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Volume 26, Issue 7, July 2012, Pages 2189-2196

Kinematics and nonlinear control of an electromagnetic actuated CVT system for passenger vehicle (Article)

Rahman, A.^a [✉](#), Sharif, S.B.^a, Hossain, A.^a, Mohiuddin, A.K.M.^a, Zahirul Alam, A.H.M.^b [👤](#)^aDepartment of Mechanical Engineering, International Islamic University, Islamabad, Malaysia^bDepartment of Electrical and Computer Engineering, International Islamic University, Islamabad, Malaysia

Abstract

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An electromagnetic actuated continuously variable transmission (EMA-CVT) system is developed by two sets of electromagnetic actuators (solenoid) located on primary and secondary pulley. A set of solenoids are attached to the primary and secondary pulley to develop the attraction and repulsive forces. The relationships between the speed ratio and electromagnetic actuation and clamping force and output torque of the CVT are established based on the kinematics of the EMA-CVT system. A fuzzy logic controller (FLC) is developed to control the EMA precisely based on the feedback of the RPM sensor and slope sensor. The EMA-CVT performance with controller has found 28% more than the performance of the EMA-CVT without controller. The solenoids of the EMA were activated by varying the current supply with the Fuzzy-Proportional-Derivative-Integrator (FPID) to maintain the non-linearity of the CVT in response of the vehicle traction torque demand. Result shows that the solenoid is able to pull the plunger in the desired distance with supply current of 12.5 amp while push the plunger to the desired distance with 14.00 amp current supply to the windings when the vehicle is considered in 10% grade. The acceleration time of the 1/4 scale car has been recorded as 5.5 s with the response of drive wheels torque. © 2012 The Korean Society of Mechanical Engineers and Springer-Verlag Berlin Heidelberg.

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[Accelerating time](#) [EMA-CVT](#) [Fuzzy logic controller](#) [Fuzzy-proportional-derivative-integrator](#) [Transmission loss](#)

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Hybrid Engine Powered City Car:
Fuzzy Controlled ApproachRahman, A. , Mohiuddin, A.K.M.
, Hawlader, M.N.A.
(2017) *IOP Conference Series:
Materials Science and
Engineering*Clamping force control strategy
of continuously variable
transmission based on extremum
seeking control of sliding modeHan, L. , An, Y. , Sohel, A.
(2017) *Jixie Gongcheng
Xuebao/Journal of Mechanical
Engineering*Intelligent optimization design
for MB-CVT electro-hydraulic
control systemHan, L. , Gao, S. , Lu, X.-H.
(2017) *Guangxue Jingmi
Gongcheng/Optics and Precision
Engineering*[View all 10 citing documents](#)Inform me when this document
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Funding details

Funding sponsor	Funding number	Acronym
International Islamic University Malaysia	PI2011-000260	IIUM

Funding text

This project was financed by the Research Management Centre, International Islamic University Malaysia. This product is in Malaysian patent having the number PI2011-000260.

ISSN: 1738494X

Source Type: Journal

Original language: English

DOI: 10.1007/s12206-012-0542-0

Document Type: Article

References (18)

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- 1 Tanaka, H., Machida, H.
Half toroidal traction-drive continuously variable power transmission
(1996) *Proc. Instn. Mech. Engrs.*, p. 12.
- 2 Bullinger, M., Pfeiffer, F., Ulbrich, H.
Elastic modelling of bodies and contacts in continuous variable transmissions
(2005) *Multibody System Dynamics*, 13 (2), pp. 175-194. Cited 16 times.
doi: 10.1007/s11044-005-2526-7
[View at Publisher](#)
- 3 Burke, M., Briffet, G., Fuller, J., Heumann, H., Newall, J.
Powertrain efficiency optimization of the torotrak Infinitely Variable Transmission (IVT)
(2003) *SAE Technical Papers*. Cited 19 times.
doi: 10.4271/2003-01-0971
[View at Publisher](#)
- 4 Pesgens, M., Vroemen, B., Stouten, B., Veldpaus, F., Steinbuch, M.
Control of a hydraulically actuated continuously variable transmission
(2006) *Vehicle System Dynamics*, 44 (5), pp. 387-406. Cited 29 times.
doi: 10.1080/00423110500244088
[View at Publisher](#)
- 5 Takeuchi, T.
Electromagnetic actuator design technology using electromagnetic coupled with motion analysis
(2006) *Mitsubishi Electric Advance*, 116, pp. 2-4. Cited 5 times.
http://global.mitsubishielectric.com/company/rd/advance/pdf/vol116/vol116_tr2.pdf

Study on the development of a fuzzy logic control electromagnetic actuated CVT system

Sharif, S.B. , Rahman, A. , Mohiuddin, A.K.M.
(2013) *International Journal of Engineering Systems Modelling and Simulation*

Energy efficient electromagnetic actuated CVT system

Rahman, A. , Sharif, S.B. , Mohiuddin, A.K.M.
(2014) *Journal of Mechanical Science and Technology*

Intelligent Control Electromagnetic Actuated Continuously Variable Transmission System for Passenger Car

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(2017) *IOP Conference Series: Materials Science and Engineering*

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