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Smart multifunctional theory of clothes with using digital method

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Abstract
In November 2010 the 1stelectronic version of ElNashar-Digital Method® apparatus of Multifunctional (durability/stiffness), Elongation, Strength and Weight of clothes was released in the Kaferelsheikh University. Multifunctional mode. Its contents corresponds to the discipline "calculation and designing of the machines in light Industry", such as fabrics and auxetic textile structures. The main goal of this paper is to introduce and study some of new notions such as; Durability Clothes Coefficient (DCC), Flexural Power Strength(FPS), Stiffness Distance Coefficient (SDC),and digitals counters of wrinkle (NOW) were developed for 3D quantification of dig cloth clothes, and using of them in many different applications such as simulation digital® in textiles, apparel, auxetic structures, the study and solution of the problems of construction and operation of digital method® apparatus.

Keywords: durability, stiffness, auxetic, clothes, coefficient digital method®

1. Introduction
Multifunctional theory of clothes by using digital method Multifunctional (durability/stiffness), Elongation, Strength and Weight of clothes of clothes is an important property that decides the gracefulness of any garment as it is related to aesthetics and appearance of garments. It describes the way in which fabric hangs itself in specific shape according to its properties when part of it is supported by any surface and rest is unsupported. Durability is of much importance for designing and development of garments and selection of appropriate fabric for intended garment and light industry as auxetic textile structures hand is one of the most important serve properties of textiles. The main purpose of creating this Multifunctional Theory was to implement the information technology in educational practices. The multifunctional theory will provide the light industry with knowledge of the principles of operation, technical characteristics, design philosophy of current technique and the technique under the development, to present the of constructions including ElNashar-digital method® Tester device to evaluate such important textiles properties, performance peculiarities and anisotropy level on the basis of disc shape specimen's restrained extraction through a rounded hole [1, 2, 3].

2. Experimental Work
Invention relates to fabric testing apparatus, of Multifunctional test of fabric testing digital apparatus, the general circles an apparatus view and principal scheme of circles are presented in Figure 1. The principal scheme of ElNashar-digital method®-tester device left circle for organize and speed control in (a), and right circle for control of displacement measurements in (b),

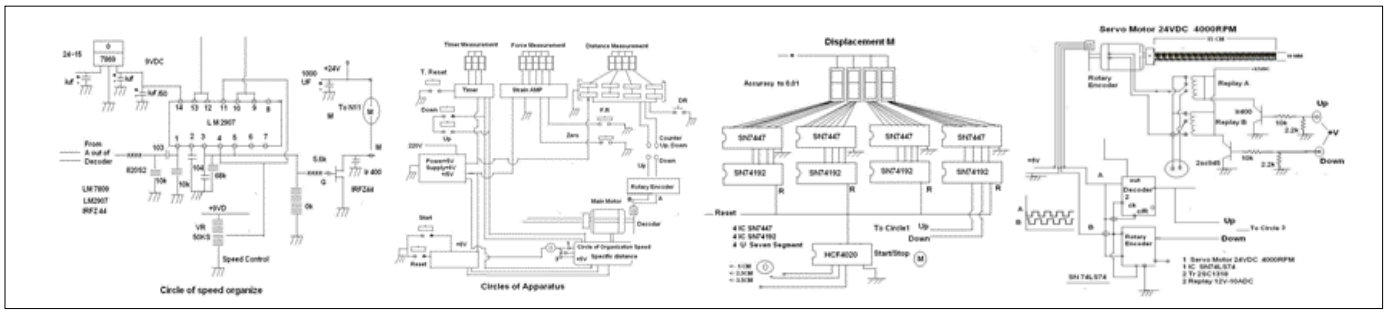

Fig 1: (A,B,C,D) Principal scheme, servo Motor 4000R.P.M. in (D)

the principal timer scheme working with 0.01 second, the principal force gage to 40000 gram, and in Figure (D) servo Motor 24 VDC 4000 RPM of ElNashar-digital method®., It is well know that various tests are carried out on fabrics to measure their properties. Durability, bending stiffness, coefficient of frication, generally these tests are conducted digital using somewhat time consuming procedures. The measurement of Nonstiffability (d/s) may be cited as an example.

