Concept Bike E-VeloMobil

Student

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Introduction: Constant population growth inevitably leads to a conspicuous increase in traffic on the roads. In addition, climate change problems and energy targets to be met in the coming years force us to find alternative and sustainable means of transport. The role of 'slow mobility' is therefore becoming increasingly important. Technical developments in propulsion technology and impending changes in Swiss legislation open up new conceptual possibilities for muscle-driven vehicles with electric assistance and all-weather protection.
Electric micro-mobility is an increasingly popular alternative for daily commuting. The use of E-bikes offers great flexibility in travel, allowing destinations that cannot be reached by car or train. While the E-bike used to be a means of transport for sports enthusiasts, it is increasingly becoming a real means of transport for daily commuting. The technological development of motors/batteries makes it possible to cover ever greater distances. However, the E-bike market is still anchored in the concept of the 'classic bicycle' and therefore there are not many vehicles that actually allow daily use of these in all weather conditions and for a variety of uses. The aim of this project is to find an attractive concept for the masses, capable of 'replacing the second car' in the short journeys of everyday life, is not available on the market.

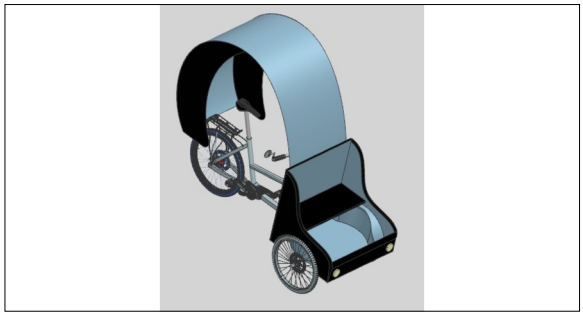
Approach: The approach used to identify initial requirements and partial/final concept solutions follows the guidelines of the general product design model. The objective of this work is to develop a conceptual study for a weather-protected, muscle-powered electric vehicle unisize for people between 1.60 up to 2.00m.
Once the constraints have been accurately identified in the initial phase, the work involves analysing different partial solutions. The technical requirements come from the Swiss regulations concerning the main requirements on the admission to traffic and use of electric mopeds and rickshaws (1/2/2019). By analysing the 4 best solutions in more detail, the best basic solution is identified, which is the starting point for CAD modelling and component selection.

Result: The result of the project is 3D modelling of E-VeloMobil with Siemens NX software and the list of commercial components used for the bicycle.
The tricycle developed has two front wheels and one rear wheel. The dimensions for the front wheels are 20x2.15 inch and for the rear wheel 26x2.15 inch. Specifications: hub motor Heinzmann (model CargoPower RN 111) with energy recovery, Pinion gearbox on the pedals with belt drive, a 745 Wh battery, 203 mm disc brakes (one per wheel). A plastic cover was also provided to protect the rider and any child transported on the tie rod. The cargo space at the front has seats for two children up to 6 years old or one adult. The bench is foldable and the cover is flexible and removable.
With regard to adjusting the riding position, a mechanism has been adopted that allows the handlebars to be tilted and adjusted in length. This, together with the saddle height adjustment, allows the E-bike to be used by all cyclists between 1.60 and 2 m tall.

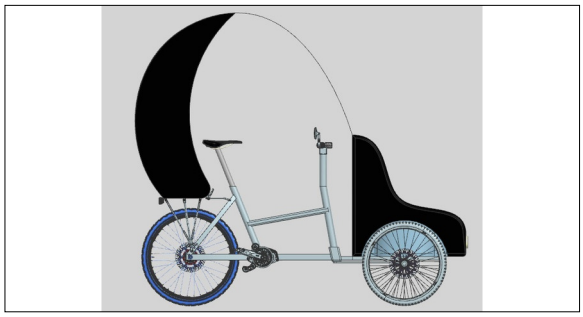
Table of the degree of fulfilment
Own presentment

Nr	Optimierungskriterien	G	Lösungsv. 1 E	Lösungsv. 1 G x E	Lösungsv. 2 E	Lösungsv. 2 G x E	Lösungsv. 3 E	Lösungsv. 3 G x E	Lösungsv. 4 E	Lösungsv. 4 G x E	E	G x E
TO1	As light as possible	5.3	8	42	8	42	8	42	6	32		0
TO2	As tilt-resistant as possible	7.6	8	61	6	46	6	46	10	76		0
TO3	Choice of components from bike supplier (standard components)	8.8	7	62	5	44	8	71	6	53		0
TO4	Storage space as large as possible	3.5	7	25	9	32	9	32	4	14		0
TO5	Meet legal requirements for child transportation	5.9	8	47	8	47	8	47	6	35		0
TO6	Good overview in the traffic	1.8	9	16	7	12	7	12	8	14		0
TO7	Max. operation range as possible or possibility to extend (eg 2nd battery)	1.8	10	18	10	18	10	18	10	18		0
KO1	Choice of components from bike supplier (scale of economy)	10.0	7	70	6	60	8	80	6	60		0
KO2	Using standard components from industry (scale of economy)	10.0	7	70	6	60	8	80	6	60		0
KO3	Using availibe components from the market (e.g. smart phone holder, scale of economy	10.0	10	100	10	100	10	100	10	100		0
		0.0		0		0		0		0		0
		0.0		0		0		0		0		0
	Max Punktzahl			511		461		528		462		0

Isometric view
Own presentment



Lateral view
Own presentment



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