

Philosophy Of Creating Macros In Accumark CAD System

Marie Nejedla

Abstract: - The article discusses a promising method of creating documentation in design preparation of clothing production using the "Macro" module. Creation of the basic and model design solution of clothing and clothing parts, which is applicable for any design methodology, is concerned. The Unified Methodology by designing, using which preconditions for computer processing were set in the 90th of the past century, is applied for solving. The macros created in Accumark CAD program can be applied for pre-defined size range and also for making clothes fitting to particular customer's dimensions. All of that can be done if the input bodily dimensions in the table bound to macro are kept. The sense and aim of macro creation is to make lengthy and repeated activities when creating design and technical documentation more effective and to show rational ways of their application in clothing production.

Keywords: Unified Methodology of Clothing Design (UMCD), philosophy of "macros", macro in CAD system Accumark, loading of macro, outputs of macro, trousers macro, macros at custom production.

1 INTRODUCTION

The quality of clothing products is, in considerable extent, ensured by a perfect cut system. In the 90th of the past century, the basis for the new Unified Methodology of Clothing Design (UMCD) [1] was laid in former Clothing Research Institute in Prostějov (project coordinator) in cooperation with the experts from Germany, Poland, Hungary, former Soviet Union, Bulgaria and Romania. The new approach set the basic conditions for application of computer technology in the process of clothing design.

UMCD is based on the unified:

- method of finding out required bodily dimensions,
- procedure for calculating design line segments,
- fundamentally new system of additions and their categorization in design [2],
- procedure of design and graphic projection,
- application of international terminology in the sphere of design.

By applying UMCD, the design engineers', designers' and model makers' activities reach fundamentally higher level, set theoretical basis for design unification and standardization, and thus for application of computer technology at clothing design in combination with offered possibilities of current CAD systems [1].

2 TRANSFORMING A CUT INTO COMPUTER

The concept of transformation is connected with transfer of a real world image into computer. We term the transformation that will be discussed in this article as substitution or expansion of macro.

Macro (from Greek "μακρό" – "large" or "far") in information science defines the rules how the input sequence should be transformed to output sequence (of characters, actions, calculations, etc.). It is a set of commands, by which user's activities executed in certain program can be automated [3]. To achieve certain result the same functions in the same sequence are applied. A macro created for clothing purposes includes a sequence of functions forming the procedure of clothing making that is established by CAD systems design tools in combination with design formulas of general form, variables of which are bodily dimensions and additions influencing the clothing silhouette. After activation, these

macros execute activities automatically and display graphic outputs in the sequence as they were created.

3 SOLVING MACROS IN 2D CAD SYSTEM

The clothing product cut designer's task is to achieve conformity between the body and clothing, which requires not only fast orientation on the body surface but also understanding of design, its creation, description and technical terminology [4]. Bodily dimensions are and will be the basis for each cut design and modelling created manually or automatically. They can be measured by a contact method, i.e. using classic measuring instruments, or by a contactless method using body scanning systems. The number of input bodily dimensions for macros depends on the applied design methodology used in given country or region when designing clothing. This causes significant variability of kinds and types of clothing. However, the situation can be settled quite fast and effectively by selecting a proper design methodology. The above mentioned UMCD methodology, which provides all conditions for creation of design documentation using macro, was chosen for solution. Using macro, design foundations and subsequently clothing models can be solved so that they can be used and can be applicable even for customers whose bodily dimensions do not comply with standard dimensions. The procedure of solution is done in Accumark CAD system, which is a product of Gerber Technology, in a selected kind of clothing, i.e. ladies' trousers.

3.1 Input data for creating macro

Macro is a part of Accumark CAD program, of PDS (Pattern Design Systems); its function is built on the principle of one command relating to a certain element (part, point, lines, curve, etc.) in the Cartesian system.

The inputs for macro are as follows:

A. Definition of input parameters

- definition of sizes for particular product type,
- definition of bodily dimensions for all determined sizes,
- definition of the basic size, in which macro should be created.

B. Definition of design methodology

- design methodology for selected kind of clothing,
- system of design formulas and design line segments for selected kind of clothing,

- system of additions to design segment lines for selected kind of clothing [2],
- procedure of designing for selected kind of clothing.

The above mentioned inputs for macro under point A. need to be prepared in advance in a table in compliance with properly defined form and content determined by the CAD program producer in "MeasureChart Editor" Table 1.

