

A New Omnidirectional Track Drive System for Off-Road Vehicles

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Omnidirectional drives are very common in robotics. They enable a robot to move on a plane completely free and thus deliver an excellent manoeuvrability. Nevertheless, they also impose high demands on the evenness and cleanliness of the floor.

The construction machinery market constantly calls for improvements in manoeuvrability of the vehicles. Omnidirectional drive technology can meet such requirements. However, a direct transfer from the omnidirectional technology commonly used for robots is not possible due to the rough work environment found at construction sites.

The purpose of this paper is to present a new drive technology for construction machines. The concept is based on Mecanum wheels (passive rollers) mounted on a track. This concept was evaluated by two demonstrators of considerable different sizes. The first demonstrator weights 100kg and have a load capacity of 80kg. It is driven by battery-powered servo-motors and controlled by a microcontroller. The second demonstrator weights 4 tons and may carry 6 tons. It is powered by a diesel motor, which delivers energy for a hydraulic system controlled by a programmable logic controller.

The paper will present design and functionality of the two demonstrators as well as their evaluation by driving test cases. As a result, the benefits and drawbacks of this omnidirectional track drive system will be derived and possible application fields will be discussed.

References

- D.T. Tran, J. T. (2002). An optimal method for the desing of a robotic tracked vehicle to operate over fresh concrete under steering motion. *Journal of Terramechanics*, S. 1-22.
- Kenjiro Tadakuma, R. T. (2. November 2007). Development of Holonomic Omnidirectional Vehicle with "Omni-Ball": Spherical Wheels. *Proceedings of the 2007 IEEE/RSJ International Conference on Intelligent Robots and Systems*, S. 33-39.
- Peng Chen, S. M. (Abril 2002). Omni-Directional Robot and Adaptive Control Method for Off-Road Running. *IEEE TRANSACTIONS ON ROBOTICS AND AUTOMATION*, S. 251-256.