

Students' works in the field of industrial design aimed to improve the life of people with disabilities

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**Equal Access through Service Learning for Persons with Disabilities
Workshop 6**

- About 15 percents of world population are people with disabilities. A great number of different kinds of physical and mental impairments make the life of these people very difficult.
- Designers and ergonomists have a big role in the process of improving their lives. They design new products and new solutions, using the latest technologies in order to develop different kinds of aids and body assists devices.

- The studies on industrial design at the Faculty of Mechanical Engineering in Skopje are active since 2004. Almost nine years hundreds of students are receiving knowledge how to design products that would make better working and living conditions for all people.
- Several students in the last few years worked on design projects for special devices for people with disabilities.

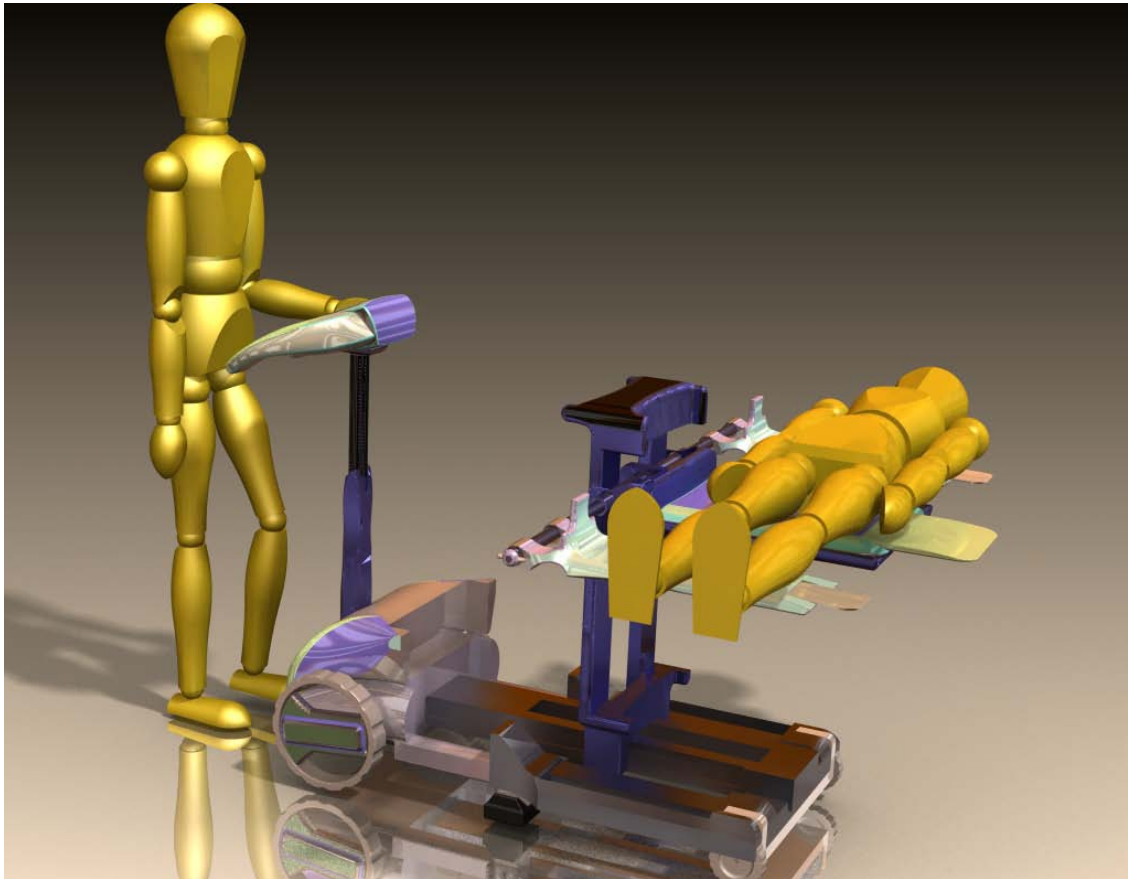
Device for patient lifting

- One of the most difficult tasks for the medical staff in the hospitals is taking care of the patients in coma or patients with serious problems with locomotion. There are many methods for changing the position of these patients in order to perform hygienic procedures, changing of clothing and garments. Most of these methods require two or more people with their own power to finish the task, and they very often suffer of back pains and other musculoskeletal disorders. There are several devices in use in the hospitals for the same purpose, but not sophisticated enough.

