A REVIEW ON ROBOTS JUST ALIKE HUMAN: THE HUMANOID

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Abstract

The interest in the field of Robotics is leading the researchers towards the goal of achieving the robots that behave just as human. Human robots are getting most popularity and lots of research has been carried out on such robot having huge size, shape and motion of body parts just as a normal human being. The invention and discovery of Humanoids is most beautiful having largest potential and challenging research field in present times. Large number of researchers are working in this area so as to get the perfect humanoid robot who is capable of working in the environment created for human beings. Present robots have limited capability to work in perfect way. The concept of Humanoid makes the researchers to believe in Science fiction to Reality. Present paper gives the brief review on the Humanoid Robots and their applications in the various fields and sectors.

Keywords: Robotics, Humanoids, Human Robots

Introduction:

Robotics is playing a worth noting role in many sectors. The Human robot is one of such invention which seems to be dream comes true. Humanoid robots are much sophisticated and complex creation of this technology. A large efforts and knowledge is required to make a humanoid which is the combination of hardware and software technologies. In present times, human robots are helping the society in many means. Their uses are very common in Health Sector, Entertainment, Education and Hospitality. A Human robot is a Robot that not only resembles the Human Being in several aspects such as Physical attributes, two legs, two arms, a Torso and a head but it is also able to communicate with Humans. It has capability to take orders from users and also answers the questions asked. All Humanoids are fully equipped with different sensors, actuators, cameras, speakers and microphones. Humanoids are preprogrammed by the manufactures for some specific task, not only specific tasks these can be designed according to particular application. The Humanoids are also being used to study the Human Behavior. Humanoid robots can be operated remotely to accomplish the tasks where humans cannot work such as the high temperature areas, humid areas particularly in West African region and also can be used as caregivers to the patients in contaminated environments [1]. There are numbers of other tasks that are being performed by humanoids such as washing of human limbs, serves as rehabilitation, a nurse assisting in lifting of patients and also in taking blood samples [2-6]. Here in this paper, some broad and current applications of Humanoids are reviewed.

Basic Concept:

A Humanoid is a robot having overall appearance same as that of human body. According to Wikipedia "Androids are humanoid robots built to resemble a male human, and Gynoids are humanoid robots built to resemble a human female" [7]. Some Humanoids have face and mouth along with a torso, head, two legs and two arms.   Such robots are designed to act autonomously and safely according to the environment around them. The working of Humanoids depends upon the theory of artificial intelligence. They have distinguish features to work. Various sensors are used in their body parts to sense the environment. To move the muscles and joints of the body parts rotary actuators are used. For the visionary actions, humanoids use cameras. Before designing and manufacturing it, one has to decide the purpose and application for which it is to be used. Software and hardware technologies are to be well known. Even with this, manufacturing the Humanoids is not a simple job. The integration of artificial intelligence, neuroscience, and image processing together make a Humanoid. In spite of all this, various challenges are faced by the manufacturers to make the human robots. Since last two decades, human beings are trying to understand the mechanism and working system of the human robots [8] such as principles of controlling the muscle, the brain system, synchronization concept of brain and body. After so many real trials, human robots are like dream comes true.

Humanoid Robots till 2020:

Robots are no doubts available in all sizes and shapes but the robot which resembles and act as human beings are of much interest for anyone. During the pandemic time-Covid-19, when the world was suffering from this diseases many countries deployed human robots. A smart field hospital was opened in Wuhan,China in early March. "There, humanoid robots—donated by Cloud Minds Technology, measure temperatures, deliver food and medicine,a Silicon Valley

company—disinfect, and entertain medical staff and patients". Some robots even helped the staff nurses by relieving them and done their duties, dis basic cleaning and deliveries. The industrial robots helped in production when their workers were quarantined [9]. Few Humanoid robots are presented here:

1. **Robotic Avatar:** This robot was first introduced in 2017 by Toyota. It is capable to mimic the movements of its human operator.

2. **Sophia:** Sophia is well known social humanoid which was developed by Hanson Robotics of Hong Kong , Now Sophia is 5 Year old robots working as Robot Ambassador who is helping in advanced research and human robot interactions. It can walk, sing and even can show more than 60 facial expressions[10] and emotions as well

3. **Delivery Robot:** It is a headless robot having nibble limbs and many sensors. It is capable of navigating the stairs and various obstacles. It can balance on one foot, but usually it walks upright and can pick up and stack boxes weighting up to 40 pounds. For compact storage it is able to fold itself.

