The Kul-car – electric city car of a new generation, designed for the disabled persons

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1. Introduction

In today’s cities one can move around on foot, by public transportation or by car. For wheelchair users, the first two methods are not very useful. In the city, even well adapted to the needs of disabled people, they have difficulties in travelling from one point to another. Also, usage of the car, especially at short distances, is cumbersome. Cars currently offered for people with disabilities, are modified standard cars. Thus, they do not provide comfortable getting in and getting out of the car and make the disabled person use wide parking places. In the cities suffering from shortage of parking places, a lot of them, reserved for the disabled, stay empty. What is more, even the disabled themselves are not satisfied with this solution. Wide parking places are distant from each other. Having parked the car, the disabled person has to go to their destination on a wheelchair (sometimes a long distance).

Kul-car - a car designed from the beginning for people in wheelchairs does not have these drawbacks.

2. Description

The design of an urban car for people with disabilities is carried out by a group of students and graduates of Warsaw colleges, under the direction of Warsaw University of Technology lecturer. The starting point for its implementation is a list of 8 conditions the complete vehicle must meet.

- The vehicle is designed for city traffic, so its maximal speed accounts for 50 km/h with the possibility of short-term excess to 60 km/h and the range without of the replenishment of energy is 100 kilometres.
- The vehicle has the lowest cost of purchase and operation possible and servicing is reduced to a minimum.
- The seating capacity of the vehicle is 2 people. It may be driven by a person in a wheelchair carrying a passenger without disabilities, or, vice versa, driven by a person without disabilities carrying a person in a wheelchair. The car is supposed to come in two versions, depending on the family situation of the user.
- Control of the vehicle is carried out exclusively by hands.
- The user of the car gets in and gets off the car on a wheelchair. The disabled remains on a wheelchair at all times during the journey.
- The disabled person can enter and exit a car in a freely chosen parking place. They can exit the car directly to the pavement or onto the street (depending where there is room to use the wheelchair).
- The vehicle is equipped with a luggage compartment accessible for the person sitting in a wheelchair. Access is possible both from the outside and from inside the vehicle.
- Due to the limited possibility of the disabled person’s turning back, driving a vehicle does not require backing up (although is possible)

Kul-car (the working name of the designed car), is the four-wheel electric vehicle. Two wheels are powered by hub motors. At this stage of the project, two wheels for steering are not powered. This does not exclude, however, applying in the future four-wheel drive. Calculations performed indicate that the vehicle will be very economical in operation. Distance of 100 km travelled by an electric vehicle with the given parameters, will require purchasing electricity of the current value of about 1 Euro. Not without significance is the fact that the electric drive eliminates the cumbersome and costly annual servicing required by the I.C engine and that charging takes places in the user’s place of residence (without the necessity to go to the petrol station).

The body of the car fits in a vertical cylinder with a diameter of 2 meters and a height of 1.8 m.

The Kul-car can be parked facing the kerb curb between cars parked perpendicular or slantwise to the axis of the road, but also between cars parked parallel to it. In no case will it protrude beyond the outline of parked vehicles. Also in any (for example supermarket) car park it can take any free place.

The most important feature of the Kul-car is that the car’s able to revolve in a spot. After parking the vehicle can be turned to the position most comfortable for the user to extend the ramp and exit the vehicle.
If a passenger without disabilities wants to exit a car, it can be revolved to a position most comfortable for them. Should the place used for extending the ramp be blocked up during parking, the vehicle can be remotely turned to the new position. Similarly, it can be turned to the most comfortable position to use the luggage compartment. Revolving of the vehicle is realised by the same wheels and engines that are used while driving. The vehicle has no additional devices for implementation of the revolving. The disabled user enters into the Kul-car in a wheelchair. This is to avoid the inconvenience to move from the wheelchair to the car seat as well as disassembling the wheelchair outside and carrying parts of the wheelchair into the vehicle. Thus time of entry into the car and leaving it is reduced greatly. Entry and exit from the vehicle takes place at the extended ramp located at the rear of the vehicle. The ramp is remotely controlled and electrically extended in a direction perpendicular to the wall of the vehicle. While opening, ramp revolves around a horizontal axis of the floor surface of the vehicle. After extending, the ramp serves as a flyover directly to a pavement or a street. Many parking places are separated from the pavement with a narrow lawn. Two-meter ramp provides an easy way to overcome this obstacle. The angle of depression of the ramp based on the street enables the disabled to use it on the wheelchair. Since entering and exiting of the vehicle does not require putting a wheelchair side by side to the car, there is no need to use a wide parking place dedicated for the disabled. A person without disabilities uses standard side door. The possibility of revolving the vehicle around its own axis eliminates the need to join the traffic pulling back the car. A physically disabled person, especially with the limited mobility of the torso, has large difficulties with looking back and finding out whether pulling back from the parking place is safe. In the Kul-car, joining the traffic is always realised face forward, after revolving the vehicle in the right direction. The concept of the vehicle perfectly fits environmentally friendly trends in the automotive industry in the European Union. In the future, the Kul-car can also be produced as an urban electric vehicle with two seats for persons without disabilities. The concept was awarded: the 1st prize in the competition “Young Inventor 2009”, silver medal on the Fair of Inventions in Brussels, 2009, Award of the Ministry of Science and Higher Education for international inventive achievement 2010.

3. Summary

The presented Vehicle is in development (during the design phase). Structural analysis and consultation with prospective users are carried out. It is already clear, however, that the creation of a vehicle designed ab ovo for disabled people is both necessary and possible. Innovative solutions used in this car receive a very positive evaluation. Expected advantages ensure that the Kul-car succeeds in every market where the disabled live. One should also expect that a vehicle with such maneuverability and economics of parking space usage (easiness to park) will find many buyers among persons without disabilities. Therefore, there is a possibility to develop a version without a ramp entrance, but with two standard seats and larger luggage compartment.