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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
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Judul Jurnal Ilmiah (Artikel) : Design and Development of Broiler Feeding System for Chicken Model Closed-House System
Jumlah Penulis : 3 orang ( Rifki Atmaja, Munadi, Mohammad Tauviqirrahman)
Status Pengusul : penulis ke-2
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   b. Nomor ISSN : 2277-3878
   c. Vol, No., Bln Thn : Volume 8, Number 2 (2019), pp. 4842-4846
   d. Penerbit : Blue Eyes Intelligence Engineering & Sciences Publication (BEIESP)
   e. DOI artikel (jika ada) : -
   f. Alamat web jurnal : https://www.ijrte.org/download/volume-8-issue-2/
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Unit Kerja : Teknik Mesin FT UNDIP

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NIP. 196205201989021001
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2. Ruang lingkup dan kedalaman pembahasan:
Artikel berisi tentang rancang-bangun sistem pakan ayam broiler otomatis untuk kandang model closed-house. Proses desain alat ini dengan menghitung semua komponen yang dibutuhkan sesuai dengan bidang mekanik. Ruang lingkup dan tata Bahasa cukup baik. Perhitungan komponen cukup mendetail.

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Artikel ini memiliki tingkat novelty yang cukup baik dimana mengemukakan cara menghitung dalam pemeliharaan komponen alat pakan ayam broiler otomatis. Alat ini masih mahal dan banyak dari import. Turmitin similarity index sebesar 1 %.

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NIP. 197403042000121001
Unit Kerja : Teknik Mesin FT UNDIP
Abstract

Broiler poultry is one of the many jobs carried out by the Indonesian people. The industrial revolution changes many aspects of broiler poultry, especially technology developments that made work easier. One of them is broiler poultry using a closed-house system. This system has several advantages, including temperature and humidity that can be adjusted to the broilers. Conventional feeding systems are also a problem. Therefore, in this study, a closed-house system was designed for a closed-house system. The development of an automatic chicken feeding machine can be very useful to the growth of the farming industry, this automatic broiler feeding system has three main components, feed hopper which works as chicken feed storage, screw conveying screw conveyor is useful for transfer of feed material from feed and motor drive systems for drive the screw conveyor. Based on the results of analysis and testing, the automatic feeding system can function properly and can distribute the feed properly. The AC motor has a power of 0.75 HP. The V-pulley is used for power transmission with a size of 2 inches and 8 inches. And the shaft that is connected to the spiral auger has a diameter of 20 mm to support the shaft force of the conveyor screw. © BEIESP.

Author keywords

Broiler, Closed-house system, Feeding system, Screw conveyor

References (13)

- Journals
- Conference proceedings
- Books
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SciVal Topic Prominence

Topic: Fertilizers | Spreaders | Rate fertilization
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1. Siswanto Imam, S., Teysar Adi, S., Agussetiadi
   Income Analysis of Closed House Broiler Farm with Partnership Business Model
   (2019) Bulletin of Animal Science, 42 (2), pp. 164-169. Cited 3 times.

2. Aravind, S., Janaprabhu, S., Pavun Kumar, B., Sathish Prasath, S., Raj, M.
   Automatic Feeding System for Poultry Farms
   (2019) Advances in Natural and Applied Sciences, 11 (2), pp. 118-122.

3. Amir, N.S., Abas, A.M.F.M., Azmi, N.A., Abidin, Z.Z., Shafie, A.A.
   Chicken Farm Monitoring System
   (2016) Proceedings - 6th International Conference on Computer and Communication Engineering: Innovative Technologies to Serve Humanity, ICCCE 2016, art. no. 7808297, pp. 132-137. Cited 3 times.
   ISBN: 978-150902427-8
doi: 10.1109/ICCCE.2016.39