3. Results and Discussions
In a standard of standard specimen diameter less than that of the fabric and light industry as auxetic textile structures, the canters of fabric and the plate being coincident. Above the plate is a translucent screen on which is positioned a fabric annulus having an inner diameter equal to that of the plate and an outer diameter equal to that of the fabric. The canter of annulus is coincident with the fabric [4]. The plate. Light is shone upwardly from beneath the fabric so that its digital

counter is projected through the translucent screen onto the paper annulus. The remaining inner portion of the annulus represents the extent to which the fabric projects laterally beyond the circular plate. a measure of the durability of the fabric. This inner portion of the annulus weighed and this weight is used in the calculation of the durability coefficient. In other hand the experimental approbation of the device was performed on the basis of more than 50 examples of woven, Auxetic and knitted materials and their fused systems, different in structure and end use. In this work only the most typical of them are presented table 1.

3.1 Multifunctional Theory

the potential of interior fabrics resulting from the raw material and fabric, auxetic textile structures, relationship to the outside of the energy severity fabrics, Some parameters of clothes: as describe in the previous section, the processes polygonal model were using to characterize clothes durability after raw point cloud data of the durability clothes was converted to a processed polygonal model. Currently, there is no standard quantitative term or coefficient in use in the textile and apparel industries to characterize clothes durability. In this research, simple and easy to calculate new parameters such as; Stiffness of Clothe Coefficient(SCC),Durability Distance Coefficient(DDC), Durability Clothes Coefficient (DCC): The steps in manipulating the processed digitals counters with using Multifunctional - ElNashar-digital method® to obtain the volume of the clothes and mannequin into a polygonal model. The selected clothes polygonal model. Where: SCC; means Stiffness of Clothe Coefficient, DDC; Durability Distance Coefficient and DCC; Durability Clothes Coefficient:

$$\mathrm{SCC} = \left\lceil \frac{\mathrm{DDC}}{\mathrm{DCC}} \right\rceil . 100 \quad \ldots . (1)$$

3.2 Multifunctional (D/S) Distance Coefficient (Mdc)

Clothes are Multifunctional freely with its only support at the waistline, it falls into a characteristic configuration. The appearance of the clothes depends on numerous factors such as fabric type and construction features. The average values of the maximum distance and minimum distance from all the digitals counters in the clothes contour were used to calculate Multifunctional distance coefficient. The Multifunctional Distance Coefficient (MDC) can be defined as the ratio of the average value of maximum node dimension, Then we can see fitting equation is the Multifunctional distance coefficient as follows: Where: h = maximum distance of depth of hole, = minimum force from the edge of the waistline contour, t = thickness.

$$\mathrm{MDC} = \frac{100}{t} \left\lceil \sum_i \mathrm{SCC} + h_i / \sum_i \mathrm{DDC} + F_i \right\rceil \quad \ldots . (2)$$

Multifunctional distance coefficient, along with number of digitals counters, provides a distinctive description of fabrics that could be used as the parameter to judge the configuration of the clothes. The results of testing the clothes for SCC, DDC, DCC, and the discussion involving the selection of three parameters quantifying clothes will be discussed in the results and discussion section. A low MDC indicates easy deformation of a fabric and a high durability coefficient indicates less deformation. MDC was conventionally calculated as: FN: factor of Nonstiffability (durability/stiffness). AUP; is Area under prausure of road force the Multifunctional sample area of support disk. CFS; is circular fabric samples.

$$\mathrm{FN} = \left\lceil \frac{\mathrm{MDC} + \mathrm{AUP}}{\mathrm{CFS}} \right\rceil \quad \ldots . (3)$$

