg, maximum joint speed was 70 Deg/s. They in corporate with advanced control system. Each unit is automatically recognized by number of head and how many units were in the robot through communication between the modules, Although the robot have quite advanced and perform well on the flat surface and even in water, Hirose stated the large number of problems still remain for realization of practical snake like robot both in software and hardware.

3.3.4 AmphiBot-I

The modular amphibious snake inspired robot constructed out by several segments each of the robot having one DOF nad the elements were fixed such that all the axes of rotation were aligned, The robot was designed to have distribution, actuation, power and control each element is carried its own DC motor, battery. microcontroller

Fig.3.3 Amphibot-I

For motion on a terrain the robot could be equipped with removal set of passive wheels.each element is made by water proof, as opposed to having a covering over the entire chain of elements. In addition center of gravity of element was purposely Placed below the geomentrical center in the order to obtain vertical orientation, That self stabilized in water. The application was support the goals of research. AmphiBot had a length of 70mm and a cross section 55mm by 33mm.the robot had total length approximately 490mm.the maximum torque of 1.2Nm.The output axis of the gears was connected to a potentiometer and the next element. each joint have a maximum oscillation frequency of 0.3Hz.The speed of robot by running the robot on a surface. During robot achieved a maximum surface locomotion speed of 35mm/s.

3.4 Robot with Active wheels

The second snake-inspired robot category encompasses robots that utilized active driven wheels to provide propulsion for the robot, However the robot design exhibits snake like motion due to multi segment configuration. one of the advantages of using powered wheels is ability to stimulate snake like motion without large number of segments. generally powered wheels are more able to deal with non smooth terrain types. Although the introduction of wheels exhibits additional flexibility of active DOF, The maximum oscillation frequency of 0.3 Hz if full amplitude is used. It was loaded with motor driver and battery in each wheel and micro controller in each body providing it with adaptive control for the terrain.

3.4.1 Koryu-I(KR-I)

The Koryu was developed by Hirose to explore the possibility of a Functional ACM being used in restricted space.the robot design was carry out manipulators, visual equipment, communication equipment and computer hardware. The robot prototype consist of six cyclindrical sections with 16 DOF.The robot was characterized as being able to allow two DOF of operate two axes in z-axis and θ axis. In addition there was an s-axis that described the crawlers, mounted at the bottom of the section each used to generate propulsive movement of the robot. There were six powered s –axis drives each underneath a section of the robot which give total 16 DOF

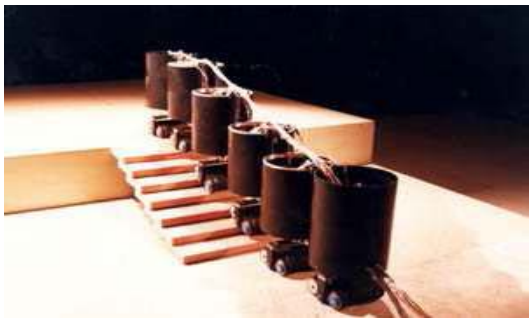

Fig 3.4 Koryu-I

The concept of the robot design was meant to negotiate passage supplied for service workers inside nuclear reactors and carry out inspection and other tasks. Diameter of about 206mm and length of 1391mm the mass of the robot is 27.8 kg,Each section is equipped with force sensor with crawler segmented body of the section. force sensor based on the optical detection system and provided information to the impedance based control system of the robot. They determined on flat surface, climbing over obstacles and cross gaps, maximum forward velocity of 266mm/s.

3.4.2 Koryu-II (KR-II)

It is similar configuration to KR-I,the robot has formed from a lead unit and 6 cyclindrical shape unitlink(1-6) which had three DOF, the first one is rotational movement axis(Q-axis) which swings to left and right of the each segment, The second one is perpendicular movement axis(Z-axis) for the purpose of slide up and down movement , the third one in the wheel axis (S-axis) for Forward movement.

Fig.3.5 Koryu-II

KR-II used wheels instead for crawlers on the S-axis for the purpose of lightening the unit, Robot configuration also made use of unique construction where each unit is powered by single wheel.KR-II had a total length of 3300mm and total height of 1080mm,the driving system for each wheel was a DC motor, Robot was able to propel itself for rough surface and elevated surface by impedance control through the use of optical force sensor attached to each axis. Robot was able to travel in a slope surface of maximum inclined of 48deg .The maximum speed of robot observed on a flat terrain 500mm/ms.

3.4.3 Omni Tread OT-8

First Omni tread robot is called OT-8.These robot consist of five segments that were connected to 2-DOF Joints. The propulsion of the robot was achieved by innovative using treads on every four side, tank tread maximize the propulsion ratio. Idea behind the maximization of the ratio was that any environmental feature that contacts the robot at a location, Treads on each side also made the design indifferent to falling over. The Omni tread act as a pneumatic bellows that act as actuators between the segments. Stiffness is adjusted by Fly. The robot was designed to support for the Rescue and other operations is dangerous for humans.

