A Gear System to Make Life Easier: Reinventing the Wheel

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Parallel parking in congested city streets decreases traffic flow. Parking spaces take up more space. Cars cannot drive left / right directly - only forwards / backwards and have to steer left & right. The goal of this project was to design and build a model and a working application model of a new, alternative multi-directional gear- and wheel system that works mechanically that will allow a wheel to turn and move directly in multiple directions. The design considerations, functions & specifications were identified. The functional criticality analysis & specification criticality analysis served as input to the design criteria. 4 Initial concepts were identified & evaluated. The detail design followed an iterative process of designing, building, assembling, testing and improving the model. 3 Models of the concept were built. Model 1 was designed to move in 4 directions directly, while models 2 & 3 were designed as an improvement on manoeuvrability (6 & 8 directions). Testing confirmed that all models move multi-directionally. 2 Applications were evaluated to demonstrate the use of the spherical gear-wheel. A model of a wheelchair was designed, built and tested successfully. Tests showed that all design specifications were met: • Works mechanically • Allows a wheel to turn in at least 4 directions directly • Is suitable for use in a conventional car / wheelchair • Can brake & stop Tests showed that all design specifications for the application model were met: • Spherical gear-wheel is used & it improves application functionality • Application model turns in at least 4 directions directly The concept was proven: mathematically; through building different models; with constructions & drawings; with CAD animations; and with an application model.

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