Table 1 Table of bodily dimensions for ladies' trousers

Boć Mćreri	44	46	48	50	52	54	56	58	60	62	64	66	Obrazek
1 T1	170	170	170	170	170	170	170	170	170	170	170	170	N
2 T18	68	72	76	80	84	88	92	96	100	104	108	112	N
3 T19	96	100	104	108	112	116	120	124	128	132	136	140	N
4 T25	108,5	108,5	108,5	108,5	108,5	108,5	108,5	108,5	108,5	108,5	108,5	108,5	N
5 T27	83	82,5	82	81,5	81	80,5	80	79,5	79	78,5	78	77,5	N
6 T51	21	21	22	22	23	23	24	24	25	25	26	26	N
7 PT18	2	2	2	2	2	2	2	2	2	2	2	2	N
8 PT19	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	N
9 a1	2	2	2	2	2	2	2	2	2	2	2	2	N
10 a2	2	2	2	2	2	2	2	2	2	2	2	2	N
11 a3	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	N
12 k1	0,53	0,53	0,53	0,53	0,53	0,53	0,53	0,53	0,53	0,53	0,53	0,53	N
*13													

The bodily dimensions are named in compliance with Ti symbols of UMCD. (T1 – figure height, T18 – waist girth, T19 – sitting position girth, T25 – lateral length of trousers, T27 – step length, T51 – lower width of trousers, PT18 – addition for latitude to waist girth, PT19 – addition for latitude to sitting position girth, a1 – absolute value of the design formula of line segment for sitting position depth, a2 – absolute value for raising waistline, a3 - absolute value for deflection of the front centre line, k3 – coefficient for proportional division of the segment line). The size range is given by the sizes 44 to 66. Values of bodily dimensions are stated in centimetres. All girth and width bodily dimensions are stated in compliance with the applied design methodology; here it is in compliance with the UMCD methodology in full values. The parts stated under point B. must also be prepared and elaborated in advance because the macro procedure differs from classic manual procedure. The procedure is bound by the way of using tools and their possibilities applied in PDS.

3.2 Creating macro

Macro commands are given by essential philosophy of the AccuMark program manufacturer. It is the method of designing indirectly. In AccuMark CAD system, macros are created in three steps:

- loading macro
- activating macro
- editing macro

a) Loading macro

The design procedure is basically created during macro loading. The procedure is bound by formulas of design line segments that are entered into the system in general form with application of bodily dimensions included in the table belonging to given macro. In this case it is Table 1 – kal3_JMKO for ladies' trousers design. While **"loading new macro"**, name of the table of dimensions (kal3_JMKO) is chosen in the dialog box first and then the whole design procedure for given kind of clothing is saved into it using basic construction elements for design – part, point, line, curve, etc., and using design formulas applying the tools of term calculator Fig. 1.

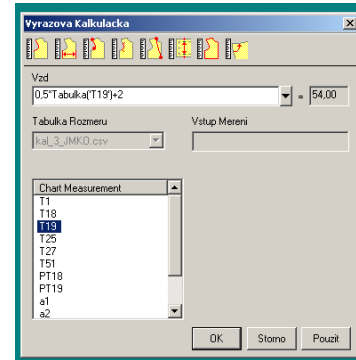
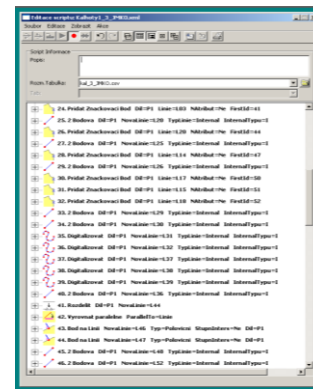


Fig. 1 Example of entering design formulas with selection of bodily dimensions and the tool of term calculator

Operator works in the dialog box where loading, saving and editing of macro occur. Fig. 1a). An example of recording macro in AccuMark CAD system is in Fig. 2b).