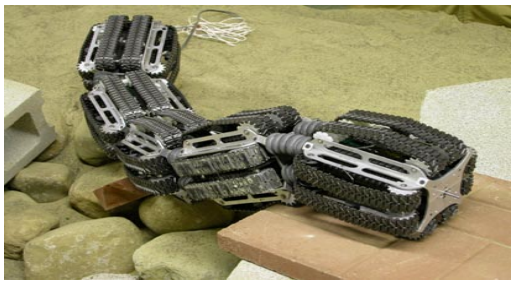

Fig.3.6 Omni Tread

The dimensions of Omni-tread Robot is 185mm and the Long is 1270mm.One motor is powered for robot with central drive shaft spline and universal joints.They have demonstrated abilityto climb up a Curb more than 36% of length and 240%of height.

IV. REQUIREMENTS OF SNAKE ROBOTS

The long term goal is to enable the exploration in the dangerous environments and aid to search and rescue operation. Hope the side effect to encourage the people looks a snake in a different way and they have to teach in navigating and traversing in the worlds.

a. Searching:

Most crucial requirements of a rescue robots is to handle work operations in any environments to detect possible hazards to search for fatalities in the hazardous accident prone environment with great degree precision and control. It is essential that these search operation be carried out quickly without increasing the risk for the rescuers. Although they detect and identification Humans beings. The major problem in the rescue operation is 1) Generally destructive tool 2) slow and tedious tool operation.3) Search based on Sniffing dogs and human voices.4) Action simulators of parties of rescue fire fighters and back supports.

b. Inspection and mapping:

The snake robots are required to provide human rescue team with general information about a situation and create a reference of the destroyed surrounding, Covering wide area in as little time as possible.

c. Structural inspection:

The Multi sensor unit as ultra sound sensor and infrared sensor and thermal camera must enable the robot find an optimal path into debris structure in order to fasten up the rescue operations and the same time make it faster, Thermal camera make a victim identification easier as well as assist in detecting fire and leakage of gases. All the sensors and cameras need to be rugged, dust proof and water proof and should be grade one to perform reliability in hazardous environments. Other requirements of snake robot include ability to move debris which otherwise would act as hindrance to rescue operations.

V. LIMITATIONS

The Snake Robots plays a significant role in today technology. Wheel invention is greater but it cannot go everywhere, It constitutes backbone for ground base Transportation. on Relatively smooth surface such mechanism achieve higher speeds. and steering ability. Rougher terrain makes it harder. If it not possible for such mechanism to move. Snake robot which can adapt its body structure with changing the environment and hence exhibits complex motion pattern, For such Purpose snake

robot be used for fir fighting, Exploring damaged buildings, Travelling through the pipes during maintenance activities. Snakes acquired many advanced motion capabilities, Their body can function as legs, when moving as “arms” when traversing branches and as fingers when grasping the objects, however their long, slender and smooth body shape that makes them especially suited to enter and move inside small areas such as encountered in disaster, In addition control which allows the robot to adapt to its environment and they should have rugged construction, but at the same time be sufficiently sensitive to detect the danger areas in environment., Future applications includes the agriculture, survillence, maintenance of dangerous systems such as power plants, pipelines, military, industrial process plants.

VI.CONCLUSION

Snake is one of the creatures that exhibits excellent mobility in various terrains. It is able to move narrow passage area and climb on rough ground. They have a high number of degrees of freedom and they are able to Locomote without using active wheels or legs. In addition the comparison of some respective design of taxonomy was showed to make difference in the robots design. They could crawl through the destroyed buildings looking for people, It could carry small amount of food or water to people trapped by the building prior to the arrival of rescue personnel. Snake inspired robots design demonstrate the general functionality and number of useful gaits, Better understanding of robots design and their useful features and Design are the major challenges, Although all these snake robots design possess programming sophisticated enough to execute one gait in operation. Although the Snake robots with one end is fixed to a base may be used for robot manipulator which reach hard to get to places, In comparison to Wheeled robot and legged mobile robots, The snake robots have high stability and good terrainability, exterior can be completely sealed to keep dust and fluids out. Future snake robots need to be achieve much higher forward and turning velocities, In many applications robots need to be capable of at least keep peace with human. Finally snake robots will need to achieve much longer operational time in spite of reduction in size.

VI. ACKNOWLEDGEMENT

The Author express thanks to Faculty of Sri Ramakrishna Engineering College, Coimbatore & PSNA College of Engineering & Technology, Dindigul, Tamil Nadu

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