Contemporary devices for patient lifting



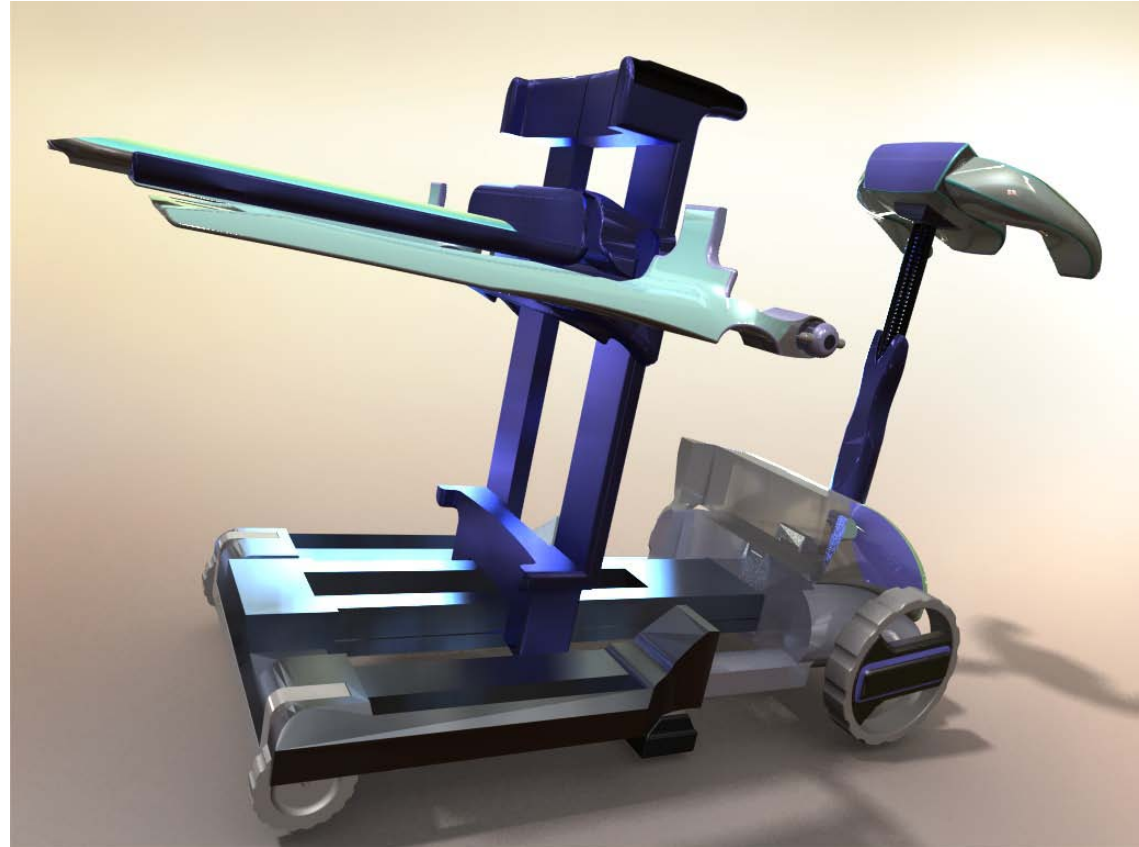
Device for patient lifting



The student Igor Ivanovski made an innovative design of a device that could be used for lifting of patient in horizontal position and for his transportation in horizontal or seating position.

Device for patient lifting

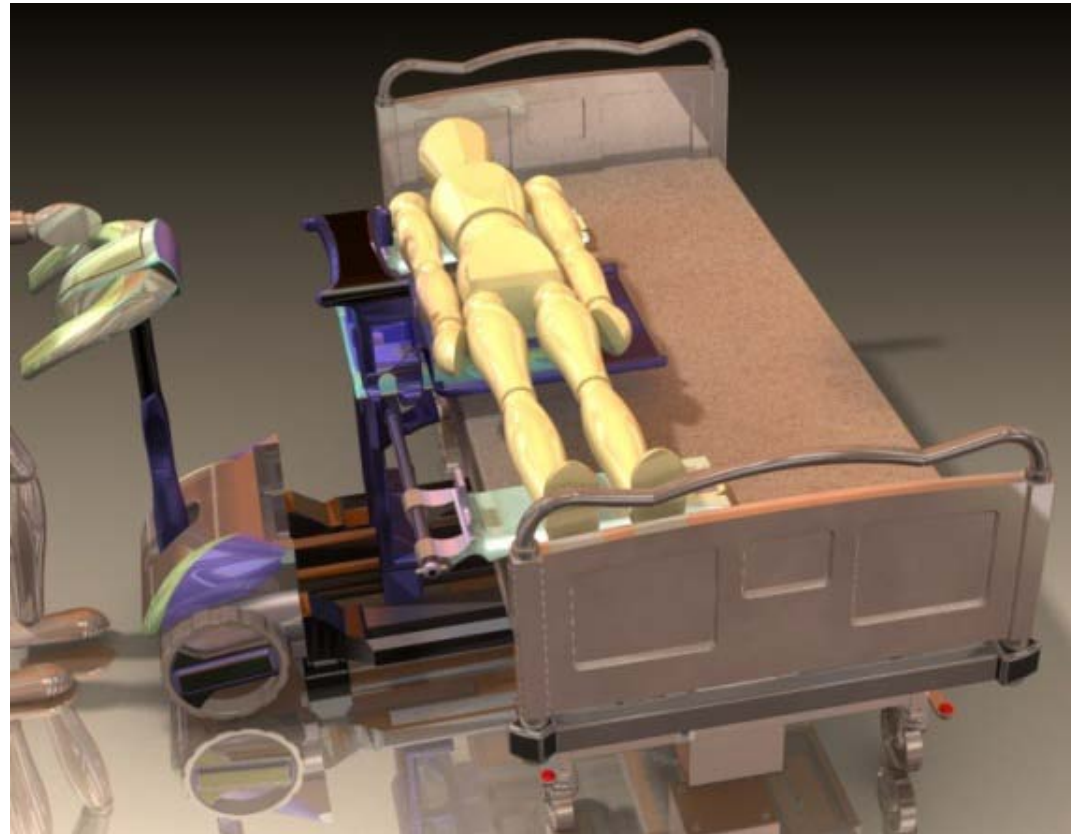
- The device is designed to work on a forklift principal. The fork is a part of the device that moves up and down, back and forth.