a

```

- <<GerberPdsPatternDraft Version="B.4.0.93" Notation="Metric" Chart="kal_3_JMKO.csv" Description=""
- <CreateRectangle NewPiece="P1" AcqTolerance="False"
- <FinalLoc Loc="XY(0,0)"/>
- <Geometric Loc="X(16,530000),PY(0,111*Chart[T1])+1,4-Chart[a1])/PX(0,5*Chart[T19])+Chart
  (PT19)"/>
- </CreateRectangle>
- <AddMarkPoint Piece="P1" Line="L01" Attribute="False" FirstID="5"
- <NewPoint Piece="P1" Id="5" Loc="Beg(Line("P1",L01),Chart[a1])*Length(Line("P1",L01)))"
  Mark="True"/>
- </AddMarkPoint>
- <AddMarkPoint Piece="P1" Line="L03" Attribute="False" FirstID="6"
- <NewPoint Piece="P1" Id="6" Loc="End(Line("P1",L03),Chart[k1])*Length(Line("P1",L01)))"
  Mark="True"/>
- </AddMarkPoint>
- <AddMarkPoint Piece="P1" NewLine="L06" LineType="Internal" InternalType="I"
- <NewPoint Id="7" Loc="Point(S) Attr="N"/>
- <NewPoint Id="8" Loc="PY(-Chart[T25]+Chart[a2])/ Attr="N"/>
- </DigitalLine>
- <TwoRLine Piece="P1" NewLine="L07" LineType="Internal" InternalType="I"
- <NewPoint Id="9" Loc="Point(S) Attr="N"/>
- <NewPoint Id="10" Loc="PY(Chart[a1])/ Attr="N"/>
- </TwoRLine>
- <AddMarkPoint Piece="P1" Line="L06" Attribute="False" FirstID="11"
- <NewPoint Piece="P1" Id="11" Loc="End(Line("P1",L06),Chart[T27])" Mark="True"/>
- </AddMarkPoint>
- <AddMarkPoint Piece="P1" Line="L06" Attribute="False" FirstID="12"
- <NewPoint Piece="P1" Id="12" Loc="End(Line("P1",L06),(0,335*Chart[T1]-9,8)" Mark="True"/>
- </AddMarkPoint>
- <AddMarkPoint Piece="P1" Line="L06" Attribute="False" FirstID="13"
- <NewPoint Piece="P1" Id="13" Loc="End(Line("P1",L06),(0,04*Chart[T1])" Mark="True"/>
- </AddMarkPoint>
- <TwoRLine Piece="P1" NewLine="L08" LineType="Internal" InternalType="I"
    
```

b

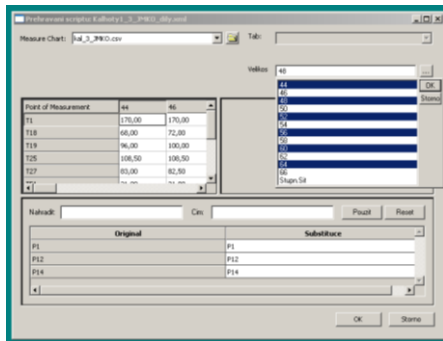
Fig. 2 a) Loading macro – dialog box using design tools; **b)** Recording macro in CAD system

While working, this box is minimized, or executed operations are checked and edited; the operator can see them in graphic form in the desktop. After loading, the macro is saved, dialog box is closed and graphic depiction of macro is removed from the desktop.

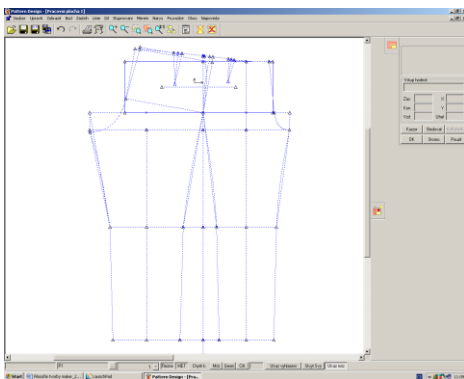
b) Activating macro

Verification of created macro's function and its validity for entered sizes and corresponding dimensions is executed in the **"activating macro"** menu – macro is selected and only the basic size or the sizes, in which macro should be

activated, are marked Fig. 3a. Design of the clothing of entered size or sizes is displayed by clicking on the desktop Fig. 3b.



a



b

Fig. 3 a) Selecting the sizes for activating macro; b) Graphic depiction of macro – design net - size 48

c) Editing macro

Macro can be created successively, saved subsequently and checked continuously by activating macro.

If macro is created in parts, we work in the "editing macro" menu to continue in creation of macro design procedure Fig. 4.

