Application of coconut paper motor speed control technology for increasing coconut liquid organic fertilizer productivity

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ABSTRACT

The potential that exists in Kadigunung Hamlet, Hargomulyo Village, Kokap District, Kulon Progo Regency, D.I Province. Yogyakarta is where 90% of agricultural land is planted with coconut trees. The livelihoods of its residents are farmers and coconut sugar grinders. However, a lot of coconut husks are not used and are just piled up in people's yards until they become mountains. This results in an increase in unused coconut coir waste. In this hamlet, there are two farmer groups, namely the Forest Farmers Group (Poktan) Tani Makmur and the Women Farmers Group Sedyorukun. Currently, this farmer group in Kadigunung Hamlet has been active in producing POC from coconut fiber as raw material. However, they still find it difficult to peel the coco coir (separating the coir from the coconut shell) in order to get the coco coir that has been separated with large productivity. In addition, residents have not been able to package the POC products in good packaging with trademark labels, which are expected to be commercialized in general. In fact, if residents are able to produce POC products with good packaging and brand labels, residents can sell them in general in the market and can increase the economic income of residents, especially farmer groups in Kadigunung Hamlet. This Community Partnership Service aims to provide solutions to the residents of Kadigunung Hamlet, especially farmer groups by donating appropriate technology tools in the form of a Coconut Coir Peeling Machine that is able to simplify and increase the productivity of processing unused coconut coir waste into products of higher use value, namely to become ready-to-use POCs. used and can be marketed in general. This service program also develops the Kadigunung Hamlet area into an area that can care about the environment with the ability of residents to process waste (waste) independently so as to increase community environmental insight. The output of this Special Scheme Community Partnership Service (PKM) includes appropriate technology products in the form of a Coconut Coir Peeler Machine, POC Processing Module from coconut coir raw materials as well as POC packaging and trademark labeling, Proceedings of the ISBN Community Service national seminar or articles in Reputable National Journals. (Indexed by Sinta), Copyright of the POC Making Module, videos of service implementation, and news in the mass media.

KEYWORDS
Coir;
POC;
trademark;
PKM

1. Introduction

The potential that exists in Kadigunung Hamlet, Hargomulyo Village, Kokap District, Kulon Progo Regency, D.I Province. Yogyakarta is where 90% of agricultural land is planted with coconut trees. The livelihoods of its residents are farmers and coconut sugar grinders. However, a lot of coconut husks are not used and are just piled up in people's yards until they become mountains. This results in an increase

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in unused coconut coir waste. In this hamlet, there are two farmer groups, namely the Forest Farmers Group (Poktan) Tani Makmur and the Women Farmers Group Sedyorukun. With the initiation of the KKN-PPM internal service grant program at the University of Muhammadiyah Yogyakarta, which had previously been carried out, namely by holding counseling on the manufacture of organic fertilizer and donating a coconut coir chopper machine for the process of making Liquid Organic Fertilizer (POC). To get optimal results, the coconut fiber chopper machine can be arranged at different speeds.

Several studies that support this community service regarding motor speed control have been studied by previous researchers. The control of the angular speed of an induction motor through a combination of a solar-powered boost converter voltage source inverter was investigated by Linares-Flores [1]. The low speed sensorless control method of brushless DC motor based on high frequency pulse voltage injection was investigated by Sun [2]. Pressure control of a fixed displacement variable speed radial piston pump using a PID controller was investigated by Kumar [3]. DC powered universal motor speed control simulation and prototype: Towards efficient operation in future DC homes researched by Ben Abdeljawed [4]. The implementation of sensorless synchronous reluctance motor speed control using an extended Kalman filter was investigated by Boztas [5]. Optimal speed–torque control of a two-feed induction motor: Analytical and graphical analysis investigated by Zerzeri [6]. ANFIS-based speed and current control by minimizing torque ripple using a hybrid SSD-SFO for an activated reluctance motor was investigated by Mukhopadhyay [7]. Sensorless fuzzy direct torque control of an induction motor with a sliding mode speed controller was investigated by [8]. ANN-based estimation of position and speed sensors for BLDC motors was investigated by Gamazo-Real [9]. The design and development of an intelligent controller for speed control of a special electric motor was investigated by [10].

