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MECCANO HUMANOID ROBOT(MHR18)

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Abstract:

A **humanoid robot** is a robot with its body shape built to resemble the human body. The design may be for functional purposes, such as interacting with human tools and environments, for experimental purposes. Here we are using CMOS technology which is Low-power, high-speed Flash/EEPROM technology. This project assumes only availability to help the people in hospitals and disaster. In the hardware section this project also introducing the accidental preventive measures to the system. Finally while comparing the existing robots this is having high durability, performance with low cost. From the comparison, we conclude that the MECCANO HUMANOID ROBOT is better suited for our society and will get the better feedback from people as well.

I.INTRODUCTION

A humanoid robot is a robot with its body shape built to resemble the human body. The design may be for functional purposes, such as interacting with human tools and environments, for experimental purposes, such as the study of bipedal locomotion (Bipedalism is a form of terrestrial locomotion where an organism moves by means of its two rear limbs or legs. An animal or machine that usually moves in a bipedal manner is known as a biped), or for other purposes. In general, humanoid robots have a torso, a head, two arms, and two legs, though some forms of humanoid robots may model only part of the body, for example, from the waist up. Some humanoid robots also have heads designed to replicate human facial features such as eyes and mouths. Androids (An android is a humanoid robot or synthetic organism designed to look and act like a human, especially one with a body having a flesh-like resemblance) are humanoid robots built to aesthetically resemble humans. The development of a humanoid robot in the collaborative research Centre 588 has the objective of creating a machines that cooperates with humans

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Pick-and-place operations, such as palletizing [1], are one of the many applications of robotic manipulators. They are often employed to increase productivity in a setting where tasks can be repetitive and laborious such as packaging [2] and assembly operations [2-4]. Application can also be in removing humans from hazardous work, such as the use of robotic arms in nuclear decommissioning tasks [5], and the increased level of intelligence integrated in some robotic arms of today means they can even work in collaboration with humans [6, 7].

While the operations of a pick-and-place robot can be customized by appropriate programming, developing an accurate model to simulate the motions of the robot can be used to determine the reach and efficiency of the robot, estimate cycle time, and convey potential collision paths without any actual implementation on hardware. This can save time and money and also prevent possible damage to the robot.

2. System Description

The mechanical structure of the developed robot is quite similar to the commercially available robotic arm Scorbot ER-4u and is to be employed in a smart flexible manufacturing system (SFMS) which consists of a machining center in the form of a CNC drilling machine [12]; a transportation system in the form of an automatic guided vehicle (AGV) [13]; and the pick-and-place robot [8, 9]. The remote machining system is based on Internet technology such that the CNC drilling machine could be controlled by registered and authenticated clients from any part of the world [14].

The framework for the developed pick-and-place robot is shown in Figure 1. A vision system is integrated into the workspace of the pick-and-place robot to recognize the shape and color of work-pieces on the work-plane of the robot. The user specifies the shape and color of the work-pieces to be manipulated through a graphical user interface (GUI) and the robot, based at the machining center, unloads the specified work-pieces from the work-plane, on the AGV, to the machining center for drilling operations.

Furthermore, the robot is controlled by a PIC16F877 microcontroller which allows easy interface to the control electronics. However, for motion planning and since the overall project also involves image processing, sufficient additional processing power is provided in the form of a personal computer (PC), designated as a server. Output data from motion planning is then communicated on request through the enhanced parallel port (EPP) of the PC to the PIC microcontroller, acting as the client, which actuates the robot and interfaces with the sensing devices. The client-server control architecture has been presented in [15].

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The pick-and-place robot has been developed for operation in an indoor environment and is mounted on a worktable which is fixed with respect to the work-plane. It has been designed for handling light weight and small size material such as wax, wood, and aluminum and therefore has a limited payload of 0.5 kg. It offers five degree-of-freedom (DOF) with motions about the base, shoulder, and elbow joints together with pitch and roll motions at the wrist joint. Also, a two-finger gripper is used as the end-of-arm-tool (EOAT) for firmly gripping the work-piece while it is being moved from one position to another.

HSM is used as the actuation device for the base, shoulder, elbow, and wrist (pitch) motions of the pick-and-place robot. Each of these motions are similar and the main subsystems of the open-loop HSM drive are shown in Figure 2. The outputs from the PIC microcontroller are the input commands to the stepper motor drive board in the form of clock pulse and direction signal. The subsystems are discussed in the following subsections.