4. Jindarat, S., Wuttidittachotti, P.
   Smart farm monitoring using Raspberry Pi and Arduino
   (2015) I4CT 2015 - 2015 2nd International Conference on Computer, Communications, and Control Technology, Art Proceeding, art. no. 7219582, pp. 284-288. Cited 34 times.
   ISBN: 978-147997952-3
doi: 10.1109/I4CT.2015.7219582

5. Lau, K.X., Leow, P.L., Jamian, J.J., Arsat, R., Abdeltawab, A.A.A., Rahman, S.S., Khalid, N.H.A., (...), Mohamed, A.
   Temperature Distribution Study for Malaysia Broiler House
   (2018) 2018 2nd International Conference on Smart Sensors and Application, ICSSA 2018, art. no. 8535821, pp. 69-73.
   http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=8511031
   ISBN: 978-153861281-1
doi: 10.1109/ICSSA.2018.8535821

6. Wicaksono, D., Perdana, D., Mayasari, R.
   Design and analysis automatic temperature control in the broiler poultry farm based on wireless sensor network
   (2018) Proceedings - 2017 2nd International Conferences on Information Technology, Information Systems and Electrical Engineering, ICITISEE 2017, 2018-January, pp. 450-455.
   ISBN: 978-153860658-2
doi: 10.1109/ICITISEE.2017.8285549

7. Aydin, A., Berckmans, D.
   Using sound technology to automatically detect the short-term feeding behaviours of broiler chickens
   (2016) Computers and Electronics in Agriculture, 121, pp. 25-31. Cited 17 times.
   www.elsevier.com/inca/publications/store/5/0/3/3/0/4
doi: 10.1016/j.csa.2015.11.010

View at Publisher
Zainal, H.C., Soh, Mohd H. Ismail, Firzana H. Otthaman, Muhamad K. Safie, Muhamad A. A. Zukri, "Development of Automatic Chicken Feeder using Arduino Uno", 2017 International Conference on Electrical (2017) Electronics and System Engineering (ICEESE) (IEEE Xplore), pp. 120-125.

Dai, J., Grace, J.R. (2008) Powder Technology, 186 (1), pp. 40-55. Cited 35 times.
doi: 10.1016/j.powtec.2007.10.032

Soavi, F., Zurla, L.R. (1990) Annals of the Clrp, 3 (1), pp. 400-404.

Pezo, M., Pezo, L., Jovanović, A.P., Terzić, A., Andrić, L., Lončar, B., Kojić, P. (2018) Powder Technology, 336, pp. 255-264. Cited 5 times.
doi: 10.1016/j.powtec.2018.06.009

Lane, M., Shaeboub, A., Gu, F., Ball, A.D. (2017) Systems Science and Control Engineering, 5 (1), pp. 361-379. Cited 5 times.
http://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=tssc20#VzGgtYSLRaO
doi: 10.1080/21642583.2017.1367734

Suga, K.S. (1978) Dasar Perencanaan Dan Pemilihan Elemen Mesin. Cited 2 times.
Jakarta: Pradnya Paramita

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Dr. Mayank Singh  
PDF (Purs), Ph.D(CSE), ME(Software Engineering), BE(CSE), SMACM, MIEEE, LMCSI, SMIACSIT  
Department of Electrical, Electronic and Computer Engineering, School of Engineering, Howard College, University of KwaZulu-Natal, Durban, South Africa.
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Associate Professor, Department of Biochemistry, Shanghai Institute of Biochemistry and Cell Biology, Shanghai, China.
Engineering and Technology, Jamshedpur (Jharkhand), India.

**Dr. Akshey Bhargava**  
Assistant Professor, Department of Civil Engineering, Global Institute of Engineering and Technology, Melvisharam (Tamil Nadu), India.

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Assistant Professor, Department of Mechanical and Electromechanical Engineering, Hawassa Institute of Technology, Hawassa University, Hawassa, Ethiopia.

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Professor, Department of Computer Applications, Hindusthan College of Arts and Science College, Coimbatore (Tamil Nadu), India.