Sensorless speed control of a bearingless induction motor based on a sliding mode observer and phase locked loop was investigated by Yang [11]. The forward speed control of a three-phase induction motor using a field-oriented control method was investigated by Arpit [12]. Reduction of torque ripple in a BLDC motor drive without an electrolytic capacitor using the simultaneous speed and torque control method was investigated by Boloor Kashani [13]. A didactic platform for DC motor speed and position control in the Z-plane was investigated by Cabré [14]. Analysis of the thermally affected high-speed spindle with angular contact ball bearings was investigated by Truong [15]. A neuroadaptive dynamic control surface for an induction motor stochastic system based on a reduced-order observer was investigated by Zhao [16]. Mapping the vestibular and visual contributions to the tuning of angular head velocity in the cortex was investigated by Hennestad [17]. The effect of increasing velocity on the angular momentum of the whole body during stride in the elderly was investigated by Begue [18]. The dynamic analysis and control of burst oscillations of a fractional sequence permanent magnet synchronous motor system was investigated by Zhang [19]. The effect of motor skill level and speed on movement variability during running was investigated by Wang [20].

The NARMA-L2 controller for stepper motors used in single link manipulators with low speed resonant damping was investigated by Gundogdu [21]. The interval linear quadratic regulator and its application for DC motor speed control in the presence of uncertainty were investigated by Zhi [22]. Research on the causes of fatigue cracks in high-speed rail hanger motors caused by current fluctuations was investigated by Mao [23]. The fault tolerance control of the clutch actuator motor in a 6-speed dry double clutch transmission enhancement was investigated by Zhao [24]. The high-frequency demodulation technique for instantaneous angular velocity estimation was investigated by Bonnardot [25]. Effect of motor imagery on movement quality while performing achievement tasks in healthy subjects: Proof of concept investigated by Kolářová [26]. Implementation of fractional pi controller for optimal speed control on fed induction motor with quasi z-source converter was investigated by bensiker Raja Singh [27]. An improved anti-reverse control algorithm for gearless traction motors in elevator applications was investigated by [28]. Control of active fault rejection and energy consumption of three-phase asynchronous motors based on dynamic system decoupling was investigated by Zhong [29]. Current Controlled BLDC Motor Driven Hysteresis Operated Matrix Converter for Efficient Speed Control and Improved Power Quality was investigated by Singh [30].

Modeling and control for an integrated permanent magnet toroidal motor drive with nonlinear electromagnetic parameters was investigated by Liu [31]. Research on the ultra-low speed driving method of a traveling wave ultrasonic motor for CMG was investigated by Zeng [32]. Improved Direct Torque

Control using Artificial Neuron Networks for Dual Feed Induction Motors was investigated by MAHFOUD [33]. Multisensory coding of angular head velocity in the retrosplenial cortex was investigated by Keshavarzi [34]. Evaluating the effect of the vibration characteristics of a mechanical system on the efficiency of servo motors was investigated by Rigacci [35]. A bio-inspired adaptive control strategy for highly efficient DC motor speed regulation under parametric uncertainty was investigated by Rodríguez [36]. Driving mode shift control for a planetary gear-based dual motor powertrain in electric vehicles was investigated by Wu [37]. Integrating the optimal timing motion profile with position control for a planar motion stage of a high-speed permanent magnet linear synchronous motor was investigated by Huang [38]. An experimental implementation of the Flower Pollination Algorithm for controlling the speed of a BLDC motor was investigated by Potnuru [39]. The dynamic characteristics of a simple supported elastic beam with three induction motors were investigated by Kong [40]. Currently, this farmer group in Kadigunung Hamlet has been active in producing POC from coconut fiber as raw material. However, they still find it difficult to peel the coco coir (separating the coir from the coconut shell) in order to get the coco coir that has been separated with large productivity. In addition, residents have not been able to package the POC products in good packaging with trademark labels, which are expected to be commercialized in general. In fact, if residents are able to produce POC products with good packaging and brand labels, residents can sell them in general in the market and can increase the economic income of residents, especially farmer groups in Kadigunung Hamlet.

