deformation of unit cell of the cubic lattice by iterative arithmetic operation of CAD system. Iteration of CAD operation is carried out between the object space and the complimentary space. A creating process of the two animals is given and discusses the techniques of CAD system and an artistic sense of creator. 3DES is shown as follows.

Keywords: 3D Escher pattern, tiling art, layer manufacturing

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Analysis of the craftsman's approach to moroccan geometric pattern

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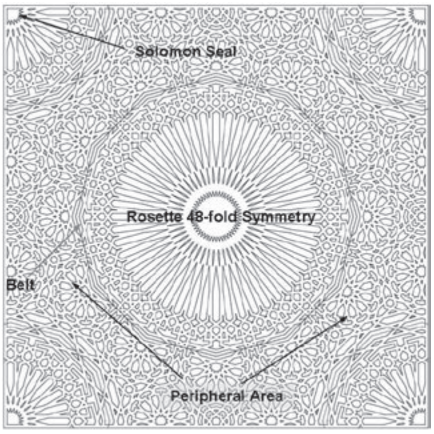
Geometric patterns occur in rich profusion throughout Moroccan Ornaments. They are found on diversity of materials: tiles, wood, plaster, brass, ... The largest class of Moroccan patterns employs complex polygons. The unit cell is constituted of central area called Rosette, a peripheral area with the Solomon Seal at the corners, and an interface area or Belt between them (Fig1). Few of authors who have published the Islamic Patterns were interested in practise of the craftsman masters. The craftsman's approach to pattern making is an empirical method which consists in creating the design on graph paper using grids based on precise criteria of measurement called Hasba (module measure). Boundaries of the square or rectangular area, commonly used to create the design, must be defined accurately as well as the measure of the grids. Using the craftsmen's method, we utilize the computer to analyse and reproduce the Moroccan Patterns. The reconstruction is used to explore the geometrical structures of the patterns and also to extract the minimal information needed to generate the entire pattern only by the action of the symmetry transformations in the symmetry group of the pattern.



Keywords: symmetry group, Hasba, fundamental area

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Development of portable X-ray powder diffractometer and its application to archaeological artifacts

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A new portable X-ray powder diffractometer suitable for on-site analyses of archaeological artifacts has been developed. The instrument is composed of a goniometer unit, a measurement-controller unit and a lap-top computer (Fig. 1). They can be stored in a portable trunk case and a total weight is 15 kg. We have adapted Cu as a target of X-ray tube and Si-Pin as detector, which enable us to obtain a good powder diffraction pattern with low background. A correct position of a sample is adjusted by using two lazar pointers, which are useful for nondestructive analysis of a large sample. Additionally, this instrument has been improved to adapt a function of X-ray fluorescence spectrometer. With this modification, the instrument allowed us to carry out more reliable identification of unknown materials. The performance of the instrument was tested by measurements of standard materials. The results showed its high performance as both of X-ray powder diffractometer and X-ray fluorescence spectrometer. The instrument was brought to several archaeological sites in Egypt to verify the performance in field analysis and many archaeologically important results have been obtained.

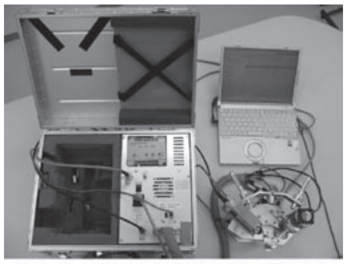

Fig. 1 An overview of the portable X-ray powder diffractometer.

Keywords: instrument development, nondestructive analysis, archaeology

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Implementing DDLm: Rewriting dREL algorithms into other languages

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The most significant barrier to implementation of the new DDLm standard is finding a way to execute dREL algorithms. One possibility is to parse and rewrite the dREL algorithms into the language of choice. In addition to the parsing/rewriting engine, this implementation route requires both (i) definition of an execution environment, (ii) provision of libraries of mathematical and utility functions and (iii) automatic handling of error propagation. Defining the execution environment involves defining how to encode access to dictionary and data items in the rewritten algorithm, how to access library functions, and how the algorithm is called and return values received. A proof-of-concept program is presented which can convert dREL to Python (the closest language syntactically to dREL) or C/C++. Python, in common with other interpreted languages, can dynamically add and execute rewritten dREL code at runtime. C/C++ requires an initial processing step to produce code which can then be compiled and made available to programs in other languages via standard wrappers.

Keywords: CIF, crystallographic software development, software computing