

REFERENCES

- [1] “robot: definition of robot in Oxford dictionary (British & World English).” [Online]. Available: <http://www.oxforddictionaries.com/definition/english/robot>. [Accessed: 03-Aug-2014].
- [2] A. V. Hill, *Encyclopedia of Operations Management, The ; A Field Manual and Glossary of Operations Management Terms and Concepts*. FT Press, 2011.
- [3] V. Gupta and R. Bala, “Advancements in Robots for Human Welfare: A Review,” *Int. J. Res. Manag. Sci. Technol.*, vol. Vol. 1 No. 2, pp. 106–115, Dec. 2013.
- [4] “The History Use Of Prosthetics Health And Social Care Essay.” [Online]. Available: <http://www.ukessays.com/essays/health-and-social-care/the-history-use-of-prosthetics-health-and-social-care-essay.php>. [Accessed: 11-May-2014].
- [5] G. Thompson and D. Lubic, “The Bionic Arm: New Prosthetic Devices Fuse Man and Machine,” presented at the Seventh Annual Freshman Conference, 2009, pp. 1–8.
- [6] N. Wiener, *Cybernetics Or Control and Communication in the Animal and the Machine*. MIT Press, 1965.
- [7] R. Meier and D. Atkins, *Functional Restoration of Adults and Children with Upper Extremity Amputation*. Demos Medical Publishing, 2004.
- [8] “Anatomy of the Shoulder | Southern California Orthopedic Institute.” [Online]. Available: <https://www.scoi.com/specialties/anatomy-shoulder>. [Accessed: 04-Aug-2014].
- [9] “Guide Human Anatomy Upper Limb Bones PDF Video Download | clammybrain658.” [Online]. Available: <http://clammybrain658.wordpress.com/2014/07/10/guide-human-anatomy-upper-limb-bones-pdf-video-download/>. [Accessed: 04-Aug-2014].

- [10] “Left Wrist Anatomy - Medical Illustration, Human Anatomy Drawing, Anatomy Illustration.” [Online]. Available: <http://graphicwitness.medicalillustration.com/generateexhibit.php?ID=63091>. [Accessed: 04-Aug-2014].
- [11] J. Hamill and K. M. Knutzen, *Biomechanical Basis of Human Movement*. Lippincott Williams & Wilkins, 2006.
- [12] R. N. Scott and P. A. Parker, “Myoelectric prostheses: state of the art,” *J. Med. Eng. Technol.*, vol. 12, no. 4, pp. 143–151, Aug. 1988.
- [13] R. A. R. C. Gopura and K. Kiguchi, “Mechanical designs of active upper-limb exoskeleton robots: State-of-the-art and design difficulties,” in proceedings of IEEE International Conference on Rehabilitation Robotics, 2009. pp. 178–187.
- [14] “Anatomy of the Hand Bones | Human body anatomy, human body muscle anatomy, human body anatomy kidney.” [Online]. Available: <http://www.paradoja7.com/anatomy-of-the-hand-bones/>. [Accessed: 04-Aug-2014].
- [15] “Anatomy-of-the-index-finger01.jpg (482×279).” [Online]. Available: http://www.sensorprod.com/research-articles/white-papers/2008-03_sha/Anatomy-of-the-index-finger01.jpg. [Accessed: 04-Aug-2014].
- [16] G. Mansour, S. Mitsi., and K. . Bouzakis, “A Kinematic and Dynamic Model of the Human Upper Extremity,” in proceedings of International Conference on Manufacturing Engineering, 2008, pp. 885–892.
- [17] K. S. Fok and S. M. Chou, “Development of a finger biomechanical model and its considerations,” *J. Biomech.*, vol. 43, no. 4, pp. 701–713, Mar. 2010.
- [18] S. K. Kundu, K. Kiguchi, and E. Horikawa, “Design and Control Strategy for a 5 DOF Above-Elbow Prosthetic Arm,” *Int. J. Assist. Robot. Mechatron.*, vol. 9, pp. 61–75, Sep. 2008.

