

Ergonomic authentication for dimensions furniture

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Abstract: : The dimensions of the population are constantly changing and the changes need to be applied in the dimensions of the furniture. The goal of this paper is to update the dimensions of ergonomic furniture using current anthropometric data. Special software designed to simulate human activity will be used to compare human body dimensions and furniture. The result will verify the accuracy of the current design used for ergonomic furniture. If the design is found inaccurate, new proportions will be suggested. The article describes the proposed procedure.

Keywords: ergonomics, furniture, methodology

ANTHROPOMETRY AND INTERIOR

Anthropometry is a science that deals with the measurement of man. Anthropometric data make groundwork for appropriate furniture design and furniture dimensions. Man has always made objects to their needs in accordance with the dimensions of the human body. It ensured better performance of the objects.

In the field of interior and furniture design, comfort lies primarily in the correct dimensions of the particular user. It is evident from historical discoveries. Changes in the dimensions of furniture are visible in the timeline -for example, length of bed in the Middle Ages was significantly shorter than today, because the population growth was smaller.

The population in the recent decades has been growing significantly. The differences in height among countries are also being diversified. These changes must be taken in count by furniture designers and architects.

It needs to be mentioned that architects and designers use anthropometric measurements of the Czechoslovak population from the 1970s and older. The data have been taken from the following publications:

- Furniture, people, housing by Stanislav Dlabal (1976)
- Neufert - Designing buildings (2000)
- Standards and regulations

All publications use data of the population around the year 1970. Newer data are not available and so even the current publications use the old data.

HISTORY ANTHROPOMETRY AND MEASUREMENT OF HUMAN

People have been interested in the dimensions of the human body from the time immemorial. The European civilization has dealt with them since Antiquity. It involved detailed observation and measurement of people. Especially, the dimension of the human body have been essential for sculpture. be without examining the relationships and understanding the human dimensions did not go. Renaissance drawing of Leonardo da Vinci – the Vitruvian Man - shows a very detailed, almost scientific, exploration into a human figure.

The science of anthropometry was created in the XIX. century when a Belgian mathematician, Jacques Quetelet Lambert Adolpe wrote a book called Antropometry and in

1883 a Frenchman, Alphonse Bertillon came up with a method of identifying criminals by measuring their bodies.

In the Czech country, the first measurements of the population were carried out by Prof. Jindrich Matiegka in 1895. Later, in 1951, Prof. Vojtech Fetter began measuring Czech children and the youth. It has been held regularly every ten years up today. The last measurement was carried out and evaluated in 2001 by the State Medical Institute. This research concerns the height and weight of children and the youth under the age of 18.

At the same time, measurements of the Czechoslovak population between ages 6 -55 were carried out at every Spartakiade (1955, 1960, 1965, 1975 and 1985), allowing to monitor the evolution in growth and change. Recent measurements from 1985 were prepared by Pavel Blaha et al.

CURRENT MEASUREMENTS

The measurement results show the increase in height and weight of the population and the large differences between the maximum and minimum values. Comparison of average values from the years 1970 -1985 (data have been taken from above mentioned publications) and 2010 (Table. 02, 03), maximum and minimum differences values (Table. 04), clearly indicate that the population is growing . It is to be emphasized that Czechs are among the highest nations in Europe. Experts believe that the growth of the Czech population has not stopped yet. In addition, the alarming increase in weight is caused by lack of exercise in the current lifestyle.

Table. 1: The average height of an adult

	1970	2010	difference
Man	174,0 cm	179,5 cm	+ 5,5 cm
woman	162,0 cm	166,5cm	+ 4,5 cm

Table. 2: The average weight of an adult

	1985	2010	difference
Man	74,6 kg	84,0 kg	+ 9,4 kg
woman	59,4 kg	68,8 kg	+9,4 kg

Table. 3: Adult height - the difference between the upper and lower limit

2010	percentil 75	percentil 25	difference
Man	184,8 cm	173,6 cm	11,2 cm
woman	171,2 cm	160,5 cm	10,7 cm

Table. 4: Adult height - the maximum difference

2010	min.	max.	difference
Man	162,3 cm	193,4 cm	31,1 cm
woman	152,3 cm	182,6 cm	30,3 cm