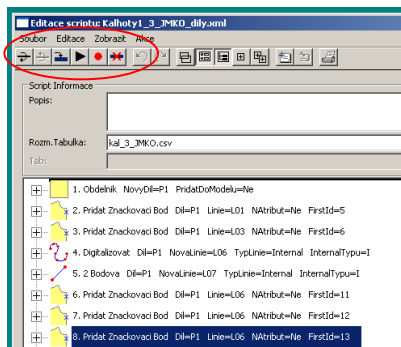


Fig. 4 Editing script and the tool for editing macro

Marked tools allow removing of selected script and recording and creating of a new script and the tool allowing display of the created part of macro in graphic form in the desktop to continue creating the macro.

3.3 Outputs of the macros of AccuMark CAD system

Macros can be solved with regard to categorization and standardization applied in design preparation of production in several phases. Depending on the purpose and application, graphic outputs of macros can be in the form of:

- basic type designs,
- basic (main) parts,
- model solution of the clothing.

a) Basic type designs and basic main parts

The basic type designs can be solved with regard to silhouettes, i.e. fitting and proportions of the clothing, that are solved by modifications in design formulas, in the system of design line segments and in design procedure. Basic type designs are universal. The outputs are – first, basic design (design net) and second, main parts that can be achieved by the definition of individual parts outline in the design net. It means that after saving they can be repeatedly used for model solving of the variants of trousers. An example of macro – of basic design (net) and basic main parts of ladies' trousers - is in Fig. 5.

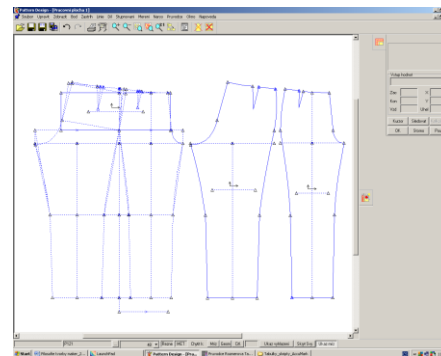


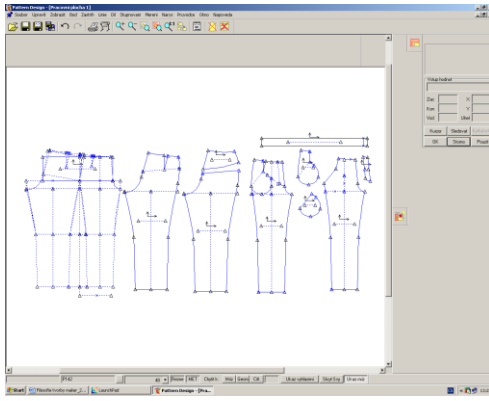
Fig. 5 Basic design (net) of ladies' trousers; Basic main parts of ladies' trousers – back and front parts

b) Model solution and clothing parts

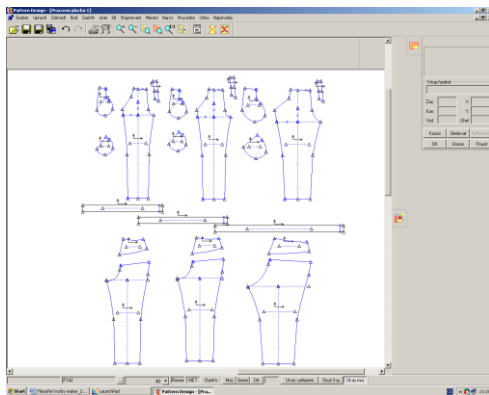
Using macros, we can solve the *variants of clothing models* with regard to shape solution, with regard to length of clothing, etc. with respect to use of the clothing. The basis for each model solution is the basic type design that is modified by structuring and transferring of selections and using many shape solutions. The outcome is a set of parts forming a model. Model solution will be reflected in all of the sizes stated in the table referring to the macro. By modelling many variants of models and their parts are created, they are solved and saved separately. Successively a modular system including the types of parts, from which a new model would be put together, can be set in. An example of model solution of ladies' trousers is in Fig. 6.

