A Survey of Artificial Hand By Using Flex Force Sensor

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Abstract- *In this paper, anartificial hand is designed using solid work to simulate a hand model action. A human hand is a very complex grasping tool which can handle object of different sizes and shapes. Most part of this research are dedicated to control of multi finger grippers with emphasis on the finger tips or finger joint. In this paper the mechanism and design of a new humanoid type hand or artificial hand with human like manipulation abilities is discussed. The ideal end-effecter for such an artificial arm or a humanoid would be able to use the tool and objects that a person uses when working in the same environment. This includes the number of fingers and the placement and motion of the thumb, the proportions of the link lengths and the shape of the palm. It can also perform most part of human grasping types.*

Keywords- Flex force sensor, human hand, power supply, signal amplifier, arduino UNO, and servo motor

I. INTRODUCTION

Robot of the current generation has been used in field isolated from the human society. They suffer major shortcoming because of their limited abilities for manipulation and interaction with human. This high stroke incidence in combination with an aging population, which implies future increases in incidence, greatly strains national healthcare service and related costs. In this majority of these cases, patients experience either partial or total absence of hand motion ability, and this loss of functionality can greatly restrict activities and task specific upper limb treatment consisting of active, highly repetitive movement is one of the most effective approaches to arm and hand function restoration is labour intensive and required one-to-one manual interaction with therapists. These systems are typically expensive and are designed for in clinic use as they are generally not portable. An intelligent prosthetic hand is defined as a hand that the natural movements of the human hand.

II. BLOCK DIAGRAM AND IMPLEMENTATION

Fig.1. shows the block diagram of artificial hand or humanoid hand. In this a glove with flex sensor attached is use to control the prosthetic hand. Each flex sensor will be used to control one servo motor. Signals from flex sensor are sent to the Arduino UNO kitto process and control servo motors. The fishing lines are attached to the fingers as tendons to help them move. An arduino combined with servo SG90 to control the action of the prototypes.

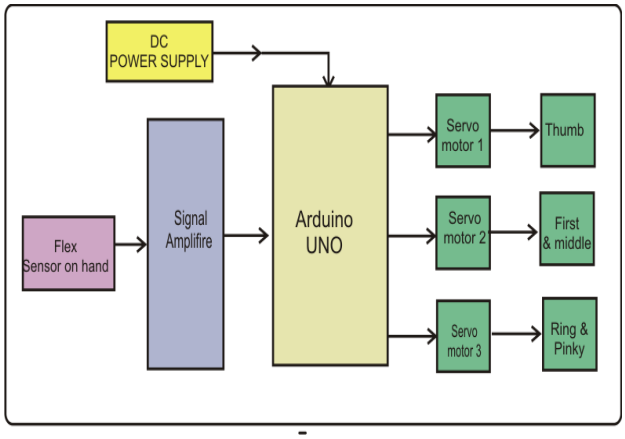

Figure 1. Block diagram of artificial hand

2.1 Signal Amplifier

Most analog signals require some form of preparation before they can be digitized signal amplifier is the manipulation of a signal in a way that prepares it for the next stage of processing.Many applications involve environmental or structural measurement, such as temperature and vibration, from sensors, switches.

2.2 Arduino

Arduino is an open source hardware and software. Most arduion boards consist of an Atmel 8-bit AVP microcontroller with varying amounts of flash memory, pin, and features. The 32-bit arduino due, based on the Atmel SAM3X8E.Arduino boards are available commercially in

preassembled form, or as do-it-yourself kits.Arduino board designs use a variety of microprocessors and controllers.

Figure 2. Arduino board

The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. Many arduino compatible and arduino derived boards exist. Some are functionally equivalent to an arduino and can be too interchangeable. The basic arduino by adding output drives, often for use in school- level education, to simplify making buggies and small robots. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple, and possibly stacked shields may be individually addressable via an I²Cserial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

2.3 Servo motor

Servo motor is an electrical device which can push or rotate an object at some specific angles or distance then you use servo motor. It just made up of simple motor which run through servo mechanism. If a motor is used in DC powered motor then it is called DC servo motor, and if it is used in AC powered motor then it is called AC servo motor.

Figure 3. Servo motor

III. CONCLUSION AND FUTURE SCOPE

A. Conclusion

In this paper we presented the mechanical design concept and experimental result of the smart artificial hand or humanoid hand. The humanoid hand is able to hold objects with the finger and palm by adapting the grip to the shape of the objects, through a self-adjustment functionality. The hand is driven by only one actuator.

B. Future scope

This is greatly useful to simplify the hand control system. With some modification we can use make it for three direction.

REFERENCES

[1] T. Asfour, K. Berns and R. Dillmann, "The HumanoidRobot ARMAR", Proc. of the Second InternationalSymposium on Humanoid Robots (HURO´99), October 8-9, 1999, Tokyo, Japan

[2] T. Asfour, K. Berns, J. Schelling and R. Dillmann,"Programming of Manipulation Tasks of the HumanoidRobot ARMAR", The 9th International Conference onAdvanced Robotics (ICAR'99), 25-27 October, Tokyo,Japan

[3] S. Toyama, S. Hatae and S. Sugitani, "Multi-Degree ofspherical ultrasonic motor", Proc. ASME Japan/USASympo. Flexible Automation, 169, 1992

[4] N. Fukaya, S. Toyama and T. Seki, "Development of anartificial arm by use of spherical ultrasonic motor", The 29thInt. Sympo. Robotics, Bermingam, England, 74, 1998

[5] S.C.Jacobsen, E.K. Iversen, D.F. Knutti, R.T. Johnson andK.B. Biggers, "Design of the Utah/MIT dexterous hand",Proc. IEEE Int. Conf. On Robotics and Automation, pp.1520-1532, 1986

[6] M. Rakic, "Mutifingerd Robot Hand with Selfadaptability",Robotics and Computer-Integrated Manufacturing, Vol. 5,No. 2/3, pp. 269-276, 1989
[7] R. M. Crowder, "An anthropomorphic robotic end effect",Robotics and Autonomous Systems, Vol.7, pp. 253-268,1991
[8] M. Umetsu, N. Afzulpurkar, Y. Kuniyoshi and T. Suehiro,"Implementation of a distributed controller for the RWCdexterous hand", Robotics and Autonomous Systems,Vol.18, pp. 13-19, 1996
[9] G. A. Bekey, H.Liu, R. Tomovic and W. J. Karplus,"Knowledge-Based control of grasping in robot hands usingheuristics from human motor skills", IEEE Transctions onRobotics and Automation, Vol. 9, No. 6, December, pp.709-722, 1993
[10] A. Meghdari, M. Arefi, and M. Mahmoudian, "GeometricAdaptability: A Novel Mechanical Design in the SharifArtificial Hand", Biomechanics Sympo. ASME, AMD-Vol.
120, pp. 219-223, 1991
[11] H. Ito, "Tsukamite no dousakinoukaiseki", Biomechanism,Vol.3, pp. 145-154, 1975 (in Japanese)
[12] A. D. Keller, C. L. Taylor and V. Zahm, "Studies todetermine the functional requirements for hand & armprostheses", Dept. of Engr., UCLA., CA, 1947
[13] Kapandiji, I., "The Physiology of joints", ChurchillLivingstone, NY, USA, 1970