Development of Humanoid Robot for Indoor Applications

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ABSTRACT

Humanoid robots are similar to human beings in body structure, movement of joints and motion. Hence, they can perform activities which human beings are capable of doing. In order to replace human being in day-to-day activities one can build cost effective humanoid robot. The agenda of this project is to develop a mechanically well-designed humanoid robot and use this Humanoid to the medical application. Such that the Humanoid robot parts are 3D print technology as it is very economical and delivers strengthened and accurate parts. The completed humanoid looks like similar to the face of human and make eye, jaw and neck movements like human. It contains arms and wrists those work like similar to human as these parts of humanoid robot are controlled by Arduino UNO it acts as a main controller it sends signals to the actuator with reference to the code written in controller board. lower part of the humanoid can be fix on the TurtleBot. as the Turtlebot has the Autonomous Navigation feature so we can move the whole Humanoid robot according to our build map such that it can deliver the needed medication to the patient such that it has built in controlled arm movements.

Keywords - Humanoid robot, TurtleBot, 3D printing, Arduino uno

I. INTRODUCTION

Humanoid Robotics be a Hot topic within the field of science and technology from past years scientists are trying to create various models of humanoid robots. It is an emerging and challenging field within the robotics domain. This paper talks about developing a humanoid robot that looks similar to human being face and expressions.

Japanese have a predilection for humanoid robots. In 1952 a Japanese draftsman, Osamu Tezuka created a human-like robot character, "Atom", also cited as "Astro-boy" in overseas, that became the favorite idol for Japanese youngsters. Long years ago, Japanese have developed tea serving doll. When tea is placed on the reception table the doll picks the cup of tea and serves it to the guest and comes back to the initial position.

There are many critical conditions where humans cannot work continuously and accurately in those situations, we are able to employ a humanoid to induce the work done. Because the Research and technology grows, we will add new features like sensors, motor drives, Arduino and then on are often wont to build the efficient humanoid robots. Considerable progress has been made within the field

of humanoid robotics that they will achieve the assigned tasks. They are also used for entertainment purposes. Humanoid robot has parts like that resembles same because the human like eyes, mouth, hands, legs and Head. Humanoid robots are used as a pursuit tool in several scientific areas. Researchers have to be compelled to understand the anatomy structure and behavior (biomechanics) to form and study humanoid robots.

Human cognition deals with studying how human beings can learn over a period of time with the help of sensory information. so as to accumulate perception and skills over a period of time. Further, this is used to develop computational models of human behaviour.

II. LITERATURE SURVEY

Md Aktharuzzaman and A.A.Shafie Evolution of Humanoid Robot and contribution of various countries in advancing the research and development of the platform " In this paper a various platforms for humanoid robot development are identified based on evolutionary research on robotics. The paper also depicts a virtual map of humanoid platform development from ancient time to present time.

Parul Gupta, Vinith Tirth and R.K Srivastava, "Futuristic Humanoid Robots: An Overview" In this paper they reviewed successes and failures in the field where humanoid research began. Further, an extrapolation of recent developments is also given where it may take us in the future.

Avishek Choudhury, Huiyang Li, Christopher M Greene and Sunanda Perumalla," Humanoid Robot-Application and Influence" This article highlights the influence of cerebral condition and social interaction on a user's behavior and attitude towards humanoid robots.

III. OBJECTIVES

❖ The objective of this project is to develop a reliable and nice-looking humanoid platform

❖ Achieving the Eye movement, Jaw movement of Humanoid robot through servo motor mechanism

❖ Achieving Neck Movement of the Humanoid through motor gear mechanism

❖ Achieving controlled Hands and Wrists Movement of the robot by using DC worm gear motors.

❖ Fixation of the lower part of Humanoid robot on the Turtlebot surface and Autonomous and Targeted movement of the whole humanoid robot using ROS platform.

IV. FABRICATION OF THE HUMANOID ROBOT

The humanoid robot has fabricated to bring it live onto the earth. The fabrication part is divided into mechanical aspects, electrical and electronic aspects and computer programming.

Design Methodology

Functionality of the humanoid robot mainly depends on the mechanical structure. The Designed Humanoid Robot must be Low cost, safe for both experimental and human environments, to be able to do maintenance, highly expandable on both robot hardware and control systems, set center of gravity as high as possible. The Head parts like Skull, eyes, Mouth, and Neck parts are mainly made of ABS plastic. The advantages of using ABS material are it can be easily glued, it also has dimensional stability and stiffness. The designs have been taken from the open source and they are printed by 3D printing method.

3D printing machine

All the parts are 3D printed. Compared to conventional manufacturing 3D printed parts are cost effective. The parts produced by this method also

meet the different specifications which are required to develop humanoid robot. Since the materials like ABS, PLA are readily available for this technique has reached a wide area. The drawings that we have are suitable to be developed with the printer due to the complexity in shape and developing lighter components due to the torque issues.

Fig 1: 3D printed parts of humanoid Robot

Methodology Assembly of Printed Humanoid skull and neck parts.

Once the different parts of head and neck are obtained by 3D printing process, they are joined with the help of nuts and bolts. servomotors are used in suitable position where we require movements like eyes movement and neck movement.