Device for patient lifting

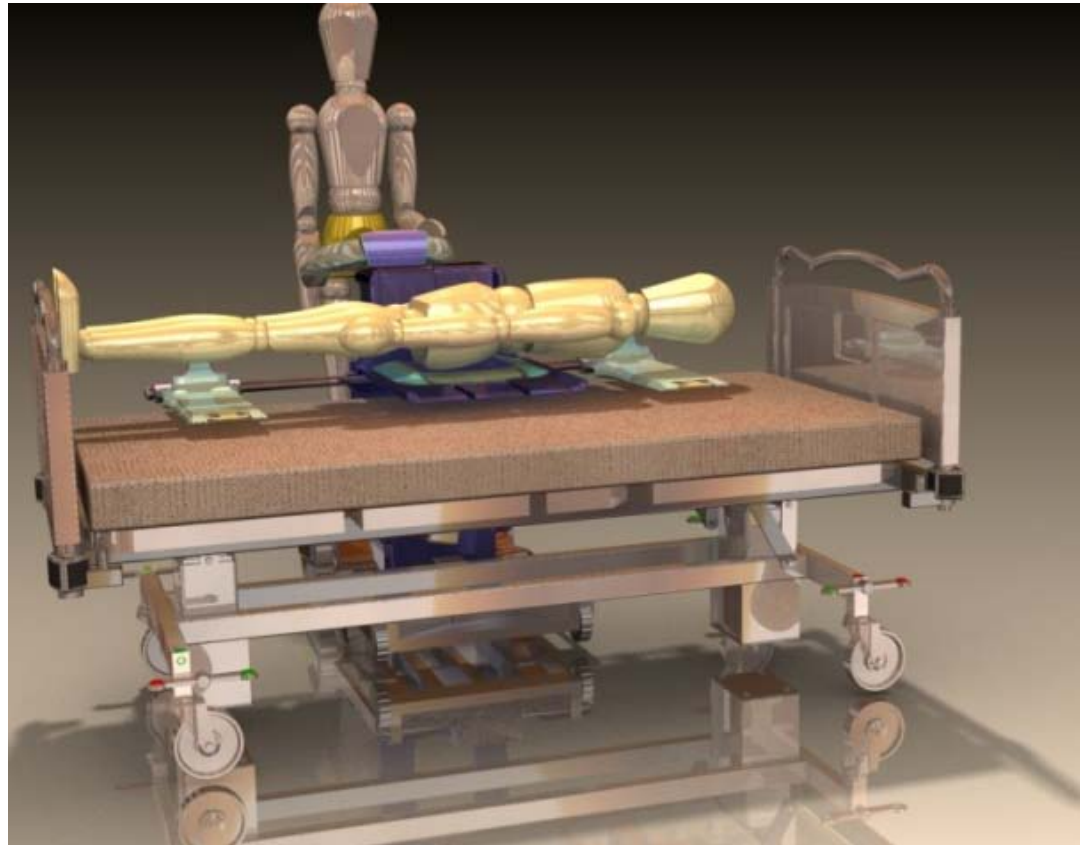
The fork is consisted of three parts - arms that could be arranged according to the patient anthropometry in order to be easily put under the patient in the bed:

- one arm under his neck,
- second arm under his back and
- third arm under his knees.



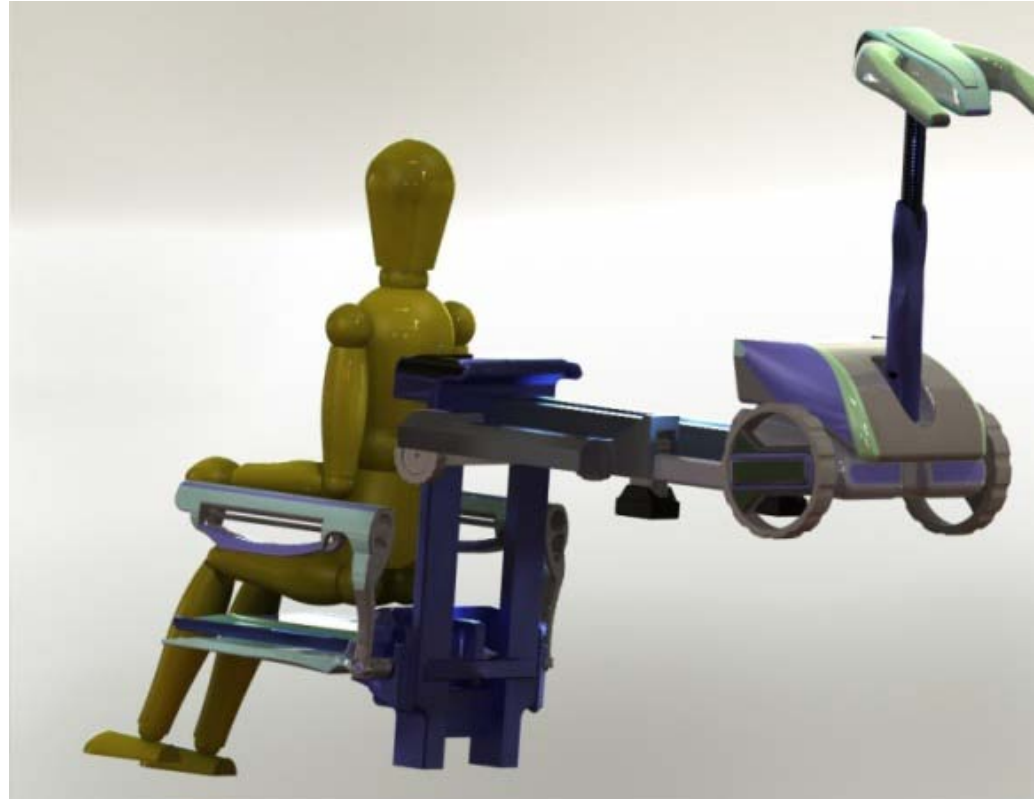
Device for patient lifting

The hospital staff could use the device for lifting of patient in order to make necessary hygienic procedures or for transportation of the patient from the hospital transport bed to the hospital or operation bed and vice versa.