- [19] L. Resnik, S. L. Klinger, and K. Etter, "The DEKA Arm: Its features, functionality, and evolution during the Veterans Affairs Study to optimize the DEKA Arm," *Prosthet. Orthot. Int.*, Oct. 2013.
- [20] J. Z. Zheng, S. De La Rosa, and A. Dollar, "An investigation of grasp type and frequency in daily household and machine shop tasks," in proceedings of *IEEE International Conference on Robotics and Automation*, 2011, pp. 4169–4175.
- [21] P.-C. V. Marco Troncossi, "Design of Upper Limb Prostheses: a New Subject-oriented Approach," *J. Mech. Med. Biol.*, vol. 5, no. 2, pp. 383–390, 2005.
- [22] A. Z. Escudero, J. Alvarez, and L. Leija, "Development of a parallel myoelectric prosthesis for above elbow replacement," in proceedings of *Annual Conference and the Annual Fall Meeting of the Biomedical Engineering Society EMBS/BMES Conference*, 2002. vol. 3, pp. 2404–2405.
- [23] T. Tsuj, O. Fukuda, H. Shigeyoshi, and M. Kaneko, "Bio-mimetic impedance control of an EMG-controlled prosthetic hand," in proceedings of *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2000. vol. 1, pp. 377–382.
- [24] O. Fukuda, T. Tsuji, M. Kaneko, and A. Otsuka, "A human-assisting manipulator teleoperated by EMG signals and arm motions," *IEEE Trans. Robot. Autom.*, vol. 19, no. 2, pp. 210–222, Apr. 2003.
- [25] K. Ito, T. Tsuji, A. Kato, and M. Ito, "An EMG controlled prosthetic forearm in three degrees of freedom using ultrasonic motors," in *proc. of 14th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 1992, vol. 4, pp. 1487–1488.
- [26] Y. Saito, A. Ogawa, H. Negoto, and K. Ohnishi, "Development of intelligent prosthetic hand adapted to age and body shape," in proceedings of *International Conference on Rehabilitation Robotics, 2005. ICORR 2005*, pp. 384–389.

- [27] S. Lee and G. N. Saridis, "The control of a prosthetic arm by EMG pattern recognition," *IEEE Trans. Autom. Control*, vol. 29, no. 4, pp. 290–302, Apr. 1984.
- [28] S. C. Jacobsen, D. F. Knutti, R. T. Johnson, and H. H. Sears, "Development of the Utah artificial arm," *IEEE Trans. Biomed. Eng.*, vol. 29, no. 4, pp. 249–269, Apr. 1982.
- [29] "Ottobock - Arm Prosthetics." [Online]. Available: http://www.ottobock.com/cps/rde/xchg/ob_com_en/hs.xsl/4747.html. [Accessed: 12-May-2014].
- [30] C. Toledo, L. Leija, R. Munoz, A. Vera, and A. Ramirez, "Upper limb prostheses for amputations above elbow: A review," in *Health Care Exchanges, 2009. PAHCE 2009*, pp. 104–108.
- [31] M. C. Carrozza, P. Dario, F. Vecchi, S. Roccella, M. Zecca, and F. Sebastiani, "The Cyberhand: on the design of a cybernetic prosthetic hand intended to be interfaced to the peripheral nervous system," in proceedings of *IEEE/RSJ International Conference on Intelligent Robots and Systems, 2003*. vol. 3, pp. 2642–2647 .
- [32] C. Pylatiuk, S. Schulz, and L. Döderlein, "Results of an Internet survey of myoelectric prosthetic hand users," *Prosthet. Orthot. Int.*, vol. 31, no. 4, pp. 362–370, Dec. 2007.
- [33] "Motion Control, Inc. U3+ Arm Myoelectric Prosthesis." [Online]. Available: <http://www.utaharm.com/ua3-plus-myoelectric-arm.php>. [Accessed: 13-May-2014].
- [34] S. Allin, E. Eckel, H. Markham, and B. R. Brewer, "Recent trends in the development and evaluation of assistive robotic manipulation devices," *Phys. Med. Rehabil. Clin. N. Am.*, vol. 21, no. 1, pp. 59–77, Feb. 2010.

