Fractal Robots and its Applications

Rashmi Chaudhari[1], V.H.Bansode[2]

[1] *Department of Mechanical engineering,SKNCOE Pune*
*, **chaudharirashmi97@gmail.com***
[2]*Department of Mechanical engineering,SKNCOE Pune,*
vhbansode@sinhgad.edu

ABSTRACT

Fractal Robots is an emerging new service that promises to revolutionize every aspect of human technology. Fractal robots are objects made from cubic bricks that can be controlled by a computer to change shape and reconfigure themselves into objects of different shapes. These cubic motorized bricks can be programmed to move and shuffle themselves to change shape to make objects like a house potentially in a few seconds. This technology has the potential to penetrate every field of human work like construction, medicine, research and others. Fractal robots can enable buildings to be built within a day, help perform sensitive medical operations and can assist in laboratory experiments.

This technology is called Digital Matter Control and is implemented here with a machine called robotic cubes and the entire technology is called Fractal Robot Technology. Also Fractal Robots have built-in self repair which means they can continue without human intervention.

***Keywords:** Fractal,Fractal Robots,Fractal Bus*

1.INTRODUCTION

1.1What Are Fractals?

Fractals are never ending matters which are created by repeating same procedure again and again.They have self similarity in the structure.Wherever you look at any part of its body it will be similar to the whole object.

(a)Natural fractals **(b)Manmade Fractals**

Fig.1 Fractal [1]

1.2Fractal Robots:

A Fractal Robot physically resembles itself according to the definition above.Fractal robots are the objects made of cubic bricks having some electronics in them. They can reconfigure themselves and can be controlled by computer.These are the machines that can change their shape from one object to another.

Fig2 Cubic structure[1]

2. FRACTAL ROBOT MECHANISM

2.1Simple constructional details

Lot of efforts has been taken in making the robotic cubes as simple as possible . The design is such that it has least possible moving parts so that they can be mass produced. Material requirements have also been made as flexible as possible. They can be built from metals and plastics which are cheaply available in industrialized countries but also from ceramics and clays which are environmentally friendlier and more readily available in developing nations. These robotic cubes are assembled from face plates which have been manufactured and bolted to a cubic frame as illustrated in figure 3.

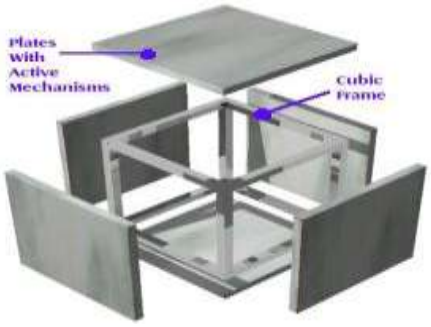

Fig-3: Hollow cubic structure[2]

Hence the cube is hollow and the plates have all the mechanisms.Face plates have electrical contact pads that allow power and data signals to be transmitted from one robotic cube to another. 45 degree petals that push out of the surface from face plates to engage the neighbouring face that allows one robotic cube to lock to its neighbour. The contact pads could be on the plates themselves or be mounted separately on a purpose built solenoid operated pad as shown in figure 4.

2.2Movement mechanism:

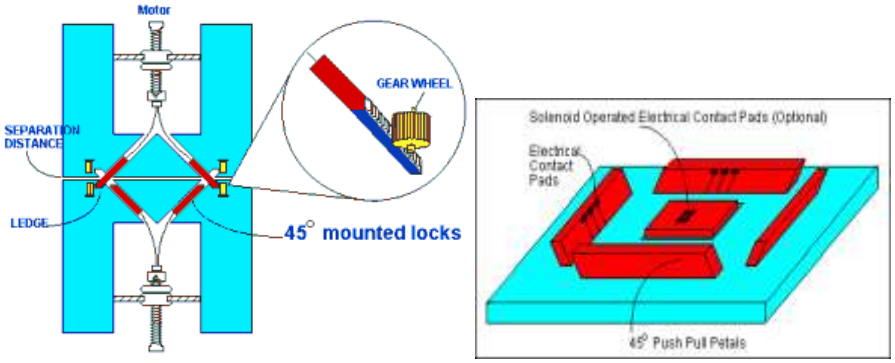

Fig.4 Movement mechanism[2]

The petals are pushed in and out of the slots with the aid of a motor. The petals have serrated edges and they engage into the neighboring robotic cube through the 45 degree slot The serrated edges of the petals are engaged by either a gear wheel or a large screw thread running the length of the slot which slides the cubes along as shown in fig 2.

3.IMPLEMENTATION OF COMPUTER CONTROL

All active robotic cubes uses microcontroller to perform basic operations such as the communication and control of internal mechanism. Hence the computer program to control the robot is greatly simplified in that whatever software that is developed for a large scale robot, it also applies to the smaller scale with no modifications to the command structure.
The largest component of the Fractal Robot system is the software. Because shape changing robots are fractals, everything around the robot such as operating system ,tooling, software etc must be fractally organized in order to take advantage of the fractal operation. Fractal Robot hardware is designed to integrate as seamlessly with software data structures as possible. So, it is essential that unifying Fractal architecture is followed to the letter for compatibility and interoperability. Fractal architecture dominates the functions of the core of the O.S, the data structures, the implementation of the devices etc. Everything that is available to the O.S is containerized into fractal data structures that permit possible compatibility and conversion issues possible.