This Community Partnership Service contributes to providing solutions to the residents of Kadigunung Hamlet, especially farmer groups by donating appropriate technology tools in the form of a Coconut Coir Peeling Machine that is able to simplify and increase the productivity of processing unused coconut coir waste into products of higher use value, namely to become ready-to-use POCs. used and can be marketed in general. The first method of processing coconut coir waste is peeling coconut coir, then chopping the coconut fibers into smaller sizes. The chopped results will then be fermented to make POC. Then so that these POC products can be marketed in general, training is given to the residents of farmer groups on how to package products and label trademarks. This service program also develops the Kadigunung Hamlet area into an area that can care about the environment with the ability of residents to process waste (waste) independently so as to increase community environmental insight. The output of this Special Scheme Community Partnership Service (PKM) includes appropriate technology products in the form of a Coconut Coir Peeler Machine, POC Processing Module from coconut coir raw materials as well as POC packaging and trademark labeling, Proceedings of the ISBN Community Service national seminar or articles in Reputable National Journals. (Indexed by Sinta), Copyright of the POC Making Module, videos of service implementation, and news in the mass media.

2. Method (bold, 11 pt) *(one single space, 11pt font)*

The activity plans in order to implement the solutions offered, in detail are:

• Collecting coconut fiber waste which was carried out together with the residents of Dusun Kadigung.

• The grant of a coconut husk peeler machine to the people of Dusun Kadigunung, represented by the Head of the Farmers Group and the Head of Dukuh Dusun Kadigung.

- Counseling on the operation and maintenance of the coconut husk peeling machine.
- The process of chopping coco coir using a coconut coir chopper machine by partners.
- Training on making POC at the stage of fermenting chopped coconut fibers and providing knowledge in agriculture.
- Implementation of POC Lab test at Soil Laboratory of Muhammadiyah University of Yogyakarta.
- Implementation of community-made POC application testing on chili plants.
- Extension of the brand logo and product packaging to package the finished POC.
- Implementation of trademark registration of POC products that have been agreed with residents to the Directorate General of Intellectual Property Rights.
- Implementation of the manufacture of POC modules.

- Implementation of POC Module Copyright registration to the Directorate General of Intellectual Property Rights.
- Implementation of mentoring and monitoring of farmer group residents in the POC process to marketing
- Implementation of program evaluation.

3. Results and Discussion

The servants together with the residents of Dusun Kadigunung collect coconut coir waste. Every resident who owns coconut land is asked to collect coconuts at the house of the head of the hamlet who is also the head of the Kadigunung farmer group. Then the implementation of the grant of Appropriate Technology Products in the form of Coconut Coir Peeling Machines to the people of Dusun Kadigunung as shown in Figure 1. The figure shows that the grants were represented by the Head of the Farmers Group as well as the Head of Hamlet of Kadigunung Hamlet.

Fig. 1. Grant of Coconut Coir Peeler Machine

The Coconut Coir Peeler Machine is designed with dimensions that are suitable for the MSME scale (Micro, Small, and Medium Enterprises). The driving force for this peeler is to use an electric motor with a minimum power of 1 HP and additional gearbox and pulley technology in the power transfer system from the electric motor to the blade drive shaft on this machine. The gearbox is used to increase the moment or torque obtained and to make the rotation of the blade shaft more stable. With this relatively small power electric motor, it is hoped that it can be applied to a power source obtained from household electricity which only has a power generation range from PLN of approximately 900 Watts. With this electric motor, the engine performance will be better, free of air pollution, quiet, minimal vibration, and easy to maintain. The purpose of giving this coconut peeler machine is so that the community can carry out the coconut peeling process more easily, quickly, and efficiently. This tool can peel 300 coconuts per hour or more depending on whether the operator is skilled or not, whereas if it is done manually using a crowbar, a resident is only able to peel a maximum of 100 eggs per hour with tiring energy. The servants carry out counseling on the operation and maintenance of the coconut husk peeler machine as shown in Figure 2. The picture shows that in this activity the aim is to make the community skilled in operating this machine and can use it for a long period of time.

