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## **High-Torque Permanent Magnet Synchronous Machine Concept with Magnetic Gearbox for Biomechanical Construction Applications**

**Abstract:** In this paper the novel concepts of high torque permanent magnet synchronous machines (PMSM) for biomechanical constructions applications will be presented. The main construction of the machine is a modified PMSM. It will be extended with different types of transmissions: magnetic gearbox, harmonic gearbox, or both. Additionally, the permanent magnets (PMs) in motor and gearbox will be placed in a Halbach array. The main goal of the research is to obtain as high torque on a machine's shaft as possible with relatively small size of a motor and possibly high rotational speed for reaching a smooth movement of biomechanical constructions.

**Keywords:** permanent magnet motors, magnetic gears, mechanobiology, wearable robots.

### **Concepts of High-Torque Permanent Magnet Synchronous Machines**

In this section, there some different constructions of HTPMSMs are discussed and a comparison of all motors generating the highest torque by a wide range of velocities will be presented. The best concept will be built and implemented. into a biomechanical construction.

### **Conclusion**

This paper presented a results of simulation test of HTPMSM, which were preceded by a huge review of currently available motors. The final machine will be built, tested and implemented into a biomechanical construction, such as a lower body part exoskeleton. This gives great hope for the practical use of these optimized drives for electric machines, and it will be the subject of future research.

### **References**

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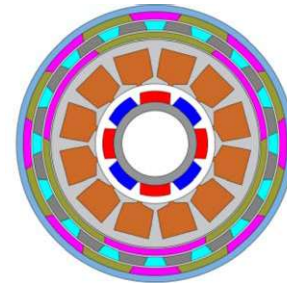


Fig.1. An example of a reluctance machine with outer magnetic gearbox implementation.