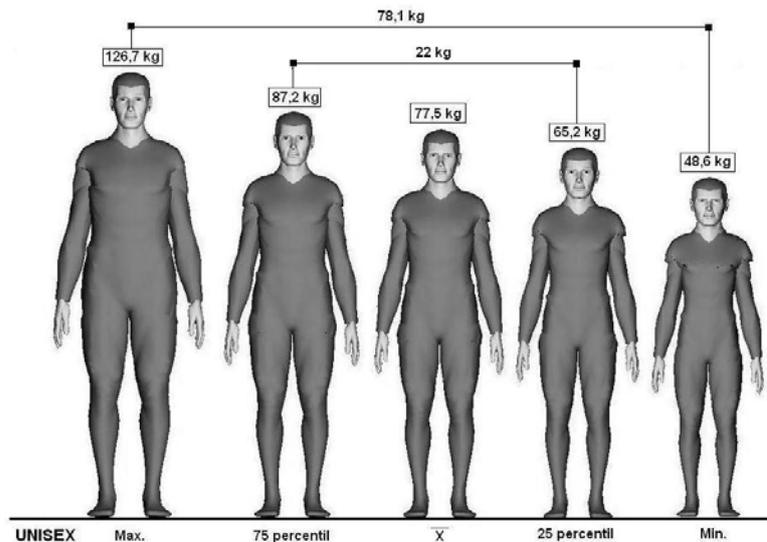


Figure 1. Differences in body weight / Unisex

DEVELOPMENT OF ANTHROPOMETRIC DATA

Anthropometric data were processed using ergonomic software, Siemens (Tecnologic Jack) on the basis of the measured sample of the population. The software Tecnomatix Jack enables to improve the ergonomics of product designs.

Tecnomatix Jack is a 3D simulation tool focused on ergonomics and behaviour at work. The software allows monitoring and evaluation of work activities and placement of the workers within a manufactory.

An accurate biomechanical model of a human body, which has a total of 69 segments and 68 joints, is inserted in the virtual environment. The most detailed parts are the backbone (17 segments) and hands (16 segments). These segments can be manipulated in 2 to 3 axes.