Fig. 2. Coconut Coir Counting Process with Coconut Coir Chopping Machine by Partners

Servants carry out training on making POC at the stage of fermentation of chopped coconut fibers and knowledge extension in the world of agriculture can be seen in Figure 3. The figure shows that this counseling also explains knowledge in the world of agriculture, especially on the importance of fertilizers, nutrient content, and water in soil and giving it to plants.

Fig. 3. POC Making Process Training for the Community

Furthermore, testing of POC content elements was carried out at the Soil Laboratory of the Muhammadiyah University of Yogyakarta which is shown in Figure 4.

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LAPORAN HASIL PENGUJIAN

ANALISIS POC

Nomor : 013/L-HA/X/2020
Nama : Pak Rinasa
Jumlah : 01 unit
Macam Uji : C organik metode Walkey & Black
N Total metode Kejdahl
P & K Total metode Extraksi HCl 25%

sample	C ORGANIK		N TOTAL	K TOTAL		P TOTAL	
	Kadar C (%)	Kdr BO (%)	(%)	K tot ppm	K Total (%)	ppm P	% P
1	0.59	1.02	0.16	1,270.56	0.13	129.02	0.01

Jogjakarta, 21 Oktober 2020

Kepala Laboratorium Ilmu Tanah

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Analis,

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Fig. 4. Results of Resident-Made POC Analysis Test

After testing in the laboratory, testing the POC application made by residents on chili plants is shown in Figure 5. The picture shows that this test aims to determine the ability of POC in carrying out its function as fertilizer. The result is that the chili plants that have been watered with POC made by local residents have dense fruit and the leaves are not curly.

Fig. 5. POC Application on Chili Plants

Servants carry out POC Brand Logo and Product Packaging Counseling to socialize the agreed upon Brand Logo citizens and also provide knowledge about POC product packaging. The agenda for the

outreach activities was carried out at the house of the Head of Hamlet who is also the Head of the Farmer's Group in Kadigunung Hamlet as shown in Figure 6 which was attended by all farmer groups, both the Makmur Farmers' Forest Group (Poktan) and the Sedyorukun Women's Farmer Group.

Fig. 6. Extension of Brand Logo and Product Packaging in the Form of Bottles for POC

Then the servants help the citizens to register the trademark of POC products and register the copyright of the POC Module with the Directorate General of Intellectual Property Rights as shown in Figure 7. The figure shows that trademark registration is useful as intellectual property protection for micro, small and medium enterprises (MSMEs). And for the registration of Copyright Modules, it is intended that module products created by the academic community of the University of Muhammadiyah Yogyakarta can be protected and belong to the university as one of the ranking items and are also useful for inventors, especially the chairman and community service team and can be freely used by residents of Dusun Kadigunung because this is a one of the grants to the community in this service program.

REPUBLIK INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

SURAT PENCATATAN
CIPTAAN

Dalam rangka pelindungan ciptaan di bidang ilmu pengetahuan, seni dan sastra berdasarkan Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta, dengan ini menerangkan:

Nomor dan tanggal permohonan : EC002019495S2, 7 Agustus 2019

Pencipta
Nama : Rinasa Agistya Anugrah, S.Pd., M.Eng., Yuliasti,
Alamat : Jl. Brawijaya, Gebugan, Tamantirto, Kasihan, Bantul, Daerah Istimewa Yogyakarta, Bantul, Di Yogyakarta, 55183
Kewarganegaraan : Indonesia

Pemegang Hak Cipta
Nama : Universitas Muhammadiyah Yogyakarta
Alamat : Jl. Brawijaya, Gebugan, Tamantirto, Kasihan, Bantul, Daerah Istimewa Yogyakarta, Bantul, Di Yogyakarta, 55183
Kewarganegaraan : Indonesia
Jenis Ciptaan : Modul
Judul Ciptaan : Mengenal Lebih Jauh Pupuk Organik Cair Sabut Kelapa
Tanggal dan tempat diumumkan untuk pertama kali di wilayah Indonesia atau di luar wilayah Indonesia : 26 Juli 2019, di Yogyakarta
Jangka waktu pelindungan : Berlaku selama 50 (lima puluh) tahun sejak Ciptaan tersebut pertama kali dilakukan Pengumuman.
Nomor pencatatan : 000149502

adalah benar berdasarkan keterangan yang diberikan oleh Pemohon.
Surat Pencatatan Hak Cipta atau produk Hak terkait ini sesuai dengan Pasal 72 Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta.