Table 2 Table of customers' design dimensions – basic size (48) and "Cust1", "Cust2"

	Bod Mereni	48	Cust1	Cust2	Obrazek
1	T1	170	168	165	
2	T18	76	80	76	
3	T19	104	110	104	
4	T25	108,5	105	106	
5	T27	82	78	75	
6	T51	22	21	21	
7	PT18	2	2	2	
8	PT19	1,5	1,5	1,5	
9	a1	2	2	2	
10	a2	2	2	2	
11	a3	0,5	0,5	0,5	
12	k1	0,53	0,53	0,53	
*13					



a



b

Fig. 6 Outputs of macro – Design net; Basic parts and model solution of the back and front parts of ladies' trousers - size 48; b) Model solution of ladies' trousers - size 44, 48, 66

The basic (main) parts and parts set in by modelling can be saved in the basic size or in any selected size in compliance with the table referring to the macro into AccuMark databank for next processing. Templates, which are subsequently available for creating a layout plan, are created from the parts by adding set-in and end turn-ups.

By saving the templates in basic size into AccuMark system we can subsequently make a layout plan for each size included in the table to given macro or make a layout for two, three or four size concurrently.

4 APPLYING MACROS AT CUSTOM PRODUCTION OF CLOTHING

An advantage of created macros is that they can be applied in custom production as follows. It is sufficient to extend the table of design dimensions made in the "Measure Chart Editor" program for a new size and add the dimensions in requested scope [4] and save with a new name, e.g. Z_1. However, there is another option - to make a new table in "Measure Chart Editor" under a name, e.g. "customers"; to enter into the new "customers" table the basic sizes from the table, in which macro was created, and size - customer's code or customers' codes, e.g. Cust1, Cust2, ... and add requested bodily dimensions of the customer(s) – Cust1, Cust2, ... in the same extend as the basic sizes of the original macro. This Table 2 can be filled in for new customers.

When activating the original macro, the new table Z_1 or "customers" is loaded to the macro instead of the original table, size – code of the customer(s) is selected and the macro of created model is activated Fig. 7.

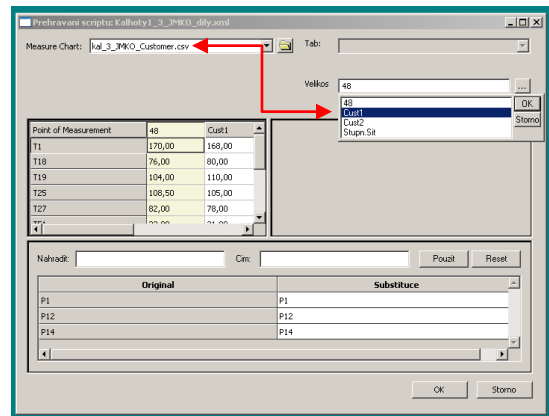
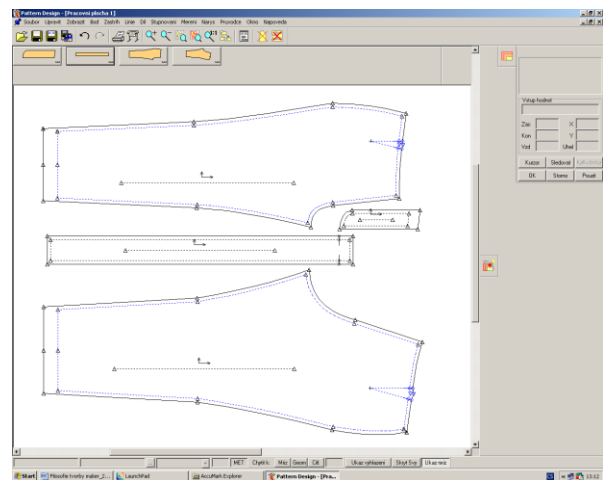


Fig. 7 Setting the "customers" table and selecting customer's size "Cust1"

The parts of ladies' trousers model 1 and model 2 in customer's (customers') sizes are saved, set-in and end turn-ups are added Fig. 8a and 9a and the cut plan of clothing product is created Fig. 8b and 9b, the clothing product can be sent to the division process for automatic cut out. Making of the clothing product in producing workshop and submitting and sending to the customer follow.