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Associate Professor, Department of Physics, Sri Venkateswara University, Tirupati (Andhra Pradesh), India.

**Dr. Said Elshahat Abdallah**  
Associate Professor, Department of Agricultural Engineering, Faculty of Agriculture Kafrelsheikh University, Kafr Elsheikh, Egypt.

**Dr. R. Devi Priya**  
Associate Professor, Department of Information Technology, Kongu Engineering College, Erode (Tamil Nadu), India.

**Dr. Abhinav Vidwans**  
Associate Professor, Department of Computer Science and Engineering, Vikrant Group of Institutions Campus, Morar, Gwalior (M.P.), India.

**Dr. A. K. Priya**  
Associate Professor, Department of Civil Engineering, KPR Institute of Engineering and Technology, Arasur, Coimbatore (Tamil Nadu), India.

**Dr. K Ashok Reddy**  
Associate Professor, Department of Mechanical Engineering, MLR Institute of Technology, Hyderabad (Telangana), India.

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Assistant Professor, Department of Information Technology, Manipal University, SMUDDE, Gangtok (Sikkim), India.

**Dr. Srinivasa Raju Rallabandi**  
Assistant Professor, Department of Mathematics, Gandhi Institute of Technology and Management, Hyderabad (Telangana), India.

**Dr. Deepika Garg**  
Assistant Professor, Department of Applied Science, GD Goenka University, Gurgaon (Haryana), India.

**Dr. Girish Madhukar Tere**  
Assistant Professor, Department of Computer Science, Thakur College of Science and Commerce, Affiliated to University of Mumbai, Mumbai (Maharashtra), India.
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Cost Effective Digitalization Solution for Sinumerik CNC System To Increase The Transparency and Utilization of The Machine

Pooja Anand, Vinitha Lea Philip, Parthasarathy Eswaran

Abstract: In this work, we fetch the current trends in industrial automation and data exchange technology adopted in Computer Numerical Control (CNC) machine and mitigate the features in a cost-effective manner. The current trend is Industry 4.0, uses cloud-based systems for information and data exchanges in machine to machine communication. This methodology is reliable, but expensive and can be afforded only by large scale companies. In order to provide the data transparencies at low cost, we utilize a low-cost computing system using Python language for small-scale industry. This technique was implemented in the existing CNC machine and the machine parameters such as Machine Operating Mode, Cycle Time, Part Count, Feed rate, Spindle Running Hours, Machine Running Hours, and Machine Utilization Hours are monitored. Graphical user interface (GUI) screens are developed to help human machine interface. Acquired real-time machine data will help boost transparency and help the operator/user for smart decision making. The IIoT (Industrial Internet of Things) technology helps to connect more numbers of such machines, results in increased machine utilization and productivity through continuously monitoring and analyzes.

Index Terms: IoT, Automation, Computer Numerical Control (CNC), Data analysis, Industry 4.0, Industrial IoT.

1. INTRODUCTION

Industry 4.0 is the fourth industrial revolution. It focuses on cyber physical systems, the Internet of Things, cloud computing and cognitive computing. This brings forth smart factories to the industrial world. Industry 4.0 has four design principles which include: Interconnection, Information transparency, Technical assistance and Decentralized decisions. A cost-effective system has been designed to measure the temperature and vibration variables of a machining process in Hass Computer Numerical Control (CNC)[1]. Industry 4.0 is revolution in a new wave of cyber-physical systems in NC (Numerically control) machining process platform which realizes the real-time monitoring and 3D display of machine tools[2-4].

