International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 07 | July -2017 www.irjet.net p-ISSN: 2395-0072

# ROBOTICS IN HEALTHCARE ARCHITECTURE

**Meghna Vij[1]**

*[1]Asssistant Professor,Amity School of Architecture & Planning,Amity University,Haryana, India*

---

**Abstract –** *Robotics which was a science fiction long time back is gradually moving from movies and books to academic labs and companies. Today, robots perform multiple tasks with precision which vary from mining and manufacturing to surgery and vacuuming. The robotic technologies have changed widely over the past years enabling new robot capabilities.*

*Recently, human-robot symbiotic systems have been studied considerably due to the increasing demand of welfare service for the aged and handicapped under the situation of decreasing of the younger generation. In the future, it will be difficult to provide help to the aged and disabled persons such as taking care, nursing, informing important information, recreation, etc., by trained human. To build human-robot symbiotic society, where robots are able to support elderly or disable people, the robot should be capable of recognizing user, gesture, gaze, speech and text commands.*

***Key Words***: **Robotics, medical robots, global research, technology, construction automation robotics**

## 1. INTRODUCTION

Since the time of evolution species have worked towards their survival. The one who is the best prevails. The mankind has evolved a lot from its basic survival techniques to leading a safe life of leisure and pleasure. We all aspire for a quality of life. Today we are concerned about getting the work done as soon as possible. Application of Artificial Intelligence has been the most vital discovery by the mankind.

### 1) Understanding Robotics

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots and the computer systems for their control, sensory feedback, and processing of the information. These technologies along with automated machines can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior and cognition.[1]

Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics.

### 1.1 Applications

Throughout history, robotics has been often seen to mimic human behavior, and often manage tasks in a similar fashion. Today, robotics is a rapidly growing field, as technological advances continue, research, design, and building new robots serve various practical purposes: whether domestic, commercial or military.

By 2050, the world's population aged 60 years and older is expected to total 2 billion, up from 841 million today. Eighty per cent of these older people will be living in low-income and middle-income countries.

The increase in longevity, especially in high-income countries (HICs), has been largely due to the decline in deaths from cardiovascular disease (stroke and ischemic heart disease), mainly because of simple, cost-effective strategies to reduce tobacco use and high blood pressure, and improved coverage and effectiveness of health interventions.[2]

To meet this challenge, health and local authority services must reconfigure, placing greater emphasis on community care and the effective use of technology. One promising solution is robotics.

Today robots are not just cooking, washing, carrying our shopping bags, running small errands but also do jobs that are hazardous to people such as defusing bombs and exploring shipwrecks.

## 2. Human – Robot Interaction

Science fiction authors typically assume that robots will eventually be capable of communicating with humans through speech, gestures and facial expressions rather than a command-line interface. Although speech would be the most natural way for the human to communicate, it is unnatural for the robot. It will probably be a long time before robots interact as naturally as the fictional C-3PO or most recent back home Ra1 and Chiti.[3]

### 2.1 Medical Robots

A medical robot is the one which is used in medical science but does not include only surgical robots.

[1] (wikipedia)

[2] (Organisation(WHO))

[3] (Computer Science, 2011)

We are born and then live our lives and eventually we die. However, it's the quality of life that matters which is correlated to our general fitness and health. We all know health is wealth and hence we tend to achieve it to be happier. Thus, there is a need for better health facilities.
Research in medical bionics, surgical robots, medi-robots is much needed still. The scientists and researchers are concentrating more on new robots rather than stressing on the industrial applications. Hospitals are very much like factories. There are many mundane tasks involved.

For example - carrying things around, moving samples from one apparatus to another, cleaning, record keeping. Further there are tasks that require some strength; e.g. lifting and moving patients. There has been some development in this field - there are robots intended for laboratory uses, there are **AGV**'s (Automated Guided Vehicle) intended for hospital use.

### 2.2 The Carrier Robots

As the word literally means these robots carry the thing like samples, reports etc. in the hospitals on their own. These kind of robots find their way around the hospital in to carry stuff around or to work as a guide. For example, the Help Mate was developed and started to operate in the 90-ties, 20th century to carry the hospital stuff. A Help Mate can carry around x-ray images, food, medication and other things.

**Fig.1**. Drugs loaded in the Helpmate by a hospital pharmacist for delivery to staff in a hospital ward. Source: http://www.allonrobots.com/robots-in-hospitals.html

Mark Stibich's germ-busting robot, which bears a slight resemblance to R2-D2 is a wheeled device that emits a pulsing ultraviolet light which disinfects rooms by zapping viruses and bacteria. Hospital-acquired infections caused by superbugs that have become resistant to traditional cleaning chemicals, are, killing numerous people year. Hospital housekeepers wheel in the **trash-can-size robot**, close the door, and use a remote to turn it on. UV light flashes for 5 to 10 minutes from the device's movable "head," killing viruses, bacteria, and spores by destroying their DNA.[4]

### 2.3 Pharmacy Robots

There is, for example, McKesson ROBOT-Rx. It is a robotic system intended for automated medication processing. It automates medication storage, selection, return, restock and crediting functions.

As the McKesson website states, more than 1/3 of all hospitals in North America use their robotic system. So it is quite widespread.