- [35] “iLimb: world’s first fully articulating and commercially available bionic hand.” [Online]. Available: <http://www.gizmag.com/go/7661/>. [Accessed: 12-May-2014].
- [36] F. Orabona, C. Castellini, B. Caputo, A. E. Fiorilla, and G. Sandini, “Model adaptation with least-squares SVM for adaptive hand prosthetics,” in proceedings of *IEEE International Conference on Robotics and Automation, 2009*. pp. 2897–2903.
- [37] J. K. Salisbury and J. J. Craig, “Articulated Hands Force Control and Kinematic Issues,” *Int. J. Robot. Res.*, vol. 1, no. 1, pp. 4–17, Mar. 1982.
- [38] G. A. Bekey, R. Tomovic, and I. Zeljkovic, “Control Architecture for the Belgrade/USC Hand,” in *Dextrous Robot Hands* by S. T. Venkataraman and T. Iberall, Eds. Springer New York, pp. 136–149, 1990 ISBN- 978-1-4613-8974-3.
- [39] T. Laliberte, L. Birglen, and C. Gosselin, “Underactuation in robotic grasping hands,” *Mach. Intell. Robot. Control*, vol. 4, no. 3, pp. 1–11, 2002.
- [40] J. Crisman, C. Kanojia, and I. Zeid, “Robot arm end effector,” Patent no. 5570920.
- [41] M. J. F, “Mechanical hand,” Patent no. US3694021 A, 26-Sep-1972.
- [42] B. Massa, S. Roccella, M. C. Carrozza, and P. Dario, “Design and development of an underactuated prosthetic hand,” in proceedings of IEEE International Conference on Robotics and Automation, 2002 ICRA ’02, vol. 4, pp. 3374–3379.
- [43] M. C. Carrozza, C. Suppo, F. Sebastiani, B. Massa, F. Vecchi, R. Lazzarini, M. R. Cutkosky, and P. Dario, “The SPRING Hand: Development of a Self-Adaptive Prosthesis for Restoring Natural Grasping,” *Auton. Robots*, vol. 16, no. 2, pp. 125–141, Mar. 2004.

- [44] R. Cabas, L. M. Cabas, and C. Balaguer, "Optimized design of the underactuated robotic hand," in the proceedings of IEEE International Conference on Robotics and Automation, 2006, pp. 982–987.
- [45] S. Krut, "A Force-Isotropic Underactuated Finger," in proceedings of IEEE International Conference on Robotics and Automation, 2005. pp. 2314–2319.
- [46] L. Wu, G. Carbone, and M. Ceccarelli, "Designing an underactuated mechanism for a 1 active DOF finger operation," *Mech. Mach. Theory*, vol. 44, no. 2, pp. 336–348, Feb. 2009.
- [47] C. Gosselin, F. Pelletier, and T. Laliberte, "An anthropomorphic underactuated robotic hand with 15 dofs and a single actuator," in proceedings of IEEE International Conference on Robotics and Automation, 2008, pp. 749–754.
- [48] P. Rea, "On the Design of Underactuated Finger Mechanisms for Robotic Hands," in *Advances in Mechatronics*, H. Martinez-Alfaro, Ed. InTech, 2011.
- [49] C. Medynski and B. Rattray, "Bebionic Prosthetic Design," in proceedings of MyoElectric Controls/Powered Prosthetics Symposium Fredericton, New Brunswick, Canada: August 14-19, 2011 .
- [50] DSV Bandara and RARC Gopura, "Upper Extremity Prosthetics: Current Status, Challenges and Future Directions," in proceedings of *Seventeenth Int. Symp. Artif. Life Robot.*, 2012.
- [51] J. T. Belter and A. M. Dollar, "Performance characteristics of anthropomorphic prosthetic hands," in proceedings of *IEEE International Conference on Rehabilitation Robotics (ICORR)*, 2011, pp. 1–7.
- [52] L. Biagiotti, F. Lotti, C. Melchiorri, and G. Vassura, *How Far Is the Human Hand? A Review on Anthropomorphic Robotic End-effectors*.2004 .