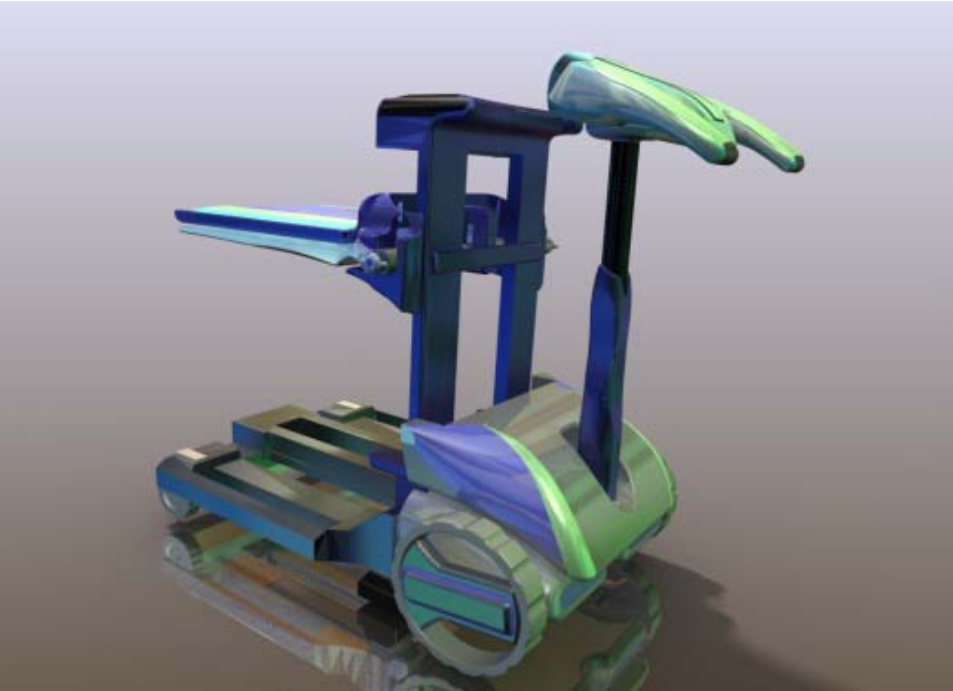


Device for patient lifting

The same device could be used for transportation of the patient in the sitting position, as a wheelchair, with possibility of moving up and down in order to put him in the pool and to take him out of the pool.



Device for patient lifting



The presented lifting device is powered by electrical engine and equipped with contemporary user interface devices. It is expected to be very easy for manipulation for the staff and safe for the patient.

Wheelchair for home use for children with cerebral palsy



- The student Brankica Mitrovikj made a design of wheelchair for home use for children with cerebral palsy. After the considerable research for this disease and the market research for wheelchairs that are produced worldwide, she decided to make a design for home use that will make the life of these children more cheerful.

Wheelchair for home use for children with cerebral palsy

She decided to make a wheelchair with the following characteristics:

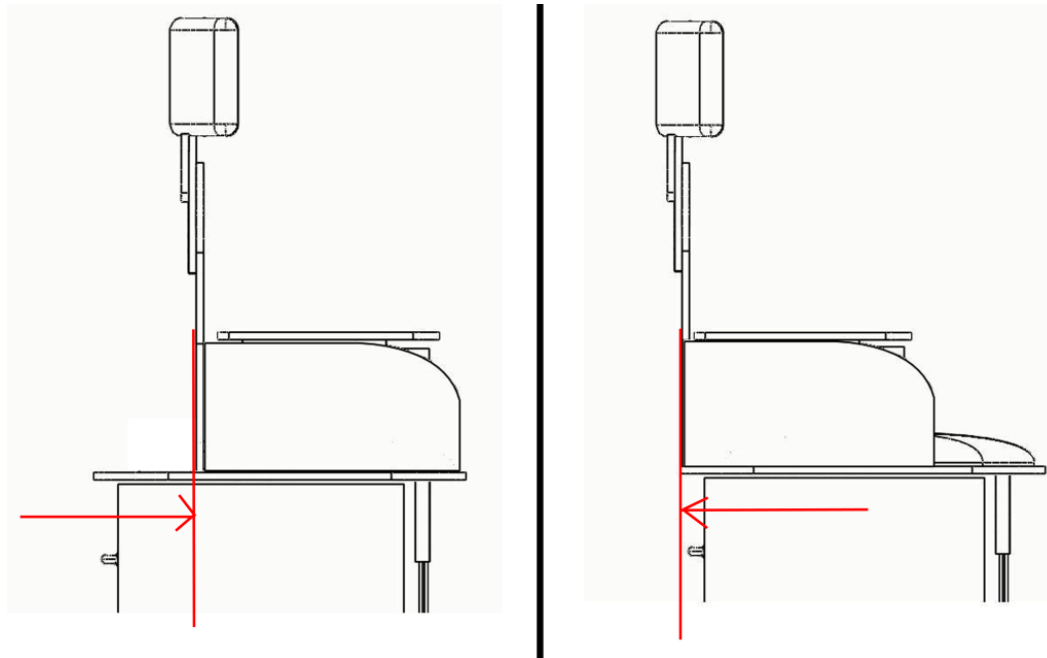
- to look like a part of the home furniture;
- to be produced of wood, textile and other materials for manufacturing of home furniture;
- to be dimensionally adaptable for following of the child body changes according to its age;
- to have an additional equipment for performing different activities;
- to be adaptable for active and relaxed sitting;
- to be easily manageable for the accompanying person.