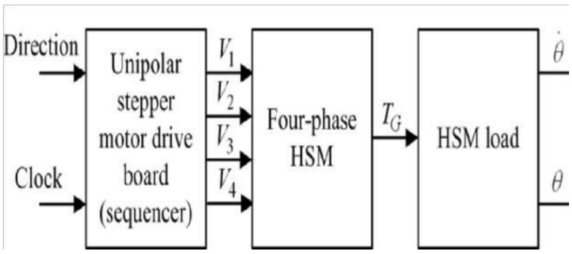


Figure 2. Main Subsystems of the Stepper Motor Drive

IV.PROPOSED SYSTEM BLOCK DIAGRAM

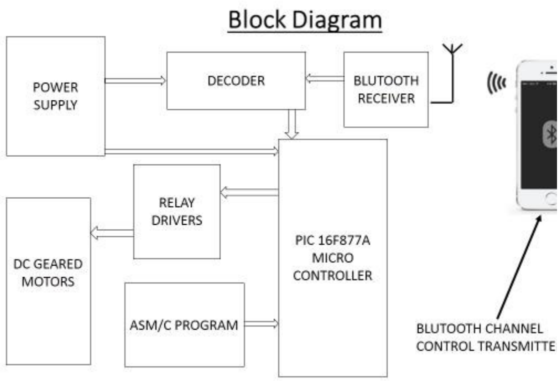


Fig-1: main block diagram

V.HARDWARE DESCRIPTION

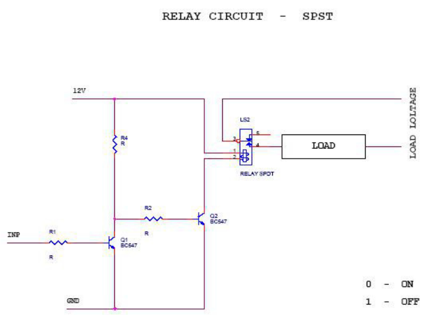
A.Zigbee

ZigBee is a mesh network specification for low-power wireless local area networks (WLANs) that cover a large area. ZigBee was designed to provide high data throughput in applications where the duty cycle is low and low power consumption is an important consideration. (Many devices that use ZigBee are powered by battery.) Because ZigBee is often used in industrial automation and physical plant operation, it is often associated with machine-to-machine (M2M) communication and the Internet of Things (IoT).

Microcontroller

A microcontroller is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

relay driver circiuit



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A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555

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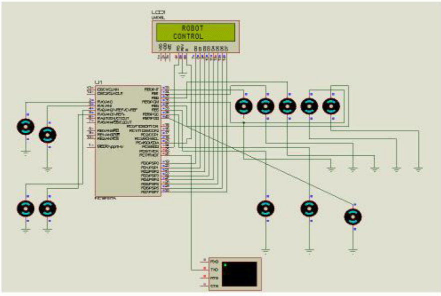
timer IC is 200mA so these devices can supply relay coils directly without amplification.

Fig-3: Program for Proposed System



B.SIMULATION RESULTS:

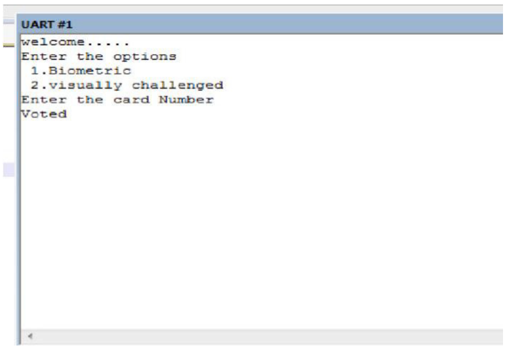
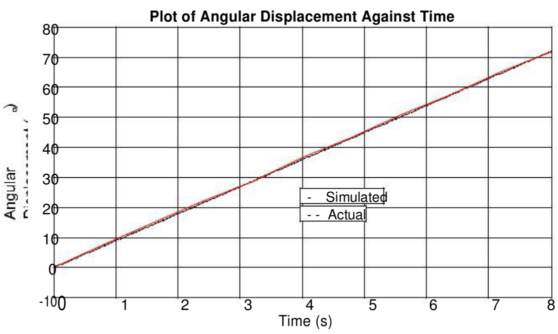