- [53] R. S. Stoughton and T. Arai, "A modified Stewart platform manipulator with improved dexterity," *IEEE Trans. Robot. Autom.*, vol. 9, no. 2, pp. 166–173, Apr. 1993.
- [54] J. A. Saglia, D. G. Caldwell, and J. S. Dai, "Geometry and Kinematic Analysis of a Redundantly Actuated Parallel Mechanism That Eliminates Singularities and Improves Dexterity," *J. Mech. Des.*, vol. 130, no. 12, pp. 124501–124501, Oct. 2008.
- [55] Y. Li and Q. Xu, "Kinematic analysis of a 3-PRS parallel manipulator," *Robot. Comput.-Integr. Manuf.*, vol. 23, no. 4, pp. 395–408, Aug. 2007.
- [56] Gough V.E, "Contribution to discussion of papers on research in automobile stability, control and tyre performance." in proceedings of Auto Div. Inst. Mech. Eng (Vol. 171, pp. 392-394). 1957.
- [57] D. Stewart, "A Platform with Six Degrees of Freedom," *Proc. Inst. Mech. Eng.*, vol. 180, no. 1, pp. 371–386, Jun. 1965.
- [58] F. Gao, W. Li, X. Zhao, Z. Jin, and H. Zhao, "New kinematic structures for 2-, 3-, 4-, and 5-DOF parallel manipulator designs," *Mech. Mach. Theory*, vol. 37, no. 11, pp. 1395–1411, Nov. 2002.
- [59] K. B. Fite, T. J. Withrow, X. Shen, K. W. Wait, J. E. Mitchell, and M. Goldfarb, "A Gas-Actuated Anthropomorphic Prosthesis for Transhumeral Amputees," *IEEE Trans. Robot.*, vol. 24, no. 1, pp. 159–169, Feb. 2008.
- [60] E. T.-C. J. R. Mendoza-Vázquez, "Simulation of a parallel mechanical elbow with 3 DOF," *J. Appl. Res. Technol.*, vol. 7, no. 2, pp. 113–123, 2009.
- [61] J. L. Pons, E. Rocon, R. Ceres, D. Reynaerts, B. Saro, S. Levin, and W. V. Moorlegheem, "The MANUS-HAND Dextrous Robotics Upper Limb Prosthesis: Mechanical and Manipulation Aspects," *Auton. Robots*, vol. 16, no. 2, pp. 143–163, Mar. 2004.

- [62] “Dean Kamen’s ‘Luke Arm’ Prosthesis Readies for Clinical Trials - IEEE Spectrum.”[Online]. Available: <http://spectrum.ieee.org/biomedical/bionics/dean-kamens-luke-arm-prosthesis-readies-for-clinical-trials>. [Accessed: 12-May-2014].
- [63] “A ‘Manhattan Project’ for the Next Generation of Bionic Arms - IEEE Spectrum.”[Online]. Available: <http://spectrum.ieee.org/biomedical/bionics/a-manhattan-project-for-the-next-generation-of-bionic-arms>. [Accessed: 12-May-2014].
- [64] F. Casolo, S. Cinquemani, and M. Cocetta, “Evolution of elbow prosthesis transmission,” in proceedings of *International Symposium on Mechatronics and Its Applications, 2008*. pp. 1–6.
- [65] S. Nasser, D. Rincon, and M. Rodriguez, “Design of an anthropomorphic underactuated hand prosthesis with passive-adaptive grasping capabilities,” in proceedings of Florida Conf. on Recent Advances in Robotics and Robot Showcase, 2006, pp. 25–26.
- [66] I. Gaiser, C. Pylatiuk, S. Schulz, A. Kargov, R. Oberle, and T. Werner, “The FLUIDHAND III: A Multifunctional Prosthetic Hand : JPO: Journal of Prosthetics and Orthotics,” *JPO J. Prosthet. Orthot.*, vol. 21, no. 2, pp. 91–96, 2009.
- [67] C. M. Kathryn J De Laurentis, “Mechanical design of a shape memory alloy actuated prosthetic hand.,” *Technol. Health Care Off. J. Eur. Soc. Eng. Med.*, vol. 10, no. 2, pp. 91–106, 2002.
- [68] L. Resnik, S. L. Klinger, K. Etter, and C. Fantini, “Controlling a multi-degree of freedom upper limb prosthesis using foot controls: user experience,” *Disabil. Rehabil. Assist. Technol.*, vol. 9, no. 4, pp. 318–329, Jul. 2014.
- [69] M. S. Fifer, S. Acharya, H. L. Benz, M. Mollazadeh, N. E. Crone, and N. V. Thakor, “Towards Electrocorticographic Control of a Dexterous Upper Limb Prosthesis,” *IEEE Pulse*, vol. 3, no. 1, pp. 38–42, Jan. 2012.