Wheelchair for home use for children with cerebral palsy



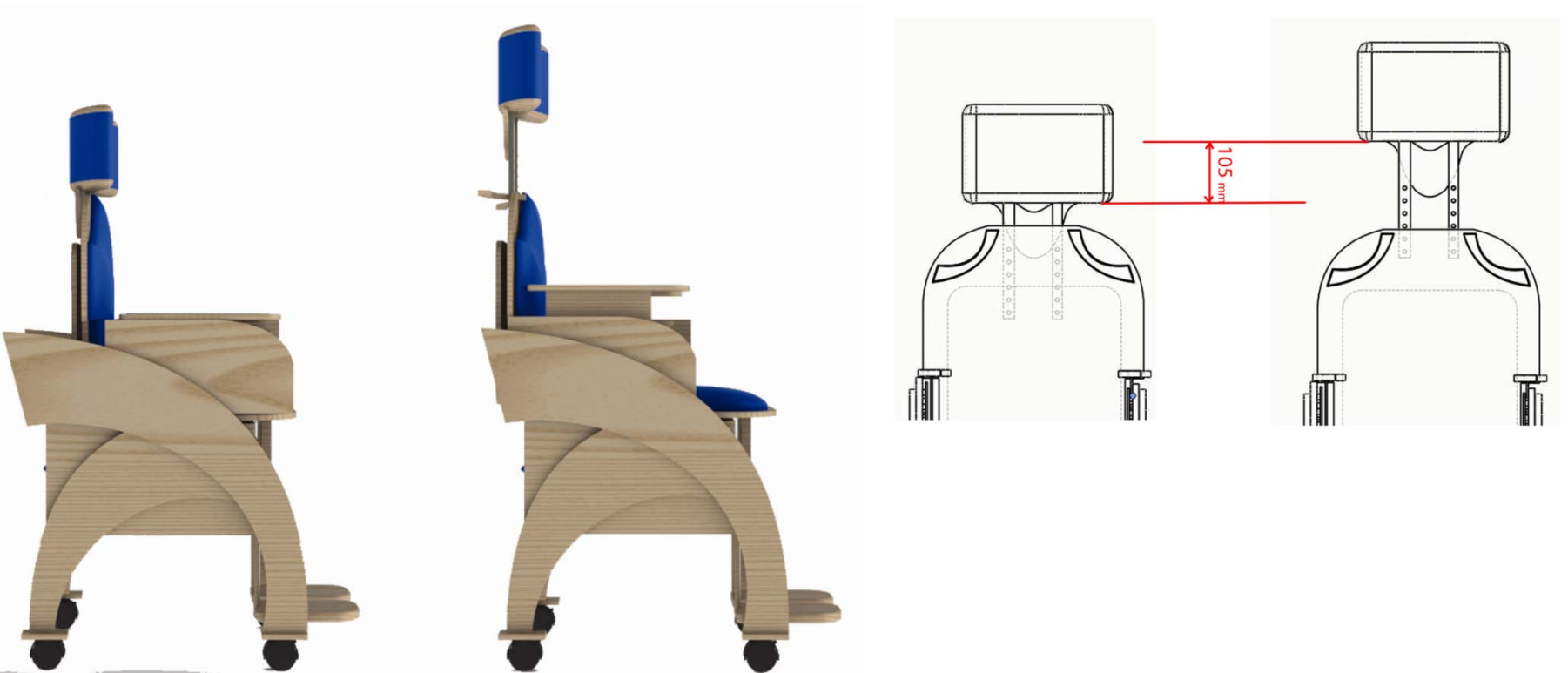
The result was a chair with wheels for use only at home, with many adjustable parts for following the changes in body dimensions: footrests, armrests, backrest, headrest etc. The ranges of adjustability were determined with an analysis of anthropometric measurements for children of different ages.

