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Development in the Creative Design of Brushless Permanent-Magnet Motors with Integrated Gear Mechanisms

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The combinations of electric motors and gear reducers are considered as typical examples of mechatronics, which are widely used in high driving torque and/or low rotational speed applications. However, the conventional design strategy, in which electric motors and gear reducers are independently designed and manufactured, suffers from inherent disadvantages on low efficiency, redundant mechanical elements usage, and incompact workspace arrangements. This talk discusses about the creative mechanism design of brushless permanent-magnet motors integrated with mechanical/magnetic gear mechanisms to form compact structure assemblies with desired functions. Several innovative design concepts, including the integration of electric motors with mechanical gear reducers, multi-speed transmissions, coaxial magnetic gear mechanisms, or magnetic continuously variable transmissions, are introduced and used to overcome inherent drawbacks of traditional designs.

Experience:

Yi-Chang Wu received the B.S. and M.S. degrees from National Sun Yat-Sen University (NSYSU), Kaohsiung, Taiwan, R.O.C., in 1995 and 1997, respectively, and the Ph.D. degree from National Cheng Kung University (NCKU), Tainan, Taiwan, R.O.C. in 2005, all in mechanical engineering. During 1999-2000, he worked as a senior mechanical design engineer at Research & Development Department of San Shing Fastech. Corp. in Tainan, Taiwan. Since 2006, he has been with National Yunlin University of Science & Technology (NYUST), Douliou, Taiwan, where he is currently a Professor in the Department of Mechanical Engineering since 2017. He is the (co-)author more than 100 academic papers and 1 book. His current research interests include creative machine design, brushless permanent-magnet motor design, and novel magnetic gear mechanism and transmission design.