a.n. MENTERI HUKUM DAN HAK ASASI MANUSIA
DIREKTUR JENDERAL KEKAYAAN INTELEKTUAL

Dr. Freddy Harris, S.H., LL.M., ACCS.
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Fig. 7. Copyright of POC Module

The servants provide assistance and monitoring to the residents of farmer groups in the process of making POCs to marketing, all of this aims so that residents can control activities after counseling on the

manufacture and packaging of POCs. The inclusion of POC in bottles that have been socialized can be seen in Figure 8.

Fig. 8. The Finished POC Results are Put in Bottle Packaging For Labeling

The next activity is the evaluation of program implementation. Evaluate the implementation of the program to find out how effectively this program has been running and how much benefit has been obtained by the community with the PKM Special Scheme program. In all series of activities in this community activity program, the community is very active and enthusiastic in carrying out each activity. The community is also very grateful for the PKM Special Scheme community service because it can increase competence and skills in managing and processing coconut coir waste which is a potential natural resource in Kadigunung Hamlet.

4. Conclusion

All Community Service Programs (PKM) for the Special Funding Year 2019-2020 by the Research, Publication and Community Service Institute (LP3M) of the University of Muhammadiyah Yogyakarta in Kadigunung Hamlet have succeeded in achieving the expected target. The implementation has been carried out, although it was originally planned for 6 months with the hope that July can be completed, but there was a covid-19 pandemic constraint so the delay for the implementation process was 9 months, namely from January 2020 to October 2020. All residents, especially the Farmer Group in Kadigunung Hamlet is very enthusiastic and enthusiastic in receiving counseling, practicing the skills that have been provided by the service team, and being able to continue this service program in the future to achieve a productive economic society. The community has been skilled in operating and maintaining a coconut peeler machine that has been donated by the Service Team and has been able to make their own POC and has knowledge of product packaging, especially POC products. The marketing of POC products is currently only being marketed to the Kadigunung Farmer's group and some to other hamlets who are also fellow farmer groups there.

References

[1] J. Linares-Flores, J. F. Guerrero-Castellanos, R. Lescas-Hernández, A. Hernández-Méndez, and R. Vázquez-Perales, “Angular speed control of an induction motor via a solar powered boost converter-voltage source inverter combination,” Energy, vol. 166, pp. 326–334, Jan. 2019.

[2] L. Sun, “Low speed sensorless control method of brushless DC motor based on pulse high frequency voltage injection,” Alexandria Eng. J., vol. 61, no. 8, pp. 6457–6463, Aug. 2022.

[3] L. Kumar and N. P. Mandal, “Pressure control of fixed displacement variable speed radial piston pump using PID controller,” Mater. Today Proc., Nov. 2021.

[4] H. Ben Abdeljawed and L. El Amraoui, “Simulation and rapid control prototyping of DC powered universal motors speed control: Towards an efficient operation in future DC homes,” Eng. Sci. Technol. an Int. J., vol. 34, p. 101092, Oct. 2022.

[5] G. Boztas and O. Aydogmus, "Implementation of sensorless speed control of synchronous reluctance motor using extended Kalman filter," Eng. Sci. Technol. an Int. J., vol. 31, p. 101066, Jul. 2022.

[6] M. Zerzeri and A. Khedher, "Optimal speed–torque control of doubly-fed induction motors: Analytical and graphical analysis," Comput. Electr. Eng., vol. 93, p. 107258, Jul. 2021.

[7] J. Mukhopadhyay, S. Choudhuri, and S. Sengupta, "ANFIS based speed and current control with torque ripple minimization using hybrid SSD-SFO for switched reluctance motor," Sustain. Energy Technol. Assessments, vol. 49, p. 101712, Feb. 2022.