a

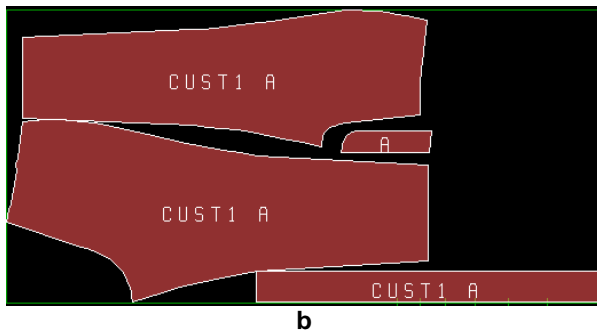


Fig. 8 a) Model 1 – Templates of the basic parts of ladies' trousers and b) their positioning onto material with no pile and pattern

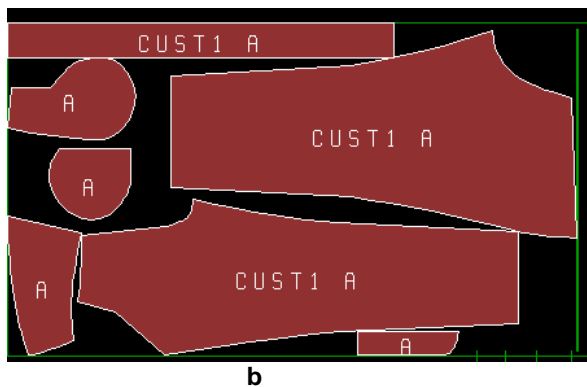
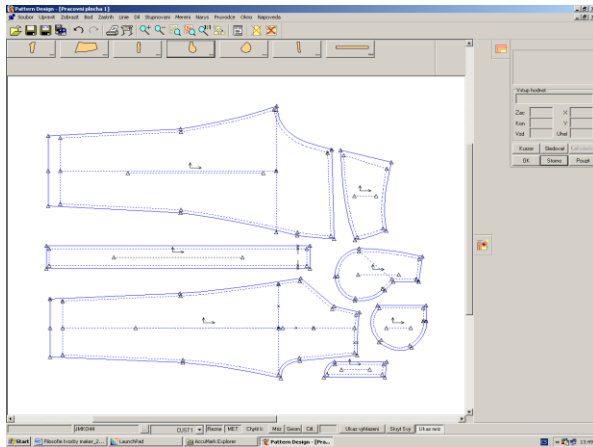


Fig. 9 a) Model 2 – Template of trousers with a saddle in the back part, pocket in the front part and b) their positioning onto material with no pile and pattern (pocket bag is made of the top fabric)

The last option how to use outputs of macro is as follows. The basic (main) parts or parts made by modelling can be **saved in other selected size**, which is included in the design table, into the AccuMark database for further processing. We can work with it means model, such parts the same way as with any other part transformed into computer, e.g. by digitization. Subsequent modelling of parts in AccuMark, however, is not projected into the sizes applied in macro. The newly modelled part can be obtained in requested sizes of the size ranges only using the method applied so far, i.e. using the principle of so called heightening.

5 CONCLUSION

The above mentioned method of solution seems very promising. It, however, requests high level of expertise, power of visualisation, qualification, creative activity and accuracy. But the modular system and standardization of the parts and models, on the basis of which a new model of many variants of clothing not only at clothing projection but also in Internet sale of clothing, particularly custom clothing, would be put together, can be achieved using elaborated procedures. All of that are possible thanks to the Unified Methodology of Clothing Design that is built on unified principles of designing clothes for entire population of men, women, boys and girls. So far, the principles of UMCD have been applied only in the software by ClassiCAD; the company's place of business is in Zlín in the Czech Republic. All clothing documentation in requested shapes and sizes is processed here not on the basis of the principle of heightening but on the basis of the principle of repeated design. Philosophy of "macros" is very close to this method of design documentation processing.

REFERENCES

- [1] Nejedlá, M. a kol. 1988. Jednotná metodika konstruování oděvů. Výzkumný ústav oděvní, Prostějov, Czech Republic.
- [2] Nejedlá, M. a kol. 1989. Systém přídavek v Jednotné metodice konstruování oděvů. Výzkumný ústav oděvní, Prostějov, Czech Republic.
- [3] Document available on a web page: Programming and Modification. August 21, 2014: Web site: [http://cs.wikipedia.org/wiki/Makro_\(software\)](http://cs.wikipedia.org/wiki/Makro_(software)).
- [4] Nejedlá, M. 2013. Transformation of designed pieces to 2D CAD systems using a macro module. Fibres and Textiles, No 4, 12-19, Bratislava, Slovak Republic.