Wheelchair for home use for children with cerebral palsy



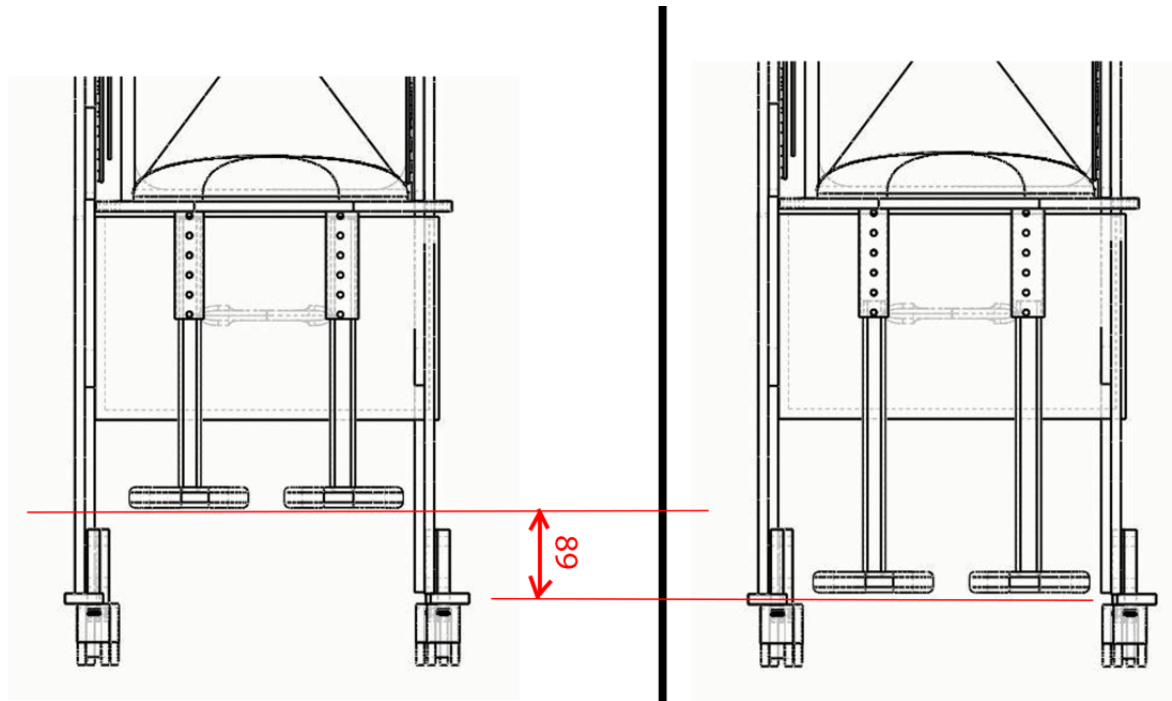
Adjustable depth of the seat for following the measurements of children of different ages

Wheelchair for home use for children with cerebral palsy



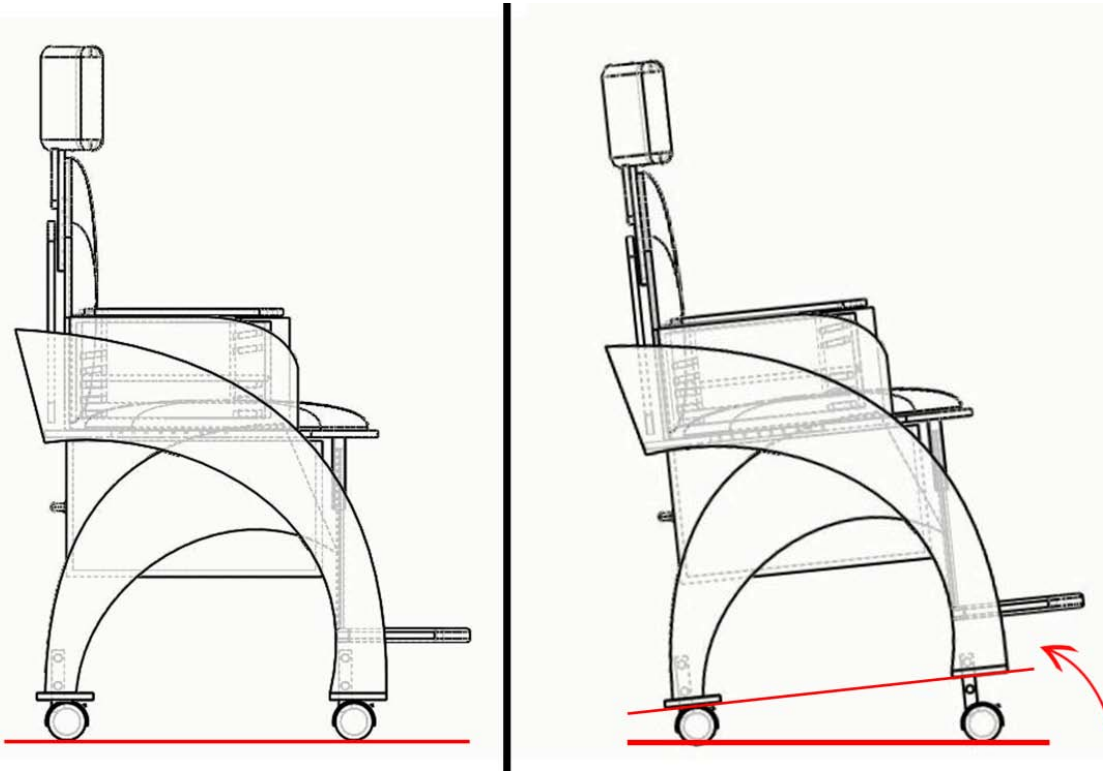
Adjustable height of the headrest for following the measurements of children of different ages