[8] S. El Daoudi, L. Lazrak, N. El Ouanjli, and M. Ait Lafkih, "Sensorless fuzzy direct torque control of induction motor with sliding mode speed controller," Comput. Electr. Eng., vol. 96, p. 107490, Dec. 2021.

[9] J.-C. Gamazo-Real, V. Martínez-Martínez, and J. Gomez-Gil, "ANN-based position and speed sensorless estimation for BLDC motors," Measurement, vol. 188, p. 110602, Jan. 2022.

[10] M. Senthilkumar, G. S. Naganathan, S. Muthulakshmi, M. Pauljeyaraj, S. Aiswariya, and T. Arun Prasath, "Design and development of intelligent controller for speed control of special electrical motor," Mater. Today Proc., Apr. 2021.

[11] Z. Yang, Q. Ding, X. Sun, C. Lu, and H. Zhu, "Speed sensorless control of a bearingless induction motor based on sliding mode observer and phase-locked loop," ISA Trans., Jun. 2021.

[12] G. Arpit, H. P. Singh, and K. Pandey, "Advance speed control of three phase induction motor using field oriented control method," Mater. Today Proc., Jun. 2021.

[13] E. Boloor Kashani and A. Halvaei Niasar, "Reduction of torque ripple in an electrolytic capacitor-less BLDC motor drive by simultaneous speed and torque control method," Ain Shams Eng. J., vol. 12, no. 4, pp. 3703–3709, Dec. 2021.

[14] T. P. Cabré, A. S. Vela, M. T. Ribes, J. M. Blanc, J. R. Pablo, and F. C. Sancho, "Didactic platform for DC motor speed and position control in Z-plane," ISA Trans., vol. 118, pp. 116–132, Dec. 2021.

[15] D. S. Truong, B.-S. Kim, and S.-K. Ro, "An analysis of a thermally affected high-speed spindle with angular contact ball bearings," Tribol. Int., vol. 157, p. 106881, May 2021.

[16] E. Zhao, J. Yu, J. Liu, and Y. Ma, "Neuroadaptive dynamic surface control for induction motors stochastic system based on reduced-order observer," ISA Trans., Sep. 2021.

[17] E. Hennestad, A. Witoelar, A. R. Chambers, and K. Vervaeke, "Mapping vestibular and visual contributions to angular head velocity tuning in the cortex," Cell Rep., vol. 37, no. 12, p. 110134, Dec. 2021.

[18] J. Begue, N. Peyrot, G. Dalleau, and T. Caderby, "Effect of increasing speed on whole-body angular momentum during stepping in the elderly," J. Biomech., vol. 122, p. 110436, Jun. 2021.

[19] S. Zhang, C. Wang, H. Zhang, P. Ma, and X. Li, "Dynamic analysis and bursting oscillation control of fractional-order permanent magnet synchronous motor system," Chaos, Solitons & Fractals, vol. 156, p. 111809, Mar. 2022.

[20] W. Wang, F. Qu, S. Li, and L. Wang, "Effects of motor skill level and speed on movement variability during running," J. Biomech., vol. 127, p. 110680, Oct. 2021.

[21] A. Gundogdu and R. Celikel, "NARMA-L2 controller for stepper motor used in single link manipulator with low-speed-resonance damping," Eng. Sci. Technol. an Int. J., vol. 24, no. 2, pp. 360–371, Apr. 2021.

[22] Y. Zhi, W. Weiqing, C. Jing, and N. Razmjooy, "Interval linear quadratic regulator and its application for speed control of DC motor in the presence of uncertainties," ISA Trans., Jul. 2021.

[23] L. Mao, W. Wang, Z. Liu, G. Yang, C. Song, and S. Qu, "Research on causes of fatigue cracking in the motor hangers of high-speed trains induced by current fluctuation," Eng. Fail. Anal., vol. 127, p. 105508, Sep. 2021.

[24] Z. Zhao, S. Jiang, R. Ni, S. Fu, Z. Han, and Z. Yu, "Fault-tolerant control of clutch actuator motor in the upshift of 6-speed dry dual clutch transmission," Control Eng. Pract., vol. 95, p. 104268, Feb. 2020.

