International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Mechatronics Robot

***Pankaj Mourya*[1], *Swapnil Divekar*[2], *Guide : Harshal Nemade*[3], *Devashri Pandit*[4], *Harshal Kadam*[5]**

[1] Students of mechanical Engineering of Pravin Patil college of Diploma Engineering and Technology, Pm8795150719@gmail.com
[2] Students of mechanical Engineering of Pravin Patil college of Diploma Engineering and Technology, swapnildivekar37@gmail.com
[3] SR. Lecturer Mechanical Department Pravin Patil college of Diploma Engineering and Technology
[4] Students of mechanical Engineering of Pravin Patil college of Diploma Engineering and Technology, devpandit3107@gmail.com
[5] Students of mechanical Engineering of Pravin Patil college of Diploma Engineering and Technology, harshalkadam107@gmail.com

ABSTRACT:

Mechatronics is the term used for the integration of mechanical and electronic engineering disciplines to achieve the objective of developing efficient systems controlled intelligently. The International Federation for the Theory of Machines and Mechanisms defines Mechatronics as the synergistic integration of mechanical and electronic engineering, electronic controls, and software in the design of products and manufacturing processes. Mechatronics is the totality of fundamentals, procedures and techniques for the service, production and development of future-oriented objects. Thus, Mechatronics is an interdisciplinary technical discipline, built upon the basis of classical mechanical, electrical and electronic engineering, binding these sciences not only with one another, but also with computer science and software engineering.

The central focus of Mechatronics is the integral development of systems from technical components (“Mecha”), which are to be intelligently controlled (“tronic”). Thus, a system composed of mechanical and electrical parts, overlaid with sensors which record information, microprocessors which interpret, process and analyze the information and assemblies which then react upon this information, becomes a complete mechatronic system.

Keywords: mechatronic, mechanical and electronic engineering, microprocessors, machines and manufacturing, Photocell, Car Mod

STRUCTURE

- Mechatronics is a rapidly evolving field. The term ‘Mechatronics’ is said to have been coined by Japanese engineers about twenty years ago. However, the actual collection of subjects and ideas that make up Mechatronics is not new. These ideas have existed, for example in the aerospace industries and have been successful for many years.
- The development of economical computational power and intelligent power electronics is the main reason that this interdisciplinary point of view has been used for the development of new products outside the scope of aerospace engineering.
- The term “electro-mechanical system” has been used by English speaking engineers to indicate a new category of electro-mechanical systems for many years. Since computerization, a technology changing rapidly is one of the technologies, which define the field; evolution of mechatronics has been rapid.
- The mechanical engineering field has employed traditional techniques for product development and manufacturing. With the advent of semiconductors, the integration of machines and manufacturing with electronics has developed rapidly. Microcomputers, as they influenced other technical disciplines, have rationalized the thinking process in the mechanical engineering field.
- The concept of ‘intelligent machines’ was popularized by the introduction of small and inexpensive microprocessors as integral parts of machines. These microprocessors, embedded in the machinery enable the machine to independently think and make decisions.

SCOPE

- It is evident that product development in mechanical engineering has undergone radical changes in the past few years. Most of these changes are due to the introduction of mechatronics in the process.
- The addition of some inexpensive electronics and a simple computer can radically change the functionality of a machine. Mechatronics can help in achieving the objectives of concepts like concurrent engineering, and design for manufacturability for product design.
- Thus, mechatronics can also be thought of as an application of the concept of concurrent engineering to the design of electromechanical systems.
- The scope of mechatronics ranges from consumer and commercial products, laboratory test instruments and equipment to industrial applications.

- A range of examples might include automatic video cameras, the Compact Disc player, photocopier, and a car engine with emission sensors and computer-controlled injection.
- It can be expected that the majority of everyday consumer products will be computerized in the near future. Thus, mechatronics has applications in almost all technological fields.