4. **Research Humanoid:** Surena IV is an adult human robot at the Iranian University of Tehran who is capable of face and object detection and it can walk with a speed of 700 meters per hour.

5. **Robotic Bartender:** Kime is a robot who works in a bar. It was developed by Macco robotics in Spain. It has human like head and Torso, two arms. It can serve 300 glasses of bear in one hour.

6. **Educational Robot:** Pepper robot designed by SoftBank Robotics can work as reading helper to work as Receptionist or even as Nanny. Pepper has been modified withan educational integrated development environment (IDE), called Tethys, who teaches students how to code. After learning software, students can program the humanoid to move, gesticulate, talk,and show different messages on its screen, all in real time. With this initiative the company hopes that it will inspire a future generation of engineers and roboticists.

Applications of Humanoids: As the research on enhancing the humanoid capabilities to make them use in different fields and area is still going on. Still success has been achieved to take their help in various sectors especially Health Care, Education and Hospitality.

Health Care Applications: A number of human robots are being developed to use them in health applications. Tele operated Robots are the robots, which can be controlled by the human operator. These robots help the doctors, nurses and other medical staff to prevent from the infection caused by transferable diseases [11]. Still the research is going on to extend the uses of tele operated robots in health care. Robots are also used for the children who are suffering from the various serious painful diseases. These robots help them by psychological distraction in order to reduce the pain as a result of stress and anxiety during a medical procedure. Many researchers

[12-14] concluded that children usually do not smile during the treatment process. Robots may help them to smile according to principles of attentional capacity theory, if distraction stimulus is much stronger than the pain stimulus to gain children attention [15].

Education Sector: Use of computers and e-learning played a very important role in the education of students[14]since a long time especially in the pandemic time. Along with the computer education the latest trends and research is on the Humanoid robots having capability to analyze the situations logically to support the human learning and work as better computer agent [16]. Robots are being used as teaching assistant and game partners for the children. Sophia, the Humanoid is a Robot ambassador and full citizen of Saudi Arabia, who is helping in advanced robot research and human interactions. Educational Robots have been used in different sections of education and are able to address wide range of students starting from junior to undergraduate engineering students. It has been observed that students also respond positively to the robot and result are too good in terms of response and student's creativity [17-18].

Hospitality: Service Robots are developed to assist the human being in their social environment. Design of effective autonomous service robots requires complete understanding of Human –Robot Interaction (HRI)[19]. The Humanoids are helping in Hotels and Restaurants in cooking food and serve the customers. In United States, a Burger robot has been created who can fulfil up to 120 orders in an hour [20]. In Japan also many restaurants have replaced frontline workers with the interactivehumanoid robot [21]

Conclusion: Robotics are being an interesting and creative field for engineers and scientist, so the Humanoid Robots. Humanoid Robotics is study of human like information processing in dealing with the real time applications and environment. A lot of research work is still going on to get success although scientists and engineering achieved a lot Sophia, Burger Robot, Educational Robot, Research Robots are few working examples of the Human robots. These robots are presently used in different fields such as Health Care, Education and Hospitality.

References:

1. Azeta Joseph, Bolu Christian, Abioye A. Abiodun and Festus Oyawale , " **A review on humanoid robotics in healthcare"**, M A T E C W e b o f C o n f e r e n c e s **1 5 3** , 0 2 0 0 4 (2 0 1 8) , https://doi.org/10.1051/matecconf/201815302004 ICMME 2017.

2. Panzirsch, M., Weber, B., Rubio, L., Coloma, S., Ferre, M., & Artigas, J. Tele-healthcare with humanoid robots: A user study on the evaluation of force feedback effects. *2017 IEEE World Haptics Conference (WHC)*, (June), 245–250. (2017). https://doi.org/10.1109/WHC.2017.7989909

3. K. Doelling, J. Shin, and D. O. Popa, "Service robotics for the home: a state of the art review,"in Int. Conf. on Pervasive Technologies Related to Assistive Environments. ACM, p. 35. (2014).