Wheelchair for home use for children with cerebral palsy



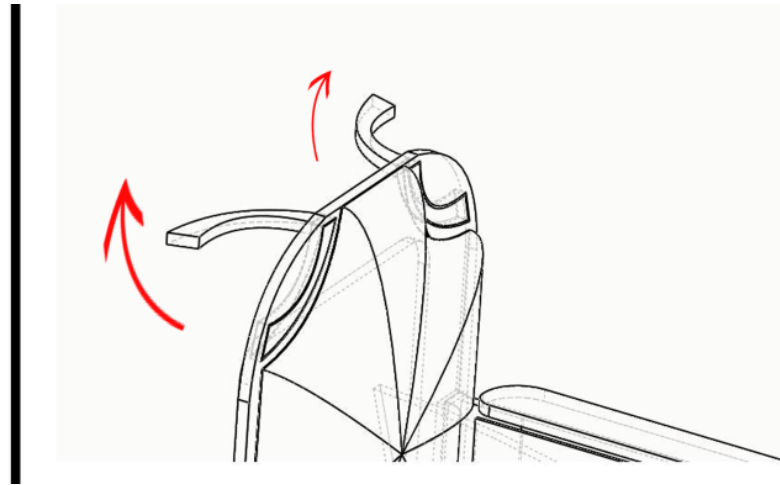
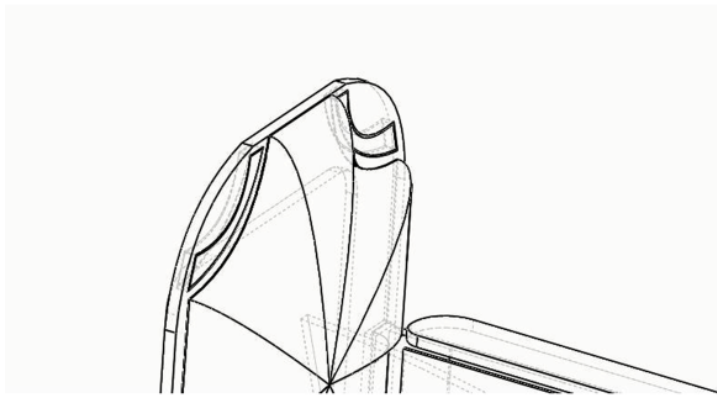
Adjustable height of the footrests for following the measurements of children of different ages

Wheelchair for home use for children with cerebral palsy



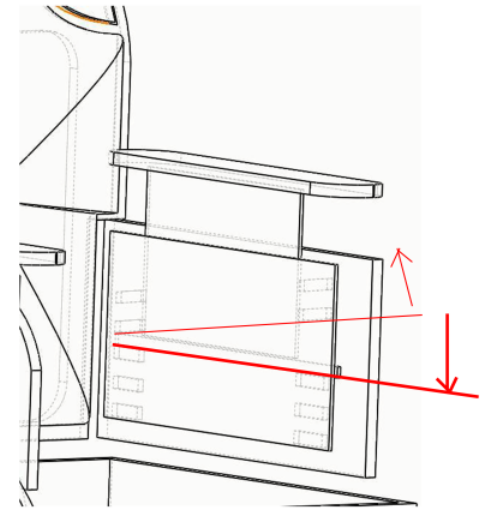
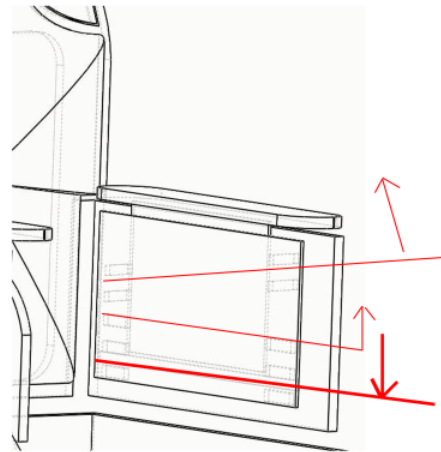
The seat is designed with possibility to change the angle of the backrest in order to obtain relaxed position. The child could be positioned on the seat with extra equipment as a medical treatment for the posture.

Wheelchair for home use for children with cerebral palsy



The special handles on the backrest are designed for manipulation of the accompanying person who takes care about the child.

Wheelchair for home use for children with cerebral palsy



The wheelchair is equipped with extra accessories for different activities – playing, drawing, computer work.

Wheelchair for home use for children with cerebral palsy



The design of the wheelchair is suitable for children, with organic shapes and possibility for selection of cheerful colors. The main intention of the design is to obtain good feelings for the children with difficult health problems.

Power wheelchair for outside use with mechanism for lifting

- The student Aleksandra Sharanovikj in her diploma work made a design concept of power chair with mechanism for lifting of the patient in vertical posture.



Power wheelchair for outside use with mechanism for lifting



The basic idea for this diploma work was to design a power wheelchair that will improve the quality of life of people with locomotion disorders. The intention was to design a wheelchair with:

- more enthusiastic, sport spirit,
- easily manageable,
- strong enough to solve the architectural barriers,
- with possibility to lift the patient in vertical position in order to obtain equal posture level with other people.

Power wheelchair for outside use with mechanism for lifting



The wheelchair is designed to have adjustable backrest in order to obtain normal (left) and relaxed position (right).

Power wheelchair for outside use with mechanism for lifting

Adjustable seat in order to obtain adjustability of height, according to the anthropometry of the user.



Power wheelchair for outside use with mechanism for lifting

Adjustable mechanism for seat lifting in order to obtain the patient position on the same level with other standing people around him. This kind of wheelchair would upgrade the working possibilities and enable maximum independence of the user, both for inside and outside use.



Mobile phone for people with vision perception impairment

- The student Filip Dimovski made a concept design of a mobile phone BRACELL for visually impaired people that use Braille. The usual mobile phones are adapted for people with visual impairments with a tactile element on the keyboard for orientation, but only for typing, reading is impossible. The mobile phones with touch screens are totally unusable for these people.