3.1 Fractal O.S

The Fractal O. S plays an important role in making the integration of the system seamless and feasible.A Fractal bus permits Hardware and software to merge seamlessly into one unified data structure. It helps in sending and receiving fractally controlled data.To reduce the flow of instructions the message is broadcast to a local machine that controls a small no: of cubes (typically around 100 cubes). All cubes communicate using a simple no: scheme. Each is identified in advance and then a number is assigned. The first time around, the whole message and the no: is sent but the next time only the number is sent.

4. APPLICATIONS OF FRACTAL ROBOTS

Bridge Building: One of the biggest problems in civil engineering is to get enough bridges built as rapidly as possible for mass transit and rapid development of an economy. Shape changing robots are ideal for making all manners of bridges from small to the very largest. To grow a suspension bridge, the shape changing robot grows a bridge by extending a rod and it feeds the rod using the L-shape streamers from underneath the rod. The bridge assembly machine is built principally from simple mass manufactured repeating cubes that move under computer control, and reshape into different scaffolds in a matter of seconds.

Fire Fighting: Fire fighting robots can enter a building through entrances that may be very small. The machines themselves may be very large and yet they must get through and once inside, they may have to support the building from collapse. To a great extent fire fighting is an art and not completely reliant technology.There are times where only machines with capabilities far beyond what we have today are capable of rescuing a particular situation.
Entering Buildings-; Shape changing robots can enter a building through entrances that are as small as 4 cubes. robot can do to enter a room through a duct. These shape changing robots could be carrying a fire hose in which case on entering they can apply the hose immediately.

Defense Technology :
The use of new technology of fractal shape changing robots in defense applications is going to completely change the way warfare is conducted in the next millennium. The machines even at the slow speedscan dodge incoming shells at 2 km distance by opening a hole in any direction. While most tanks and aircraft need to keep a 4 km distance from each other to avoid being hit, this machine can avoid being hit and return fire inside 2 km, while carrying a formidable array of fractal weapons integrated into a true multi-terrain vehicle, making them totally lethal to any passing War fighters, aircraft, tanks, and armored personnel carriers; surviving shelling, rockets and missiles. As the technology moves on to hydraulic & pneumatic technology, shell avoidance is feasible at practically point blank range. Nothing survives on extended warranties in a battlefield as it has advantage of self repair.

Medical Applications
A fractal robot system with 1 mm cubes can squirt into the human body through a 2 mm pin hole and rebuild itself inside the body into surgical instruments and perform the operation without having to open up the patient (figure 1)
A size 1 mm is just adequate for nearest point of entry into the site of injury from the surface to perform very complicated surgery to remove cancers, cysts, blood clots and stones. The machine reaches its objective from nearest geometric point of entry by threading itself past major blood vessels or pinching and severing them if they are not for negotiation. The smaller the machines the more readily it can be used to directly operate from the nearest entry point with the least amount of wounding to the patient. A machine like this could operate on shrapnel victims. As shrapnel is a fractal object, the wounding it causes is fractal in nature. AIn normal use, this machine must be able to drain bad blood and fluids, detect and remove all foreign objects that have entered the body, sew up minor wounds after cleaning and medicating them, sew together blood vessels and nerve bundles using microsurgery methods before sealing major wounds, move shattered bone fragments inside the body and hold them in position for a few days while it sets back, and when necessary, perform amputations that involves cutting through flesh and bone.

5. LIMITATIONS:

1. Technology is still in infancy
2. Current cost is very high ($1000 per cube for the 1st generation of cubes, after which it will reduce to $100 or so).
3. Needs very precise & flexible controlling software

6. CONCLUSION

1. It may take about 4-5 years for this technology to be introduced and tried out all over the world.
2. Once the first step is taken and its advantages well understood it will not take much time for it to be used in our everyday life.
3. Using Fractal Robots will help in saving economy, time etc.
4. The fractal geometry science in this new era is proven to be flexible and efficient.
5. The applications of fractals in various fields has been proposed and analyzed.
6. They can be used even for the most sensitive tasks. Also the raw materials needed are cheap, making it affordable for developing nations also.

REFERENCES

1. Prateeksha Tiwari, Ruchika Nagarkar, Surbhi Shrivastava and Shweta Uikey, "New Era Fractals,"IJETMR, Vol 1,Issue 1, February 2013- 261
2. Arifmohammad Attar, Loukik Kulkarni & S. G. Bhatwadekar, "Fractal Robots – Smart Future of Manufacturing Industry," ISSN : 2319 – 3182, Volume-2, Issue-4, 2013
3. B.B. Mandelbrot, the Fractal Geometry of Nature
4. K. D. Bollacker, S. Lawrence, and C. L. Giles, "Discovering relevant scientific literature on the Web," Intelligent Systems and their Applications, IEEE, vol. 15, pp. 42-47, 2000.
5. http://loreviaweb.blogspot.in/2012/11/fractal-robots-future-robots.html
6. A. Ismail, S. Sulaiman, M. Sabudin, and S. Sulaiman, "A point-based semi-automatic expertise classification (PBaSE) method for knowledge management of an online Special Interest Group," in Proceedings of International Symposium on Information Technology, ITSIM'08, IEEE.
7. D. L. Jaggar d , " Fract al Electrodynamics: Wave Interactions with Discretely Self-similar Structures," in C. Baum and H.Kritikos Electromagnetic Symmetry, Washington DC, Taylor and Francis Publishers, 1995, pp. 231-281.