Hospitals can reduce errors and costs, as well as enhance productivity by using this robot. The head moves along a single axis while it rotates 180 degrees to pull the medications. During this process it uses barcode technology to verify its pulling the correct drug. It then delivers the drug to a patient specific bin on a conveyor belt. Once the bin is filled with all of the drugs that a particular patient needs and that the robot stocks, the bin is then released and returned out on the conveyor belt to a technician waiting to load it into a cart for delivery to the floor. McKesson's Robot RX is another healthcare robotics product that helps pharmacies dispense thousands of medications daily with little or no errors. The robot can be ten feet wide and thirty feet long and can hold hundreds of different kinds of medications and thousands of doses.

The pharmacy saves many resources like staff members that are otherwise unavailable in a resource scarce industry. It uses an electromechanical head coupled with a pneumatic system to capture each dose and deliver it to its either stocked or dispensed location.

### 2.4 Robotic Doctors

The robotic doctors are actually tools to extend the capabilities of a doctor. They cannot replace the doctors at present. This type of telerobotics can be very helpful in critical and emergency situation when every second is precious by the help of which the doctor can examine the patient from another place. RP-7 this stands for Remote Presence 7.

[4] (bloomberg, 2013)

### 2.5 Nurse-bot : Twendy-One

The machine is designed to help Japan's growing population of frail and elderly who continue to live in their own homes. It has soft fingertips nimble which can grip a drinking straw and arms with the strength to lift an adult out of bed.[5]

Researchers at Waseda University in Tokyo say Twendy-One can clean floors, carry patients, and even bring them breakfast in bed besides fetching medication or refreshments. Scientists expect Twendy-One to go on sale within a decade for about $200,000. A hospital's budget gets swallowed by its surgical theatres and in the recovery of sterile operating environments. Errors can lead to the patient risk and delay in the surgeries. Improper sterilization can cost lives

An "intelligent" robot that can do all of this faster, more efficiently, and more thoroughly than humans. Cleaning used surgical tools, restoring them to their proper places, kit out surgical carts with all the tools the surgeon will need for the next procedures are some such functions which robots can perform.

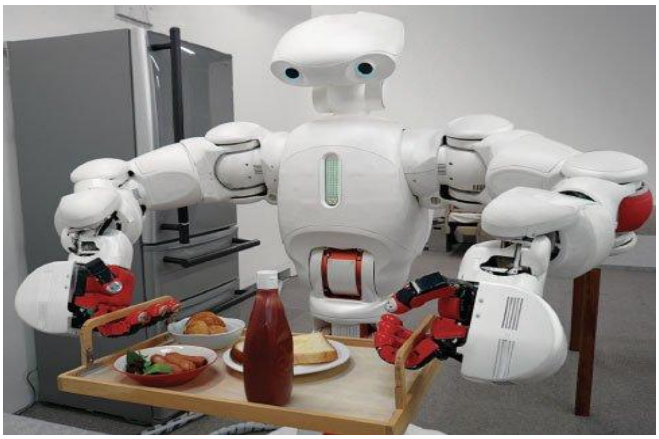

**Fig.3**. Nurse-bot : Twendy-One
Source :Sugano Laboratory/Waseda University

Artas is the transplant robot which can harvest thousands of hair follicles from a lush patch of human skin from which the bald areas can be re-implanted by the cosmetic surgeons. The implanted follicles connect back up with the blood supply and continue growing hairs as before. Artas can do this by taking the precise 3-D images of the scalp and then measuring the depth and angle of each hair follicle.


**Fig.4**. Artas
**Source** :Sugano Laboratory/Waseda University

## 3. CONCLUSIONS

Robotic innovation and its growth in the medical sector shows that robotics will greatly impact the healthcare sector varying from surgical precision, telemedical network, assisting the aged for a better life to nano robotics. Healthcare is changing and technological advancements as such can make care better, faster, reliable and more accessible for all.

## REFERENCES

1) wikipedia.org/wiki/Robot
2) www.allonrobots.com/robots-in-hospitals.html
3) www.businessweek.com/articles/2013-02-21/mark-stibichs-hospital-disinfecting-robot
4) www.popsci.com/technology/article/2013-01/ges-hospital-bot-will-sort-scalpels-sterilize-tools-and-prep-operating-rooms-surgery
5) www.popsci.com/technology/article/2010-08/video-robotic-wheelchair-follows-walking-companions-around-automatically
6) www.davidreneke.com/wpcontent/uploads/2012/12/Robots.jpg
7) botsinc.com/wp-content/uploads/2011/11/human-vs-robot-09-300x204.jpg
8) www.popsci.com/scitech/article/2009-06/machines-heal
9) www.popsci.com/technology/article/2013-03/robot-week-artas-harvests-living-human-hairs-one-one
10) www.naefrontiers.org/File.aspx?id=28710
11) www.nii.ac.jp/graduate/thesis/pdf/hasan_Dr_thesis.pdf
12) www.intechopen.com/download/get/type/pdfs/id/5555
13) www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&ved=0CFEQFjAC&url=http%3A%2F%2Fadaptablehouse.vtt.fi%2Ffiles%2Ftechnology%2Frobotics.doc&ei=T0y2UqKGA6LyiAfiqoCoCg&usg=AFQjCNEjqz4fi2qWqafftp1jOgo3Yf3N0A&sig2=Xz-W5TebJlvZzNAj2mhV5Q&bvm=bv.58187178,d.aGc