Increasing efficiency has always been a major factor in the manufacturing sector for better production. Improved efficiency leads to better profitability. With the IoT gaining importance, it has become one of the leading use cases for Industry 4.0[5], [6]. A combination of traditional condition monitoring enhanced with analytical algorithm forms the basis of Predictive maintenance strategies. Total Productive Maintenance (TPM) and 5S techniques minimize the breakdowns and improve the performance and efficiency of a machine [7]. This technology enables the prediction of machine failures before they occur. For many small business owners, the adoption of IoT may seem like a daunting challenge. Cloud computing based equipment monitoring systems help in monitoring the performance, statuses, equipment faults, production quality and precision of the machine [8]. These systems involve the use of expensive and complex software which are difficult to use. This bottleneck prevents many small scale industries from adopting these methods, and also their return on Investment takes a longer time. Monitoring machining processes have become a major factor for a manufacturer to improve the efficiency of the production line. Investigating the data of the CNC machine tool based on controller tuning operation help in increasing the productivity of industry 4.0[9-11]. It can also help in reducing the downtime of the machines. This work aims to help small manufacturing industries to use the current technology to improve functionality and identify the key areas for improvement and thereby increase the utilization by simplifying machine monitoring [12-13]. IoT technologies are the key factors in Industry 4.0 which help in increased product customization, productivity, and reliability of physical systems and are compared in real time [14]. Data extraction is made possible using industrial IoT in machines [15]. The proposed methodology will enhance small and medium enterprises to embrace IoT in a big way. These enterprises look for the following: cost should be affordable, the technology should be easy to use without any specialized knowledge or having to hire someone with special skills, it should be readily available, and the results should be accurate and must help them save or recover money faster. Our work is aimed to develop a solution that will help small and medium businesses achieve the above objectives. In our work, we will be monitoring the Sinumerik CNC with the help of a raspberry pi and thereby showing the machine’s utilization patterns. The process of monitoring is initiated by selecting the list of parameters to be monitored [16]. The raspberry pi is programmed with the help of the programming language Python to meet the requirements.
V. CONCLUSION
Smart factories take the manufacturing industries a leap forward from traditional automation to a fully connected and flexible system, which compels the companies to take up the latest industrial mechanisms. We have provided a feasible, cost-effective solution using a raspberry pi to simulate an Industry 4.0 solution for CNC. This is a solution for small manufacturing companies to adopt new technologies for improving overall efficiency and become more competitive. We can capture the machine utilization parameters easily over a weekly period and simulate the acquired data in graphical form with the help of user interface screens. Data acquisition is done in real time so that the user can analyze the performance of the machine and the production rate at the current time. This method increases transparency, thereby giving insight on where the scope is available to improve machine utilization. This helps the user to get more profit, production, and higher efficiency. Adopting cost-effective technology for monitoring and managing the utilization and efficiency of machine tools will help in reducing waste and becoming more productive.