Fig-4: Simulation Results

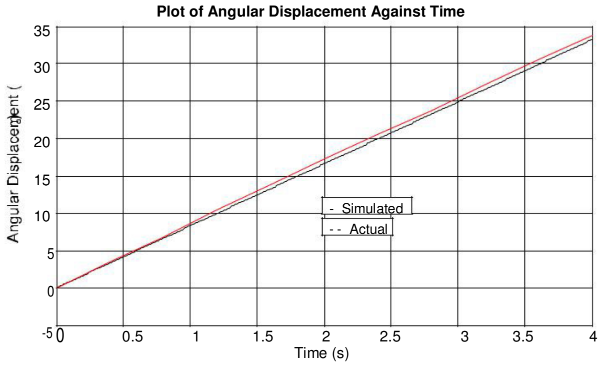
C.Model Validation

The angular velocity of the arm movements could not be physically measured due to limitations in instrumentation. Therefore, only the simulated and actual results for angular displacement were compared. In both cases, the direction was set to logic 0 for clockwise rotation of the motor shaft while the clock frequency was set as given in Table 2.

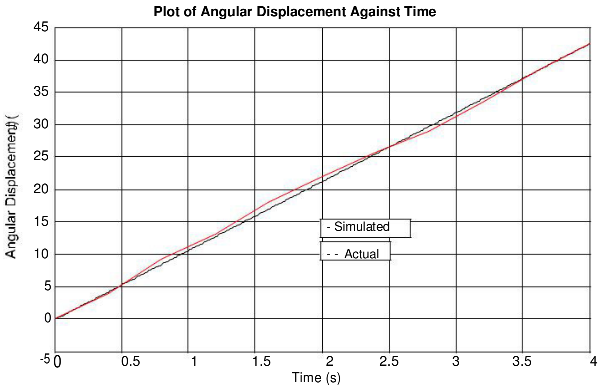
Figure 4 shows the simulated and actual robot arm angular displacements for (a) the base, (b) the shoulder, (c) the elbow, and (d) the wrist (pitch) motions.



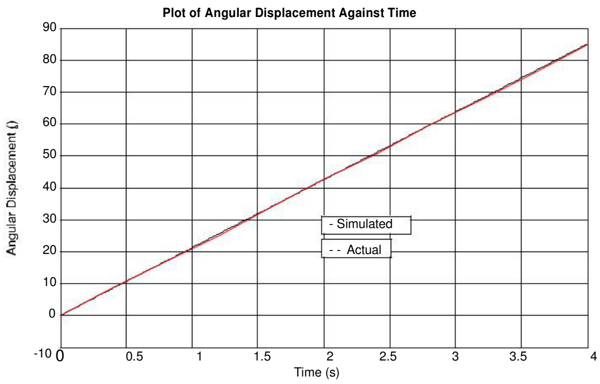
(a) Angular displacement for base



(b) Angular displacement for shoulder



(c) Angular displacement for elbow



(d) Angular displacement for wrist (pitch)

5. Discussion

The simulated and actual angular displacement results are close in each case. However, the current model does not include the torque, T_D, which is required to produce the force to move the arm of the robot. The HSM torque, T_G, has to overcome this torque apart from the ones given in eq. (7). In addition, some estimated parameters were used in the model and the actual angular displacement of the robot in each case was manually measured. These could be some of the reasons for the variation between the two readings.

Better instrumentation, more accurate values of the estimated parameters used in the simulation, and determining a more complete model could be some of the ways to achieve more conforming results.

6. Conclusion

The mathematical model of a HSM has been used to understand the dynamics of the motions of the base, shoulder, elbow, and wrist (pitch) of the pick-and-place robot. The outputs of the simulated model are angular displacement and angular velocity but due to limitations in instrumentation, only the results for angular displacement were compared against the actual angular displacement. While the model is not a complete one, it gives a good approximation of the angular displacement of each motion.

However, further work is needed to get a more accurate model of the physical system. Also, the angular velocity needs to be measured to determine parameters such as settling time and overshoot which can in turn be used to determine the damping of the system.

VII.CONCLUSION

This project can be used for voting since it overcome all the draw backs of ordinary voting machine also provide additional security. Its main advantage is that since fingerprints of every person is unique and hence this system completely reduces the chance of invalid votes. The system can be manufactured simply as well as cheap and casting vote becomes easier by the process of voting from any place inside Tamilnadu.