3.3 Theory of Multifunctional Measurement

Optimization of the main parameters diameter of hole and the force of the device is based referring to the specimen's jamming conditions in the rounded hole and between the limiting plates. Maximum force, reseat force, diameter of hole, diameter of road, time, depth of hole, and fabric thickness, The dangerous zone in which the specimen can jam during its extraction locates at the outer contour of the pads hole. The jamming phenomenon is related with the thickness and the radius of the specimen. In ElNashar-digital method®-Tester device the size of the specimen is similar to those used in other devices of the same type, i.e.

h = 1.0 cm. (for heavy fabrics), h = 2.5 cm. for medium fabrics, h = 3.5 cm. for light fabrics, which allow to observe and to capture the variations of specimen's shape during the extraction. The rating given by the three digitals counters processing based system for specimens. Scale which is used in the subjective assessment of fabric varied from 1 to 3.5 cm. in order of their superiority. The difference between them is essential.

The shapes of knitted materials transform into ovals, while the shapes of woven fabrics–into the shape of four-leaved clover. Table 1; Blended 0.0232, Polyester 0.0239, and Lycra 0.0220)., In addition, we used standard density of weft per cm. the yarn density (27x18) yarn /cm. Fiber densities were:

cotton=1.54, viscose =1.46, polyester =1.38, fibran =1.52, blended (cotton/polyester (50/50) =1.46.

Table 1: Measurements of Multifunctional fabrics

Na	Weave Structure	Composition	Thickness t, mm	Surface weight, g/m^2	Multifunctional
1	1/1 Plain **	95%cotton, 5 % lycra	2.9	206	0.2
2	1/1 Plain	95%cotton, 5 % lycra	3.0	180	0.3
3	1/1 Plain**	100 % cotton	2.36	177.5	0.35
4	1/1 Plain	75 % cotton, 25 % lycra	3.5	163.8	0.28
5	1/1 Plain	100 % cotton	3.19	305.1	0.85
6	Plain *	80 % cotton, 20 polyester	3.3	214	1.25
7	Plain *	80 % cotton, 20 polyester	4.5	224	1.05
8	Plain *	70%cotton,10%polyester,20% viscose	4.6	208	1.21
9	1/1 Plain	100 % cotton	3.19	305.1	0.85
10	12/14 twill	100 % cotton	3.39	213.5	0.45
11	12/14 twill	75 % cotton, 25 % lycra	3.29	210.1	0.32
12	48/45 spider	100 % cotton	3.81	358.4	0.31

13	48/45 spider	75 % cotton, 25 % lycra	5.45	359.8	0.45
14	12/14 twill	100 % cotton	4.84	243.3	0.55
15	48/45 spider	100 % cotton	4.0	377.8	0.48
16	12/14 twill	75 % cotton, 25 % lycra	5.56	244.6	0.36
17	48/45 spider	100 % cotton	1.85	279.3	0.65
18	48/45 spider	75 % cotton, 25 % lycra	1.94	173.1	0.38
19	12/14 twill	100 % cotton	1.67	176.4	0.67
20	12/14 twill	75 % cotton, 25 % lycra	1.75	198.5	0.36

* jersey with Embroidery, **Plain jersey

3.4 Development of digital counters processing system

The properties can be measured by digital counters processing system. Canny edge direction technique is used for the measurement of durability in fabric. And edge is a property attached to an individual force for depth and is calculated from the digital counter function behaviour having magnitude of the gradient and direction. The direction of depth should be oriented perpendicular to the edge. This direction in not known in advance. However, a robust estimate of it based on the smoothed gradient direction is available. If the digitals counters is the normal to the edge is estimated as:

Where:

Mon= Multifunctional, : Maximum Force, :Force after rest, :Distance pleated, circumference, :Distance of road circumference, :time for Depth in hole, : time of reset in hole, :Depth of hope, :thickness of fabrics.