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REFERENCES
1. Sezer, E., Romero, D., Guedea, F., Macchi, M., and Emmanouilidis, C. (2018). “An industry 4.0-enabled low cost predictive maintenance approach for smes.” 2018 IEEE International Conference on Engineering, Technology and Innovation (ITE/ICTM), 1–8 (June).
2. Xiao Hua Lia, Wen Yi Lib. “The Research on Intelligent Monitoring Technology of NC Machining Process.” 9th International Conference on Digital Enterprise Technology-DET2016
3. Lu, X., Yu, D., Hu, Y., and Yao, Z. (2014). “Design and implementation of machine tools supervisory system based on information model.” 2014 IEEE International Conference on Information and Automation (ICIA), 856–859 (July).
4. Jonathan Downeyab,b,*, Denis O’Sullivanc, Miroslaw Nejmand, Sebastian Bombinskid, Paul O’Learye, Ramesh Raghavendrace, Krzysztof Jemielniak “Real time monitoring of the CNC process in a production environment: the data collection & analysis phase ” 48th CIRP Conference on Manufacturing systems - CIRP CMS 2015.
5. Omnes, N., Bouillon, M., Fromentoux, G., and Grand, O. L. (2015). “A programmable and virtualized network module: it infrastructure for the internet of things: How can avf isp: sdn help for facing the following challenges.” 2015 18th International Conference on Intelegence in Next Generation Networks, 64–69 (Feb).
6. Shrouf, F., Ordieres, J., and Miragliotta, G. (2014). “Smart factories in industry 4.0: A review of the concept and of energy management approached in production based on the internet of things paradigm.” 2014 IEEE International Conference on Industrial Engineering and Engineering Management, 697–701 (Dec).
7. S. Nallasamy. “Enhancement of Productivity and Efficiency of CNC Machines in a Small Scale Industry Using Total Productive Maintenance.” International Journal of Engineering Research in Africa, 02 September 2016.
8. Hung, M., Lin, Y., Quoc Huy, T., Yang, H., and Cheng, F. (2012). “Development of a cloud-computing-based equipment monitoring system for machine tool industry.” 2012 IEEE International Conference on Automation Science and Engineering (CASE), 962–967 (Aug).
9. Chang, W. and Wu, S. (2016). “Investigated information data of CNC machine tool for established productivity of industry 4.0.” 2016 5th IAI International Congress on Advanced Applied Informatics (IAI-AAI), 1088–1092 (July).
10. Al-Saeedi, I. R. K., Mohammed, F. M., and Obayes, S. S. (2017). “CNC machine based on embedded wireless and internet of things for workshop development.” 2017 International Conference on Control, Automation and Diagnosis (ICCAD), 439–444 (Jan).
11. Desai, D. P. and Patel, D. M. (2015). “Design of control unit for cnc machine tool using arduino based embedded system.” 2015 International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), 443–448 (May).
12. Xiao Li, X. and Bin, R. (2011). “Research on data acquisition and database-building technology based on highend cnc machine tool.” 2011 IEEE 3rd International Conference on Communication Software and Networks, 135–138 (May).
13. Kunpeng Zhu, Yu Zhang “A Cyber-Physical Production System Framework of Smart CNC Machining Monitoring System” in IEEE/ASME Transactions on Mechatronics, vol. 23, no. 6, pp. 2579-2586, Dec. 2018.
14. F. Shrouf, J. Ordieres and G. Miragliotta, “Smart factories in Industry 4.0: A review of the concept and of energy management approached in production based on the Internet of Things paradigm,” 2014 IEEE International Conference on Industrial Engineering and Engineering Management, Bandar Sunway, 2014, pp. 697-701.
15. Saez, M., Maturana, F. P., Barton, K., and Tilbury, D. M. (2018). “Real-time manufacturing machine and system performance monitoring using internet of things.” IEEE Transactions on Automation Science and Engineering, 15(4), 1735–1748.
16. S. N. Bhagat and S. L. Naibalwar, “LabVIEW based tool condition monitoring and control for CNC lathe based on parameter analysis,” 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, 2016, pp. 1386-1388.
17. Raspberry Pi 3 Model B V1.2, Available online
18. URL: https://www.raspberrypi.org/products/raspberry-pi-3-model-b/
19. Accessed on: 20th March 2019
20. Sinumerik 828 D, Available online
21. URL:https://new.siemens.com/se/sv/produkte/industriautomation/sytems/sinumerik-tjanster-verktygsmaskiner/automation-systems/sinumerik-828.html
22. Accessed on: 20th March 2019.
23. I/O module PP 72/84D 2/2 A PN, Available online
24. URL:https://support.industry.siemens.com/cs/document/43209486/828 d-delivery-release-pp-72-48d-2-2-a-pn?di=0&lc=en-WW
25. Accessed on: 20th March 2019
26. 8 channel Relay, Available online
27. URL:https://hacktronics.co.in/solid-state-relay-ssr-module/5v-8-chann el-omron-ssr-solid-state-relay-module-250v-2a
28. Accessed on: 20th March 2019
29. Tkinter, Available online
30. URL:https://docs.python.org/2/library/tkinter.html
31. Accessed on: 22nd April 2019
32. Python 3, Available online
33. URL:https://www.python.org/downloads/
34. Accessed on: 22nd April 2019
35. Gnuplot, Available online
36. URL: http://www.gnuplot.info/
37. Accessed on: 22nd April 2019