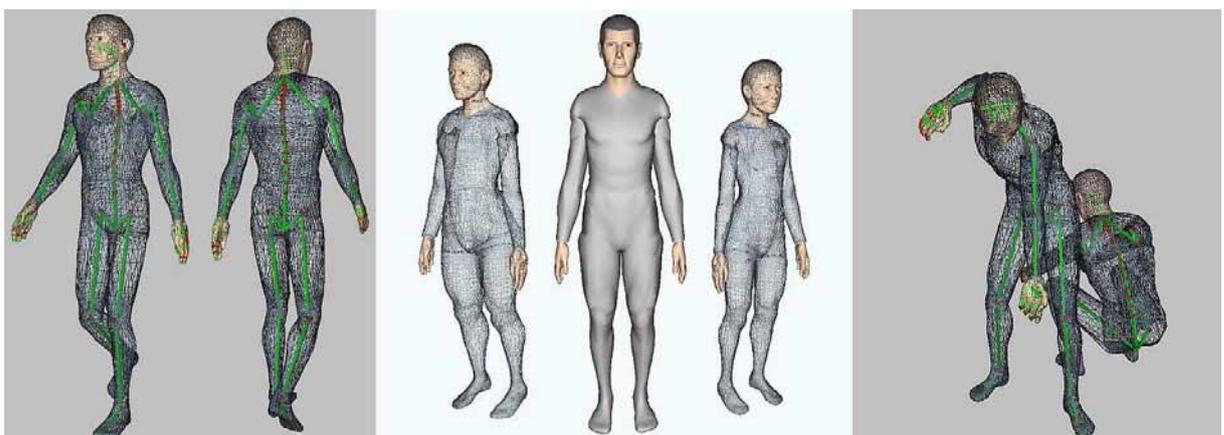


Figure 2. Tecnomatix Jack 3D simulation

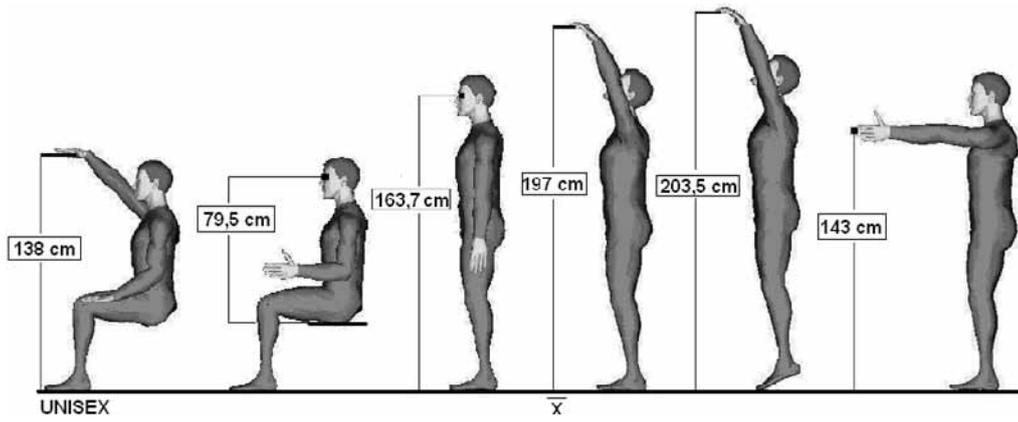


Figure 3. Maximum height standing on the tips / Unisex

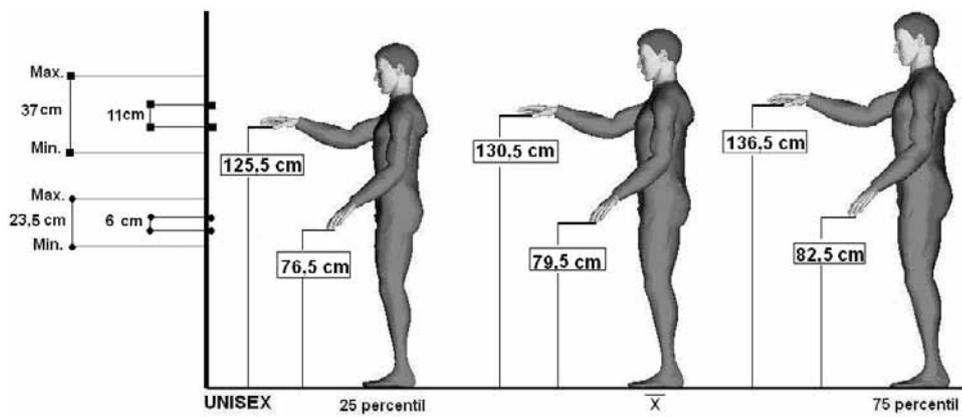


Figure 4. The optimum height of the shelves at work standing / Unisex

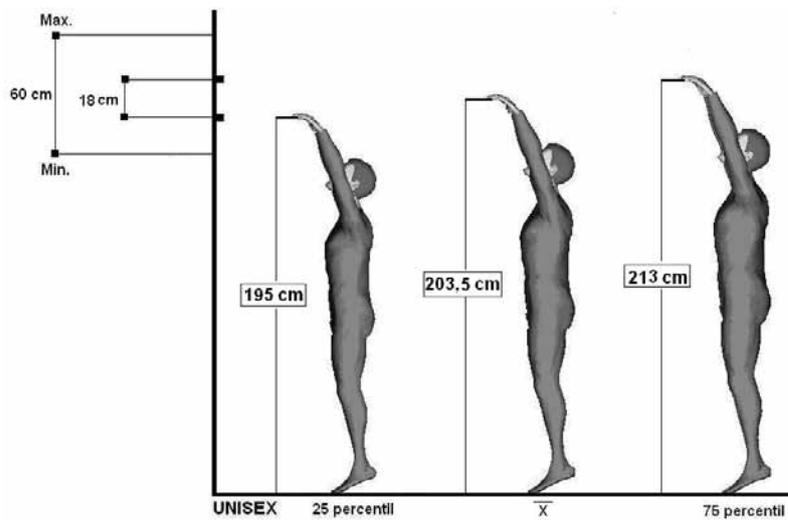


Figure 5. Maximum height of the peak standing / Unisex

CONCLUSION

It is suggested to implement the classification of XS, S, M, L and XL used in the clothes industry, which would help the customers to choose the right size. This idea has been introduced for the first time by T. Teraoka, R. Mitsuya and K. Noro who based it on a survey of seating comfort.

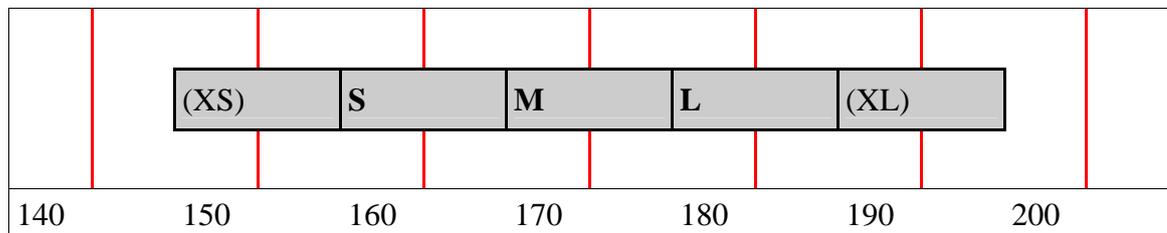


Figure 5. Height in cm man

Human-inhabited environment (the connection between architecture and interior) and product design, these changes must occur in particular:

- accepting changes in lifestyle;
- changing the current "recommended" size due to growing population, divided into size categories. This also applies to the preparation of documents for architects and designers.

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Streszczenie: *Ergonomiczna weryfikacja wymiarów mebli.* Cechy antropometryczne populacji podlegają ciągłym zmianom i stąd też istnieje potrzeba uwzględnienia tych zmian w wymiarowaniu mebli. Celem pracy jest aktualizacja wymiarów mebli na podstawie aktualnych danych antropometrycznych. Do realizacji tego celu użyto specjalnego oprogramowania przeznaczonego do symulacji czynności wykonywanych przez człowieka. Pozwoliło to na porównanie wymiarów ciała ludzkiego oraz mebli.

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