$$Mon = \frac{(F_B/T_1 - F_A/T_2)}{R - r} / h * 1/t = \quad \ldots\ldots (4)$$

3.5. Evaluation of the Geometrical Model

geometric characteristics of structure of woven fabrics of weft (cotton, spandex, polyester, viscose rayon, blended (polyester/cotton), trace of embroidery and the warp of cotton, the calculated Multifunctional of fabrics and the measured one is considered as the indication of the accuracy of the geometrical model. Experimental of woven fabrics using various materials as weft; Cotton;[(Warp linear density of (30Tex), Measured (d1) mm (0.0195)], Weft linear density (40Tex): [(cotton, Fibran, viscose, Blended, Polyester, and Lycra34,] Measured (d2) mm :(cotton 0.0226, Fibran 0.0227, viscose 0.0232, a flow chart indicating the different steps involved in processing fabric by digitals counters are thickness and weight, the coefficient of concordance for fused textile systems.

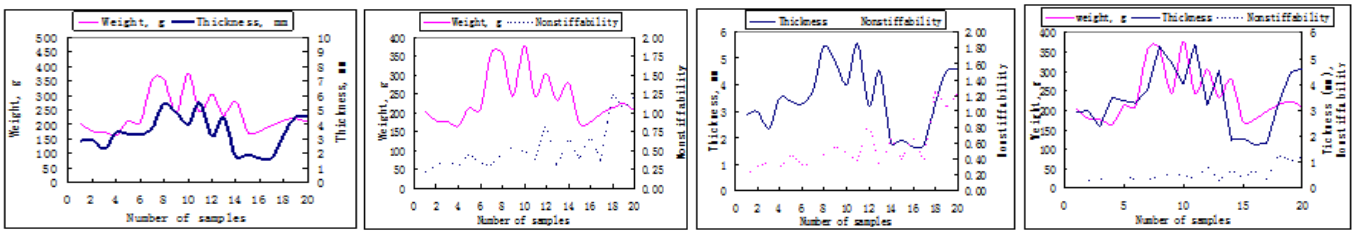

Fig 2: A,B,C,D. the relationship between the thickness: weight: with Multifunctional

In the case of restrained extraction when rounded specimen for weave, knitted fabrics and with embroidery, are pulled through the hole of the pad an interesting transformations of specimens shape are taking part. These changes become significant when outer contour of specimen approaches the hole of the pad, i.e. approaches the value of fabrics, the analysis of specimens projections at different stages of deformation have shown that geometrical shapes of fabrics can be mathematically.

4. Conclusion

The presented results show that ElNashar-digital method ®-Tester is technically simple and multifunctional methodologically reliable instrumental device suitable to control hand properties of textile materials. Simple (with small number of parameters) and reliable mathematical models are proposed to describe the process of disc shaped specimen's extraction through a hole. The best models for this purpose are those of shortened epicycloids and Cassini ovals at the most reliable loading conditions initial stages of extraction multifunctional the developed testing method can be suitable to evaluate the effect of softeners and other types of textiles finishing.

in this paper describe an experimental and computational approach to smart multifunctional theory of clothes with using digital method the behaviour investigations of woven, auxetic fabrics while the shapes of multifunctional; the directions of minimal and maximal deformations remain the same, certain similarities between polar diagrams of these two testing elnashar-digital methods exist, coefficient of anisotropy for fifth knitted materials, determined experimentally by uniaxial tension test at low values of external loading is closely related with calculated parameter between the thickness and weight multifunctional of digital method extraction through a rounded hole, during the extraction of a disc shaped specimen through a hole all the directions of the material affect each other and the obtained deformation distribution is different. Though the extraction through a rounded hole belongs to the group of biaxial testing methods, still certain similarities between the specimen and disc shaped specimen exist. Multifunctional tes the directions of minimal and maximal deformations remain the same, certain similarities between polar diagrams of these two testing elnashar-digital methods exist, knitted fabrics, embroidery of woven fabrics – the minimal value of displacement is obtained at the angle of 45 o, as it can be seen from captured digital counter. Multifunctional coefficient of

anisotropy for knitted materials, determined experimentally by uniaxial tension test at low values of external loading is closely related with calculated parameter, defined on the basis of specimens extraction through a hole results and applying the model of shortened epicycloids.

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