REFERENCES

[1] S. N. Yu, S. J. Lim, C. S. Han, M. K. Kang and S. R. Kim, "Development of a robot simulator using a modified trajectory generation algorithm oriented towards the palletizing task", Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science, vol. 222, no. 7, **(2008)** July, pp. 1253-1264,.

[2] H. M. Do, C. Park and J. H. Kyung, "Dual arm robot for packaging and assembling of IT products", 2012 IEEE International Conference on Automation Science and Engineering (CASE), **(2012)** August 20-24, pp. 1067-1070.

[3] C. Park, K. Park and D. Kim, "Design of dual arm robot manipulator for precision assembly of mechanical parts", International Conference on Smart Manufacturing Application 2008 (ICSMA 2008), **(2008)** April 911, pp. 424-427.

[4] B. Roy and H. H. Asada, "Design of a Reconfigurable Robot Arm for Assembly Operations inside an Aircraft Wing-Box", Proceedings of the 2005 IEEE International Conference on Robotics and Automation (ICRA 2005), **(2005)** April 18-22, pp. 590-595.

[5] M. J. Bakari, K. M. Zeid and D. W. Seward, "Development of a multi-arm mobile robot for nuclear decommissioning tasks", International Journal of Advanced Robotic Systems, vol. 4, no. 4, **(2007)**, pp. 387406.

[6] C. Lenz, S. Nair, M. Rickert, A. Knoll, W. Rosel, J. Gast, A. Bannat and F. Wallhoff, "Joint-action for humans and industrial robots for assembly tasks", The 17th IEEE International Symposium on Robot and Human Interactive Communication 2008 (RO-MAN 2008), **(2008)** August 1-3, pp. 130-135.

[7] S. R. Cruz-Ramirez, Y. Ishizuka, Y. Mae, T. Takubo and T. Arai, "Dismantling interior facilities in buildings by human robot collaboration", IEEE International Conference on Robotics and Automation 2008 (ICRA 2008), **(2008)** May 19-23, pp. 2583-2590.

[8] R. V. Sharan, "A vision-based pick-and-place robot", MSc Thesis, Department of Engineering, University of the South Pacific, Suva, Fiji, **(2006)** June.

[9] R. V. Sharan and G. C. Onwubolu, "Development of a vision-based pick-and-place robot", Proceedings of the 3rd International Conference on Autonomous Robots and Agents (ICARA), Palmerston North, New Zealand, **(2006)** December 12-14, pp. 473-478.

[10] A. Morar, "Stepper motor model for dynamic simulation", ACTA Electrotehnica, vol. 44, no. 2, **(2003)**, pp. 117-122.

[11] P. Chand, G. C. Onwubolu and S. Kumar, "Modeling and simulation of a PC-based computer numerically controlled drilling machine worktable", Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, vol. 218, no. 11, **(2004)** November, pp. 1625-1630.

[12] G. C. Onwubolu, S. Aborhey, R. Singh, H. Reddy, M. Prasad, S. Kumar and S. Singh, "Development of a PC-based computer numerical control drilling machine", Proceedings of Institute of Mechanical Engineers, Part B: Journal of Engineering Manufacture, vol. 216, no. 11, **(2002)**, pp. 1509-1515.

[13] S. Kumar and G. C. Onwubolu, "A roaming vehicle for entity relocation", Proceedings of the Virtual International Conference on Intelligent Production Machines and Systems (Eds D.T. Pham, E. E. Eldukhri, and A. J. Soroka), **(2005)**, pp. 135-139.

[14] S. P. Lal and G. C. Onwubolu, "Three tiered web-based manufacturing system-Part 1: system development", Journal of Robotics and Computer-Integrated Manufacturing, vol. 23, no. 1, **(2007)**, pp. 138-151.

[15] R. V. Sharan and G. C. Onwubolu, "Client-server control architecture for a vision-based pick-and-place robot", Proceedings of the Institution of Mechanical Engineers, Part B: Journal of

Special Issue; March - 2018 [ISSN: 2455-1457]
DOI : 10.23883/IJRTER.CONF.02180328.015.HYSXE

Engineering Manufacture, vol. 228, no. 8, **(2012)** August, pp. 1369-1378.
[16] RS Data Sheet 425-6241: stepper motor drive boards, RS Components, Australia, (**2002**).