# Simple, Efficient and Flexible CAD System for Textile Patterning

Miloslav Košek
Technical University of Liberec
Hálkova 6, CZ–46117 Liberec 1, Czech Republic
Phone: +42-48-25441, Fax: +42-48-27383
E-mail: miloslav.kosek@vslib.cz

**Abstract:** Textile patterning is one of very efficient areas for the application of computer graphics in textile industry. The key procedure of textile patterning consists of regular placement of the atomic pattern part, the motif, into the pattern area. Several big specialized commercial systems exist, their common disadvantage is high cost and special equipment they require. A simple and flexible CAD system for textile patterning developed at the Technical University in Liberec has all basic features of big systems and in advance it can run on each PC with a standard equipment. The system performs all basic operations of textile patterning: scanning of drawn motif, creation of pattern and preparation of the pattern printing on fabrics. Therefore the system is very suitable for textile student training but it can be also used in small textile companies.

**Key words:** 2D graphics, CAD systems, symmetry operations, textile patterning

## Short System Description

Several big commercial CAD systems for textile patterning produced by specialized companies exist at the present time, for example

A) TEX-DESIGN from Koppermann Computersysteme GmbH (Germany)

B) INVES-STUDIO from Investronica (Germany)

C) IGOS System from HCS Computer Graphics BV (Netherlands)

The commercial systems exhibit a high comfort in standard conditions they were developed for, but they have some disadvantages, for example, their cost is very high, no changes are possible and the transfer of their outputs into another equipment is difficult. Taking these problems into account, we have developed open, simple and flexible CAD system for textile patterning that can run on each PC and exhibits all basic features of big systems, irrespective of its simplicity.

System was developed by the use of theory of planar patterns. Since the theory was presented elsewhere [1], we will concentrate to the further development of the system. The developed system automates all routine steps of real pattern preparation:

- Creation of the motif either by hand or by computer drawing system.
- Pattern displacement on the computer screen, evaluation of displayed pattern and selection of the best results for printing.
- Preparation of matrices for CMYK printing.

In principle the designer starts the automated pattern design after the motif drawing and finishes it by printing of the selected best patterns. Four printed CMYK matrices per each selected pattern are inputs for printing equipment; therefore, the pattern can be put on the textile surface.

As for input, the motif can be drawn classically by the designer and then scanned by a scanner or the motif can be created by one from variety of drawing programmes. Also in the case of hand drawing some motif corrections are possible during the scanning procedure. In both cases the motif is transformed into an image file. Our system can accept the widely used TIFF graphic format. The motif arisen in fractal programmes appears as the perspective way. Since some limitations exist in this case we have not applied this possibility yet.

The key part of the system is the pattern generation controlled by the designer. In general, point and plane symmetry operations are applied to the motif in order to get a pattern. The selection and order of the symmetry operations determine the pattern aesthetic value. Many different pattern can be prepared and evaluated in a short time. The generated pattern can be either strictly symmetric or some irregularities in the pattern are possible, which are typical for modern design. The immediate result is displayed on the screen. Since the programmes are written in Pascal language under DOS system, there is the largest disadvantage of our system — the pattern can contain 640 times 480 pixels as a maximum and only 16 colours can be utilized.

As the pattern is defined by contents of the motif and several numerical parameters used in the pattern generation, selected patterns can be stored in a very simple graphic database. The database contains pattern parameters and motif file reference. Its biggest part are motif files. This database is a part of the system.

Immediate result of pattern creation is on the computer screen. Selected patterns can be stored in the database or printed by colour printer for further evaluation. If the pattern is found suitable for a practical use, four CMYK matrices derived from this pattern can be printed on a standard printer. The matrices are produced by filtering the cyan (C), magenta (M), yellow (Y) and black (K) colour from the pattern. But their dimensions are limited by the printer format (usually A4), therefore, this real output is suitable for students' training first of all. However, there is not a problem to prepare CMYK files for dimensions of industrial printing equipment.

The CAD pattern design system was developed predominantly for the education purposes. From this point of view its main advantage is the system transparency. Each step of real pattern production can be demonstrated in the system with a high degree of teaching objectivity. The second important system feature is its openness, any part can be changed or new parts can be included, for example some nice effects utilized in big commercial systems.

The prepared system is simple, open and flexible. It does not require any special and expensive equipment. Everybody can understand the system very quickly, the system can be modified if necessary. Because of its low cost the system can be used also in small textile companies.

# Reference

[1] Košek, M.: Simulation of Textile Patterning by the Use of Personal Computer. EURO-GRAPHICS'91, Vienna, Austria, Sept. 4 – 6, 1991. Poster Presentation, pp. 45 – 46.