AUTHORS PROFILE
Pooja Anand, Pursuing her under graduation in Electronics and Communication Engineering at SRM Institute of Science and Technology, Kancheepuram, Chennai, India

Vinitha Lea Philip, Pursuing her under graduation in Electronics and Communication Engineering at SRM Institute of Science and Technology, Kancheepuram, Chennai, India
Cost Effective Digitalization Solution for Sinumerik CNC System To Increase The Transparency and Utilization of The Machine

Parthasarathy Eswaran is associate professor at SRM Institute of Science and technology, India. He received his Ph.D in Electronics and Communication Engineering from SRM University, Kattankulatur, India in 2014 and Masters and Bachelors in Mechatronics and Electronics and Communication Engineering from Anna University, Chennai and Institute of Engineers, India respectively. His main research interests are in the field of MEMS, Device modeling, Embedded system, Avionics, IoT, Cyber Physical system, Industry 4.0.
The Effect of Sensor Structure and Coplanar Electrode for Capacitive Based Flow Sensor

Mohd Norzaiddi Mat Nawi, Nur Shahira Shahripul Azeman, Muhammad Rashidi Ab Razak

Abstract: This paper presents the analysis of the capacitive based flow sensor using computational fluid dynamic (CFD) and mathematical equation approach. The CFD simulations for different types of sensor structure were carried out. Pressure and velocity of the fluid were varied in order to study the hydrodynamic parameter such as displacement and drag force. For the coplanar electrode, width of electrode and half gap between electrodes were varied for capacitive response using mathematical approach. Based on the simulation, the displacement of the dome increases as the pressure increases. The result shows that the most suitable thickness of the dome is 0.1 mm based on the displacement and the strain. Meanwhile for the coplanar electrode, the width and half gap showed a significant effect on the capacitance response.

Index Terms: Capacitive Flow Sensor, CFD, Coplanar Electrode.

I. INTRODUCTION

Underwater surveillance is the requirement to detect, localise and classify targets underwater[1]. Global industries call for technology to be applied in several underwater scenarios such as environmental monitoring and monitoring of underwater structures[2]. Target detection, localization, classification and tracking are some of the issues that need to be considered with surveillance systems[3]. Flow sensors are one of the sensors that are used underwater to measure fluid velocity. There are many types of flow sensors in the flow sensor field which have different functions and purpose. Flow measurement is applied in diverse areas and it is necessary for different engineering operations. There are two commonly used structures in designing a flow sensor which includes the dome-shaped structure [4] and hair cell structure [5,6].

The Dome-shaped structure of the flow sensor was inspired by the cupula fish which consists of neuromasts[7]. There are two types of neuromasts present in the fish’s lateral line, canal and superficial. Both neuromasts have a gelatin cupula which moves according to the flow pressure and induces the neuron signal[8]. A miniature form is cupula (or cupula) which is described as the dome-shaped roof of the pleural cavity that extends into the root of the neck[9]. The common software used in modelling related to fluid is the computational fluid dynamic (CFD) FLUENT software. The FLUENT is able to solve Euler and Navier–Stokes equations in an arbitrary Lagrangian–Eulerian formulation. In this paper, we focus on the simulation of different types of sensor structures using computational fluid dynamic (CFD) approach and mathematical approach for coplanar electrode.

II. DESIGN AND METHODOLOGY

A. Analysis Sensor Structure using CFD

Computational fluid dynamics (CFD) is an effective and powerful tool that stimulates fluid flow numerically[10]. Besides that, computational fluid dynamics (CFD) is an interdisciplinary tool that is related to both the computer technology and fluid physics[11]. Capacitive based flow sensor needs the CFD simulation approach to get an effective simulation and to produce the best result especially on drag force acting on the different types of structures. There are a few steps involved in the CFD simulation process for modelling structure. Fig. 1 shows the CFD simulation process.