Basic letters

| | | | | | | | | | | | | |
|------|-------|--------|---------|----------|-----------|------------|-------------|--------------|---------------|----------------|-----------------|------------------|
| • | •• | ••• | •••• | ••••• | •••••• | ••••••• | •••••••• | ••••••••• | •••••••••• | ••••••••••• | •••••••••••• | ••••••••••••• |
| a | b | c | d | e | f | g | h | i | j | k | l | m |
| •••• | ••••• | •••••• | ••••••• | •••••••• | ••••••••• | •••••••••• | ••••••••••• | •••••••••••• | ••••••••••••• | •••••••••••••• | ••••••••••~•••• | ••••••••••~••••• |
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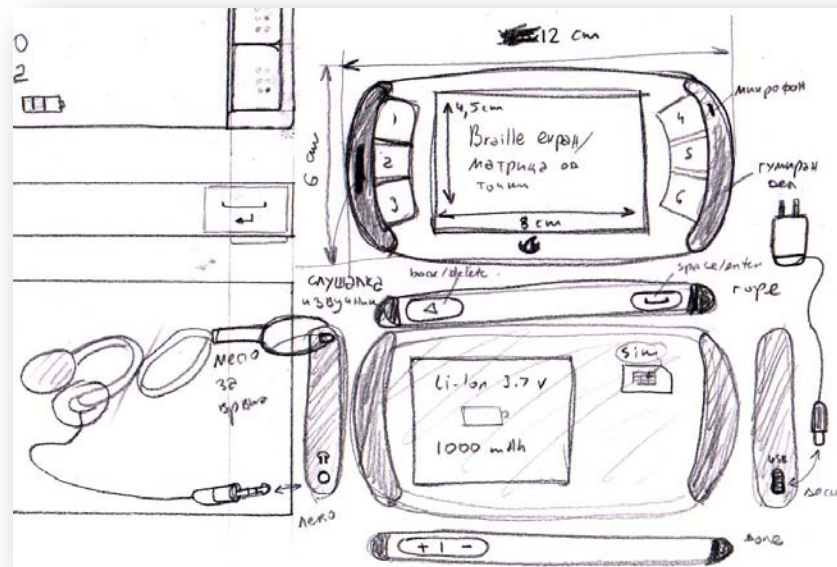
Mobile phone for people with vision perception impairment

The student made a short research of the similar products on the market that are already in use. There are several devices for input and read of texts that use tactile writing system Braille, but they have serious problems: very complex to use, very expensive, the design is not ergonomic, equipped with complex software system, that requires processing of big amount of information.



Mobile phone for people with vision perception impairment

Having in mind all these problems, the student Filip Dimovski decided to make a concept of a mobile phone and pocket computer for people with visual impairments. The BRACELL concept is designed for reading and writing messages with Braille signs. The concept name BRACELL is a mix of the terms Braille and cell phone.

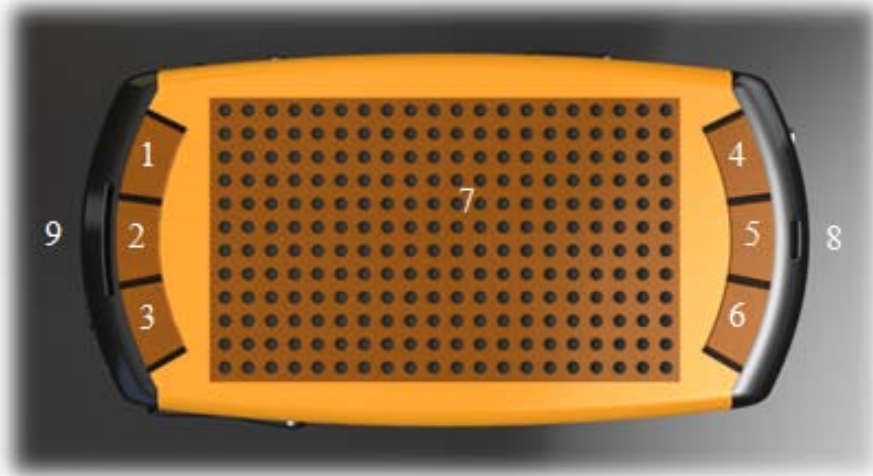


Mobile phone for people with vision perception impairment



The screen for reading of messages is a matrix of mechanical dots that could move up and down across the flat surface of the front side of the phone in order to present different Braille sign. The signs could be recognized by the user when he moves his fingers across the screen. Each sign is consisted of 2 columns with 3 dots. The screen is designed for presentation of text in 4 rows with 10 signs per row.

Mobile phone for people with vision perception impairment



- 1-6 buttons for input of Braille signs
- 7 screen with mechanical dot matrix
- 8 microphone
- 9 speaker
- 10 buttons for sound settings
- 11 headphone port

Mobile phone for people with vision perception impairment

- The dimensions of the device are relatively small: 120 x 60 x 12 mm, suitable for pocket. The shape is simple thin box with rounded edges, designed to be comfortable for handling and manipulation.
- It could be produced of ABS in order to be impact and crash resistible. The side surfaces have to be produced of soft material, like silicone or rubber, in order to avoid slipping in the hand.
- The color of the surfaces have to be easily visible, very intensive (yellow, red, orange, green), because some of the users have only partial visual impairment. The buttons have to be with contrast color, for example black or dark blue.