4. . T. L. Chen, C.-H. A. King, A. L. Thomaz, and C. C. Kemp, "An investigation of responses to robot-initiated touch in a nursing context, " Int. Journal of Social Robotics, vol. **6**, no. 1, pp. 141–161, (2014).

5. Barrett Medical, "Proficio," http://www.barrettmedical.com/, accessed: 2016-02-19. 16. J. Hu, A. Edsinger, Y.-J. Lim, N. Donaldson, M. Solano, A. Solochek, and R. Marchessault, "An advanced medical robotic system augmenting healthcare capabilities-robotic nursing assistant," in Int. Conf. on Robotics and Automation. IEEE, pp. 6264–6269. (2011).

6. A. I. Chen, M. L. Balter, T. J. Maguire, and M. L. Yarmush, "Realtime needle steering in response to rolling vein deformation by a 9dof image-guided autonomous venipuncture robot," in Int. Conf. on Intelligent Robots and Systems. IEEE, pp. 2633–2638. (2015).

7. https://www.sciencedaily.com/terms/humanoid_robot.htm

8. Yuki Asano, Kei Okada and Masayuki Inaba, "Design principles of a human mimetic humanoid: Humanoid platform to study human intelligence and internal body system" *Science Robotics* 20 Dec 2017,Vol. 2, Issue 13, eaaq0899,DOI: 10.1126/scirobotics.aaq0899

9. Daria Merkusheva, "10 Humanoid robots of 2020", https://www.asme.org/topics-resources/content/10-humanoid-robots-of-2020

10. I Pavan Raju et. Al, "A brief review of recent advancement in Humanoid robotics research" MuktShabd Journal, Volume IX, Issue VI, JUNE/2020, pp-3743-3748, ISSN NO : 2347-3150.

11. Yasemin, M., &Kasımo, Y. Management of dental anxiety in children using robots Reduction of Dental Anxiety and Pain in Children using Robots, (May), 327–332, 2016 https://doi.org/10.1109/SIU.2016.7495721 .

12. Beran, T. N., Ramirez-Serrano, A., Vanderkooi, O. G., & Kuhn, S. Humanoid robotics in health care: An exploration of children's and parents" emotional reactions. *Journal of Health Psychology*, **20**(7), 984–989,2015 https://doi.org/10.1177/1359105313504794

13. Beran, T. N., Ramirez-Serrano, A., Vanderkooi, O. G., & Kuhn, S. Reducing children's pain and distress towards flu vaccinations: A novel and effective application of humanoid robotics. *Vaccine*, **31**(25), 2772–2777, 2013.

14. Avishek Choudhury et.al, "Humanoid Robot-Application and Influence", Arch Clin Biomed Res 2018; 2 (6): 197-187, DOI: 10.26502/acbr.50170059.

15. DeMore M, Cohen L, "Distraction for pediatric immunization pain: a critical review", JClinPsychol Med Settings; **12**(4):281–91 2005.

16. Powers A, Kiesler S, Fussell S, Torrey C "Comparing a computer agent with a humanoid robot" Proceedings of the ACM/IEEE international conference on human-robot interaction Pp: 145-152, 2007.

17. Yi H, Knabe C "Experiential Learning in the Development of a DARwIn-HP Humanoid Educational Robot", J Intelligent Robotic Sys Pp: 41-49, 2016.

18. Barakova EI, Bajracharya P, Willemsen M, Lourens T, Huskens B, Long‐term LEGO therapy with a humanoid robot for children with ASD. ExpSyst 32: 698-709, 2015.

19. Bowen, J., & Whalen, E. "Trends that are changing travel and tourism. Worldwide Hospitality and Tourism Themes", 9(6), 592–602, 2017.

20. Troitino, C. "Meet the world's first fully automated burger robot: Creator debuts the Big Mac killer" Forbes. https://www.forbes.com/sites/christinatroitino/2018/06/21/ ,2018.

21. Osawa, H., Ema, A., Hattori, H., Akiya, N., Kanzaki, N., Kubo, A., Koyama, T., &Ichise, R. "Analysis of robot hotel: Reconstruction of works with robots", The 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), Lisbon, Portugal, 2017.