![CFD Simulation Process](image)

Fig. 1: CFD Simulation process. (a) Dome-shape is selected as the initial design. (b) Designed the dome-shaped structure in Solidwork 2016 and is imported to ANSYS Fluent. (c) Mesh is applied on the dome-shaped structure. (d) Setup the variable to test the design structure. (e) Run the solver to get the result (f) The data obtained are collected and inserted into the table.

The CFD simulation process needs to be carried out in order to run the simulation and test different types of microfluidics flow sensor structure including structure of dome, ellipse and hair cell. Different types of structures needed to be designed and imported into the ANSYS Fluent 18.1. Then, mesh was applied on the design before setting up the variable. Each faces of the design were labelled based on its function, such as input and output. Then, variable such as velocity showed a variation of 1 m/s to 10 m/s which is suitable for robust application[12]. The iteration number was set up to 100 for sequence of outcome generation. The results of the three design structure simulation is shown in Fig. 2 (a), (b) and (c).
B. Half gap between electrodes, a constant

Half gap between electrodes was fixed at 0.24 mm. Table 2 shows the capacitive response data of different width of electrode, w.

TABLE II. The data of capacitive response

| width, w (mm) | Capacitance, C (F) | Capacitance per unit length, C/l(F/mm) |
|--------------|---------------------|--------------------------------------|
| 0.01         | 9.48E-10            | 2.87E-11                             |
| 0.02         | 1.83E-09            | 5.54E-11                             |
| 0.03         | 2.65E-09            | 8.03E-11                             |
| 0.04         | 3.42E-09            | 1.04E-10                             |
| 0.05         | 4.14E-09            | 1.26E-10                             |
| 0.06         | 4.83E-09            | 1.46E-10                             |
| 0.07         | 5.48E-09            | 1.66E-10                             |
| 0.08         | 6.09E-09            | 1.85E-10                             |
| 0.09         | 6.68E-09            | 2.02E-10                             |
| 0.10         | 7.24E-09            | 2.19E-10                             |

All the data in table II were obtained from the mathematical equation of capacitive response due to the different value of width of electrode, w and constant of half gap between electrodes. Then the data was transferred into the graph that is shown in Fig. 7.

Fig. 7: Capacitance per unit length depends on scale of width

Fig. 7 shows capacitance per unit length value based on the width of electrode. The graph shows capacitance per unit length increased linearly to the width of electrode, w. The highest capacitance per unit length is when the width of electrode is 0.1 mm and the lowest capacitance per unit length is when the width of electrode is 0.01 mm.

IV. CONCLUSION AND FUTURE SCOPE

CFD simulation work on different types of flow sensor structures was successful. The result shows that a dome structure produces the highest value of drag force compared to hair cell structure and ellipse structure based on the velocity. For coplanar electrode, the larger the width of the electrode the higher the capacitance per unit length increases while the larger the half gap between electrodes, the lower the capacitance per unit length decreases. This consideration of electrode dimension is important when designing the capacitive based flow sensor.