TABLE

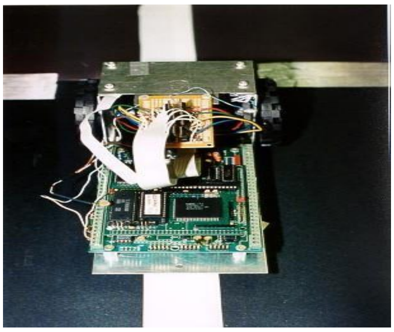
Voltage	delay=8	delay=10	delay=12	delay=14	delay=16	delay=18	delay=20	delay=22
4	0.07	0	0	0.11	0.14	0.08	0.08	0.08
5	0.08	0.07	0.13	0.12	0.16	0.1	0.1	0.09
6	0.09	0.08	0.16	0.13	0.17	0.12	0.11	0.1
7	0.08	0.09	0.18	0.19	0.18	0.12	0.11	0.1
8	0.12	0.1	0.2	0.22	0.2	0.13	0.17	0.11
9	0.13	0.12	0.26	0.18	0.22	0.13	0.22	0.12
10	0.14	0.13	0.37	0.24	0.25	0.14	0.32	0.13
11	0.14	0.14	0.44	0.27	0.28	0.16	0.36	0.14
12	0.15	0.15	0.47	0.32	0.28	0.19	0.43	0.16
13	0.19	0.16	0.54	0.4	0.26	0.23	0.44	0.33
14	0.2	0.17	0.51	0.44	0.28	0.28	0.47	0.37
15	0.22	0.18	0.5	0.5	0.3	0.39	0.5	0.43

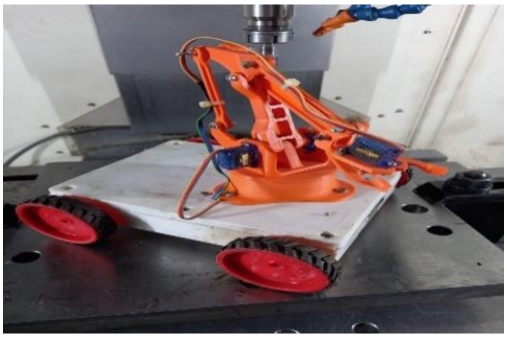
Table 5.6: Force(lbf) measured with reference to changes in supply voltage and delay

IMAGES

1. Timed course setup for the model car

2. Front view of the model car





3.Profile view of the model car

EQUATIONS :

The circuit output is given by

Vout=Vin * R2/(R2+R1)

Using Equation 1, the output for the dark condition is:

Vout = 5 VDC 1105/(1105+2362.6) = 1.6 Volts DC

For room light condition:

Vout = 5 VDC 1105/(1105+1080) = 2.53 Volts DC

For intense light:
Vout = 5 VDC 1105/(1105+45) = 4.8 Volts DC

RESULT :

Computer Controlled Autonomous Model Car

- The stepper motors are connected to the microprocessor board through a circuit. Digital port port2 is used to run the motors.
- The startup circuit for the car consists of a photocell and a resistor in series, which starts the car only when the room is essentially dark.
- The photocells are mounted facing theroadway at a height of 0.5inches.

Performance Results of the Car

- The car has to follow a path defined by white reflective tape on dark paper. At the end of this course defined by reflective tape, an obstacle is placed.
- The car has to detect the obstacle and stop before the main body of the car makes contact with the obstacle.
- An obstacle is placed at the end of the tape. The car is placed at the beginning of the tape.
- Delay variables ranging from 6ms to 16ms were used to determine optimum running conditions, at a supply voltage of 12V.

CONCLUSION :

1. A computer controlled autonomous model car can be designed as a successful mechatronics project.
2. The Tern, Inc model V104 and Analog Drive control boards can successfully control a model car. These boards in standard configuration do not incorporate digital to analog interface capability.
3. The variable reaction time inherent in using a human to start the car can be eliminated with a voltage divider circuit containing a photocell that responds to room lights being momentarily turned off.
4. Stepper motors can be used provide movement and guidance for the car to execute a predetermined path.
5. Photocells incorporated in voltage divider circuits can provide input to an analog to digital conversion channel that can be used to guide the car along a reflective path.
6. A mechanical switch connected to a digital input channel can be used to detect an obstacle in the path of the car.
7. A 12-volt DC powered autonomous car can develop a pulling force of at least 0.5 pound.