Fig 2: Side view of head

Fig 3: Head and Neck part

It is very expensive to 3D print the upper body and the arms of the robot. So, we Selected the suitable robot body (mannequin) that contains the robot arms and wrist and gear DC motor with micro-turbine worm. This motor has sequential gears. It also has the capacity to carry high load. The reduction ratio of this gears is large and it is connected to potentiometer which helps in reaching accurate position. After completion of Arms and Wrists parts mounting. the Fixation of lower body of the Humanoid robot on the woodened surface of the TurtleBot by fastening nuts and bolts.
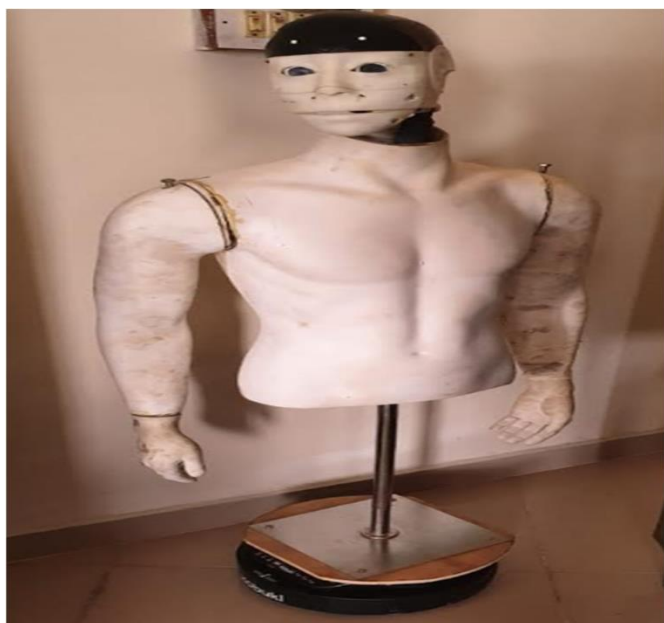
Fig 4: The humanoid robot with Fixed complete assembly,

TurtleBot -TurtleBot is a Kobuki mobile platform made by the Yujin robot company. TurtleBot rests on the ground on 2 wheels and a caster. the lower portion of the turtlebot is designed as a differential drive base, which insists that once when the TurtleBot is moving, the move rate of the wheels is controlled severally.

V. COMPUTER PROGRAMMING

Our Humanoid robot consists of several Servo motors these can be controlled through well programmed Arduino Board which acts as a controller The Arduino platform can control the hardware as long as if it is programmed well. The program is written in an Arduino UNO and then it is fed into the Arduino board through a USB connector from the computer. From there on the micro controller takes control of sending inputs to the servo motors and receives feedback from the encoders of the servo motors.

Arduino uno:
The Arduino Uno is a microcontroller board supports the ATmega328t. It has twenty digital input/output pins. There are six pins which can be used for PWM output. There are six pins which can be used for analog input, a 16 MHz resonator, a USB affiliation, an influence jack, associate in-circuit system programming (ICSP) header, and a push button. It just contains everything required to call this as a microcontroller merely connect it to a portable computer with a USB cable.
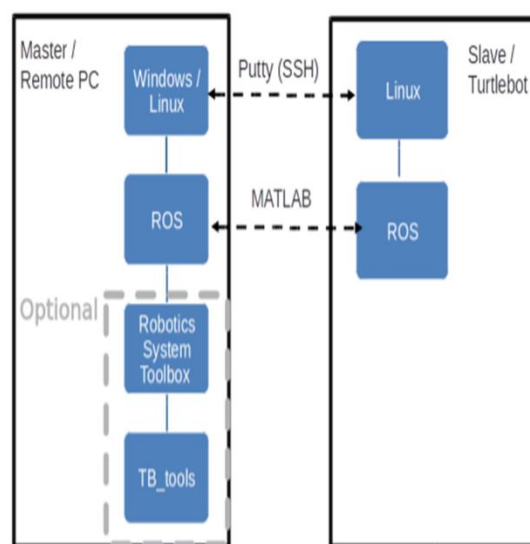

Fig 5: Arduino uno

Fig 6: ROS architecture

ROS:
The robot operating system (ROS) is be a versatile open source framework for writing robot software. And robots to do things. It consists set of tools, libraries, that aim to change the task of making

advanced and strong robot behavior across a good form of robotic platforms.it contains nearly 2,000 software packages. Approximately over 80commerciallyavailable robots are supported. ROS provides. ROS provides the all parts of the robot software that we would otherwise we have to write.

Indoor Applications of humanoid robot:

Hotels: Humanoids can perform more useful work in indoor applications like hotels restaurants coffee shops etc. they can be used as waiter or server to take orders from the customer and to deliver meals to designated tables by navigation. when customer arrives, humanoid robot greets them and shows the menu in its screen. once the order is ready and humanoid can deliver these orders to the designated tables using the predefined path for the particular table where the customers are seated. Implementing humanoids can also act as non-contact service to the customers during pandemic situations like covid-19.

Assisting aged people in home: Application of AI has enabled humanoid robots to find its usefulness in health care sector. Humanoids are being used to take care of the aged people in home. One can easily monitor the activities of aged people from a distant place.

Student screening at the entry of college: During the covid time these can be placed near each department or classroom to monitor the temperature and any related symptoms of the students. The data from these is transferred to cloud and collected by different departments to monitor student health condition. Similarly, these can be adopted where people gather in large number which becomes difficult to monitor each one's health care.

Greeting people in function: Apart from health care and educational aspects it is also used for entertainments. It is used to greet people in functions. Humanoid have movements similar to normal human being. It can greet people by hand shaking, conveying wishes through voice or giving a Boquete to a person.

VI. CONCLUSION

Our Primary goal is to Design a well-designed and Efficient Humanoid robot that can mimic human movements like eye movement, neck movement, jaw movements, hand and wrists movements are successfully achieved. And the next part like as the lower humanoid robot body is fixed to the Turtlebot surface and by using Robotic operating system in that by implementing Navigation and Autonomous navigation feature. The Autonomous movement and moving the whole humanoid robot to the targeted place achieved successfully.

VII. REFERENCES

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