- [70] J. J. Craig, *Introduction to Robotics: Mechanics and Control*, 2nd ed. Boston, MA, USA: Addison-Wesley Longman Publishing Co., Inc., 1989. ISBN 0201095289.
- [71] Y. Li and Q. Xu, “Kinematic Analysis and Design of a New 3-DOF Translational Parallel Manipulator,” *J. Mech. Des.*, vol. 128, no. 4, pp. 729–737, Sep. 2005.
- [72] M. A. Saliba, D. Camilleri, and M. J. Farrugia, “Development of an anthropomorphic robot hand and wrist for teleoperation applications,” in proceedings of International Conference on Information and Automation, , pp. 203–208. 2005.
- [73] S. K. Kundu, K. Kiguchi, and E. Horikawa, “Design and Control Strategy for a 5 DOF Above-Elbow Prosthetic Arm,” *Int. J. Assist. Robot. Mechatron.*, vol. 9, pp. 61–75, Sep. 2008.

LIST OF PUBLICATIONS

Book Chapters

- R. A. R. C. Gopura, D. S. V. Bandara, J. M. P. Gunasekara and T. S. S. Jayawardane, "Recent trends in EMG based control methods for assistive robots" Invited Book Chapter, *Electrodiagnosis in New Frontiers of Clinical Research*, book edited by Handel Turker, ISBN 978-953-51-1118-4, Intech, 2013.

Journal Papers

- R.A.R.C Gopura, D. S. V Bandara, G.K.I Mann and Kazuo Kiguchi "Developments in Mechanical Designs of Upper-Limb Exoskeleton Robots" submitted to *IEEE Transactions on Human-Machine Systems*.
- D.S.V Bandara, R.A.R.C Gopura, K.T.M.U Hemapala and Kazuo Kiguchi "Development of multi-DoF Transhumeral Robotic Arm Prosthesis" in preparation to submit for *IEEE/ASME Transactions of Mechatronics*.
- D.S.V Bandara, R.A.R.C Gopura and Kazuo Kiguchi "Whereabouts of Upper Extremity Prostheses and Future Goals" in preparation to submit for *IEEE Transactions on Human-Machine Systems*.

Conferences

- D.S.V Bandara, R.A.R.C Gopura, K.T.M.U Hemapala and K. Kiguchi "A multi-DoF Anthropomorphic Transradial Prosthetic Arm," in *Proc. of IEEE RAS & EMBS International Conference on Biomedical Robotics and Biomechatronics, Brazil, 2014*, pp. 1039-1044.
- D.S.V. Bandara, R.A.R.C Gopura, G.Kajanthan, M. Brunthavan and H.I.M.M. Abeynayake, "An Under-actuated Mechanism for a Robotic Finger," in *Proc. of International IEEE International Conference on Cyber Technology in Automation, Control and Intelligent Systems, China, 2014*. pp. 407-412.

- D. S. V. Bandara, R. A. R. C.Gopura, K. T. M. U. Hemapala and K. Kiguchi "Upper Extremity Prosthetics: Current Status, Challenges and Future Directions," International Conference on Artificial Life and Robotics (AROB 2012), Beppu, Japan, 2012. pp. 875-880.
- R. A. R. C.Gopura, K. Kiguchi and D. S. V. Bandara, "A Brief Review on Upper Extremity Robotic Exoskeleton Systems," in Proc. of International Conference on Industrial and Information Systems (ICIIS 2011), Peradeniya, Sri Lanka, 2011. pp. 346-351.
- N.P.A. Gunasekera, V.H. Hapuarachchi, B.S. Ariyaratna, D.S.V. Bandara and R.A.R.C. Gopura, "Development of a Multifunctional Hand Prosthesis with a Self-Adaptive Mechanism," in Proc. of the Peradeniya University International Research Sessions, Sri Lanka, July, 2014, vol. 18, pp.167.
- D.S.V. Bandara, G. Kajanathan, M. Brunthavan and R.A.R.C. Gopura, "An Under-actuated Mechanism for Finger Designs in Hand Prosthesis," in Proc. of the Peradeniya University International Research Sessions, Sri Lanka, July, 2014, vol. 18, pp.169.

Presentations

- G.Kajanathan, M.Brunthavan, DSV Bandara and RARC Gopura “ An under actuated hand prosthesis with grasping adaptation” at mini Engineering Research Unit Symposium, University of Moratuwa 2013 (Mini ERU-2013).
- D.S.V. Bandara, “Generations in Prosthetic Arm Designing,” Presentation at ENEUMRO 2014 Workshop on Advancing Technologies, IEEE SB University of Moratuwa, 2014.