REFERENCES :

1. D.M. Auslander, University of California, Berkeley, “What is Mechatronics?” IEEE/ASME Transactions on Mechatronics.
2. F. Harashima, M. Tomizuka, and T.Fukuda, editorial IEEE/ASME Transactions on Mechatronics.
3. N. Kyura and H. Oho, “Mechatronics- An Industrial Perspective”, IEEE/ASME Transactions on Mechatronics, March 1996, Pp. 10-15.
4. R. Isermann, “Modeling and Design Methodology for Mechatronic Systems”, IEEE/ASME Transactions on Mechatronics, March 1996, Pp. 16-28.
5. K. Youcef-Toumi, “Modeling, Design and Control Integration: A Necessary Step in Mechatronics”, IEEE/ASME Transactions on Mechatronics, March 1996 Pp.29-38.
6. N. Kyura, “The Development of a Controller for Mechatronics Equipment”, IEEE/ASME Transactions on Mechatronics, March 1996, Pp. 30-37.
7. C.R. Luo, “Sensor Technologies and Microsensor Issues for Mechatronic Systems”, IEEE/ASME Transactions on Mechatronics, March 1996, Pp. 39-49.
8. G.M. Prabhu, C.T. Wright, “The use of Microcontrollers in Mechatronics education”, Proceedings of the Workshop on Mechatronics Education, organized by The
Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
9. R. Shourshi, “Foundations for Mechatronics Education”, Proceedings of the Workshop on Mechatronics Education, organized by The Synthesis Coalition of the
National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
10. C. Ume, M. Timmerman, “Mechatronics Instruction in Mechanical Engineering Curriculum at Georgia Tech”, Proceedings of the Workshop on Mechatronics
Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
11. D.G. Morin, “The Design and Implementation of a First Course in Microprocessor Technology for Mechanical Engineers”, Proceedings of the Workshop on
71 Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
12. K. Craig, “Mechatronic System Design at Rensselaer”, Proceedings of the Workshop on Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.

13. K. Sasaki, "Getting started from the Physical World", Proceedings of the Workshop on Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
14. W. Harwin, R. Foulds, "Teaching Mechatronics at the University of Delaware", Proceedings of the Workshop on Mechatronics Education, organized by The
    Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
15. D.G. Alciatore, M.B. Histand, "Mechatronics and Measurement Course at Colorado State University", Proceedings of the Workshop on Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
16. G. Rizzoni, A. Keyhani, "Design of Mechatronic Systems: an Integrated Inter Departmental Curriculum", Proceedings of the Workshop on Mechatronics
    Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
17. R. Rajagopalan, R. Cheng, H. Hong, G. Huard, "Teaching Mechatronics to Mechanical Engineering Students at Concordia University", Proceedings of the
    Workshop on Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
18. M.P. Hajnal, "Teaching Mechatronics to Information Engineering Students", Proceedings of the Workshop on Mechatronics Education, organized by The
    Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
19. A. Memis, "Mechatronics Engineering Education in the U.K", Proceedings of the Workshop on Mechatronics Education, organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994. 72
20. J.E. Carryer, "The design of Laboratory Experiments and Projects for Mechatronics Courses", Proceedings of the Workshop on Mechatronics Education organized by The Synthesis Coalition of the National Science Foundation, Motorola Inc, Stanford University, July 21, 1994.
21. U.R. Shashikiran, "A Computer Based System for Operating A Motorola 68HC11 Miniboard: A Mechatronics Application", Thesis, Department of Industrial and Management Systems Engineering, West Virginia University, 1996.
22. T. Sriram, "Design and Development of a Mobile Smart Vehicle: A Mechatronics Application", Thesis, Department of Industrial and Management Systems Engineering, West Virginia University, 1997.