[25] F. Bonnardot, K. Lizoul, S. Errafik, H. André, and F. Guillet, "High frequency demodulation technique for instantaneous angular speed estimation," Mech. Syst. Signal Process., vol. 159, p. 107745, Oct. 2021.

[26] B. Kolářová, J. Richards, H. Haltmar, K. Lippertová, L. Connell, and A. Chohan, "The effect of motor imagery on quality of movement when performing reaching tasks in healthy subjects: A proof of concept," J. Bodyw. Mov. Ther., vol. 29, pp. 161–166, Jan. 2022.

[27] D. BENSIKER RAJA SINGH and R. SUJA MANI MALAR, "IMPLEMENTATION OF FRACTIONAL PI CONTROLLER FOR OPTIMAL SPEED CONTROL OF INDUCTION MOTOR FED WITH QUASI Z-SOURCE CONVERTER," Microprocess. Microsyst., p. 103323, Oct. 2020.

[28] J. Sawma, V. Seferian, F. Khatounian, E. Monmasson, and R. Ghosn, "An improved anti-rollback control algorithm for gearless traction motor in elevator applications," Mechatronics, vol. 79, p. 102659, Nov. 2021.

[29] B. Zhong and L. L. Ma, "Active disturbance rejection control and energy consumption of three-phase asynchronous motor based on dynamic system's decoupling," Sustain. Energy Technol. Assessments, vol. 47, p. 101338, Oct. 2021.

[30] A. K. Singh and S. Pattnaik, "Matrix Converter Operated Hysteresis Current Controlled BLDC Motor Drive for Efficient Speed Control and Improved Power Quality," Procedia Comput. Sci., vol. 167, pp. 541–550, 2020.

[31] X. Liu, D. Li, and L. Zuo, "Modeling and control for an integrated permanent magnet toroidal motor drive with nonlinear electromagnetic parameters," Appl. Math. Model., vol. 89, pp. 154–170, Jan. 2021.

[32] W. Zeng, S. Pan, L. Chen, Z. Xu, Z. Xiao, and J. Zhang, "Research on ultra-low speed driving method of traveling wave ultrasonic motor for CMG," Ultrasonics, vol. 103, p. 106088, Apr. 2020.

[33] S. MAHFOUD, A. DEROUICH, N. EL OUANJLI, and M. EL MAHFOUD, "Enhancement of the Direct Torque Control by using Artificial Neuron Network for a Doubly Fed Induction Motor," Intell. Syst. with Appl., vol. 13, p. 200060, Jan. 2022.

[34] S. Keshavarzi et al., "Multisensory coding of angular head velocity in the retrosplenial cortex," Neuron, vol. 110, no. 3, pp. 532-543.e9, Feb. 2022.

[35] M. Rigacci, R. Sato, and K. Shirase, "Evaluating the influence of mechanical system vibration characteristics on servo motor efficiency," Precis. Eng., vol. 72, pp. 680–689, Nov. 2021.

[36] A. Rodríguez-Molina, M. G. Villarreal-Cervantes, J. Álvarez-Gallegos, and M. Aldape-Pérez, "Bio-inspired adaptive control strategy for the highly efficient speed regulation of the DC motor under parametric uncertainty," Appl. Soft Comput., vol. 75, pp. 29–45, Feb. 2019.

[37] J. Wu and N. Zhang, "Driving mode shift control for planetary gear based dual motor powertrain in electric vehicles," Mech. Mach. Theory, vol. 158, p. 104217, Apr. 2021.

[38] W.-L. Huang et al., "Integrating time-optimal motion profiles with position control for a high-speed permanent magnet linear synchronous motor planar motion stage," Precis. Eng., vol. 68, pp. 106–123, Mar. 2021.

[39] D. Potnuru, K. Alice Mary, and C. Sai Babu, "Experimental implementation of Flower Pollination Algorithm for speed controller of a BLDC motor," Ain Shams Eng. J., vol. 10, no. 2, pp. 287–295, Jun. 2019.

[40] X. Kong, W. Li, J. Jiang, Z. Dong, and Z. Wang, "Dynamic characteristics of a simply supported elastic beam with three induction motors," J. Sound Vib., vol. 520, p. 116603, Mar. 2022.