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REFERENCES

1. Ferri, G., Munafò, A., Tesesi, A., Braca, P., Meyer, F., Pelekanakis, K., Petroccia, R., Alves, J., Strode, C. and LePage, K., 2017. Cooperative robotic networks for underwater surveillance: an overview. IET Radar, Sonar & Navigation, 11(12), pp.1740-1761.
2. Hasan, N., Sefat, M.S. and Shahjahan, M., 2017. A low cost remotely operated vehicle for underwater surveillance—A cost effective experimental platform. In 2017 IEEE International Conference on Electrical, Computer and Communication Engineering (ECCE) (pp. 486-490).
3. Munasinghe, K., Aseeri, M., Almorqi, S., Hossain, M., Binte Wali, M. and Jamalipour, A., 2017. EM-based high speed wireless sensor networks for underwater surveillance and target tracking. Journal of Sensors, 2017.
4. Asadnia M., Kottapalli A.G.P., Karavitaki K.D., Warkiani M.E., Miao J., Corey D.P. & Triantafyllou M.(2016). From Biological Cilia to Artificial Flow Sensors: Biomimetic Soft Polymer Nanosensors with High Sensing Performance. Scientific Reports.
5. Qualiti, A., Rizzi, F., Todaro, M.T., Passaseo, A., Cingolani, R., and De Vittorio, M. (2011). Stress-driven AIN cantilever-based flow sensor for fish lateral line system. Microelectronic Engineering, 88(8): 2376-2378.
6. Sadeghi, M.M., Peterson, R.L., and Najafi, K. (2013). A 2-D directional air flow sensor array made using stereolithography and MEMS micro- hydraulic structures. The 17th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSUDCERS & EUROSENSORS XXVII), 722-725.
7. Nawi, M.N.M., Manaf, A.A., Arshad, M.R. and Sidek, O., 2012. Modeling of biomimetic flow sensor based on artificial hair cell using CFD and FEM Approach. In Proceeding Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2012) (pp. 161-164).
8. A.J. Hudspeth, Y. Choc, A.D. Mehta, P. Martin, “Putting ion channels to work: Mechanoelectrical transduction, adaptation, and amplification by hair cells”, Proceedings of the National Academy of Sciences of the United States of America, 97, pp. 11765-11772, 2000.
9. Robert Fortuine, 2000. THE WORDS OF MEDICINE: Sources, Meanings, and Delights. 0398083134, 9780398083137. The Imagery of Robert Fortuine, 2000. THE WORDS OF MEDICINE: Sources, Meanings, and Delights. 0398083134, 9780398083137. The Imagery of
10. Hosain, M.L. and Fdhila, R.B., 2015. Literature review of accelerated CFD simulation methods towards online application. Energy Procedia, 75, pp.3307-3314.
11. Lu, J., Yu, J., & Shi, H., 2017. Feasibility Study of Computational Fluid Dynamics Simulation of Coronary Computed Tomography Angiography Based on Dual-Source Computed Tomography. Journal of Clinical Medicine Research, 9(1), 40–45.
12. Magirl, C. S., Gartner, J. W., Smart, G. M., & Webb, R. H., 2009. Water velocity and the nature of critical flow in large rapids on the Colorado River, Utah. Water Resources Research, 45(5).
13. Chen, J.Z., Darhuber, A.A., Troian, S.M. and Wagner, S., 2004. Capacitive sensing of droplets for microfluidic devices based on thermocapillary actuation. Lab on a Chip, 4(5), pp.473-480.

AUTHORS PROFILE

Mohd Norzaidi Mat Nawi received the B.Eng. degree in Mechatronic Engineering from the Universiti Sains Malaysia,Nibong Tebal, Malaysia in 2010, and the Ph.D degree in electrical and electronic engineering with a specialization in fluidic based flow sensor in 2015. He is currently interested in designing low cost flow sensor for underwater robotic applications.
Nur Shahira Shahrilpul Azeman received the B.Education degree in physics education from Universiti Pendidikan Sultan Idris, Perak, Malaysia, in 2017 where she is currently pursuing the M.Sc in Physics. Her research focuses on the fluidic-based sensor for flow measurement. She is well versed in microelectromechanical systems design software such as Ansys and Autodesk Inventor Professional.

Muhammad Rashidi Ab Razak received the B.Eng. degree in Electrical Engineering from Universiti Malaysia Pahang, Pahang, Malaysia in 2015. He is currently pursuing the MSc in Physics from Universiti Pendidikan Sultan Idris, Perak, Malaysia. His research focuses on the fluidic-based sensor for pressure applications.