

Digitizing Typographic Logo Using Multi Head Computerized Embroidery Machine For MEN's Branded Apparel



Home Science

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ABSTRACT

Typography is a craft of architecting a visual language to convey a message. It is an application created on physical space in written modes as signatures, time tables, commercial agreements, advertisements, promotions, token of value, receipts, book notes, tickets, stamps and many other intellectual forms. In this work, a Typographic Logo for men's Branded apparel was digitized using Tajima high speed computerized multi-head embroidery machine. The task involved Typographic Logo Digitizing and Generation on men's casual apparel using Tajima high speed computerized multi-head embroidery machine. Certain important Tests were carried out to evaluate the Logo's surface consumption, Color consumption, durability, stitch strength and color fastness. The study proves that the Typography is an important technique which could be designed using text formatting options in CAD applications and found suitable for Logo designs that could be digitized and generated using modern embroidery machines.

1. INTRODUCTION

Typographic designs involve the utilization of complex tools and techniques to design a Typographic concept made suitable for a theme [1]. A Typographic design can be developed by using an aligning tool, Rotating tool, Scripting tool, Design by a path, Text filling option, designing by scaling and many other features. A Typographic designer integrates several important tasks to finish a complete Logo design. A text could be edited in several different aspects; the outline of the text can vary from thin to thick line, dotted, dashed, wave lines [2]. The text can be filled with a solid color, an inbuilt pattern or an imported pattern. The Typographic Text can be printed with any type of printer, plotted, altered, copied and saved. The mini size print of the original Typographic Logo can be taken out and during this time any alterations that are needed are carried out. Hence manipulation of Typographic is a very important task[3].

A logo is the means by which we identify a Brand. Logo's Trademarks and Corporate identities are the visual signals representing a value for a brand. The term 'Brand' covers products services and organization and can include people, places and nations. A Brand is a feeling. Brands connect with people emotionally and psychologically, guides consumer understanding of value and lead to loyalty [4].

1.1 Computerized Embroidery Manufacture (CEM)

Embroidery is done on the surface of the fabric, garment and accessories surface like hat, hand bags, shoes, gloves and scarves. The designing principle for the embroidery CAD/CAM system was initially developed on the basis for Engineering CAD/CAM applications like construction, automobile, electronic, CNC systems. CED is a multi user, multi-task computer graphics system for the design of embroidery pattern. CEM machine coding and the online electronic control of embroidery machines represent the embroidery pattern. CEM process is carried out by the embroidery software which converts the design data to machine code in the computer. An important feature of CED is; it controls the machine throughout the manufacture process [5].

There are wide varieties of embroidery techniques that could be done with Tajima embroidery machine like the Emblem embroidery, coarse thread embroidery, 3D embroidery, foam free 3D embroidery, rising thread embroidery, appliqué embroidery, shrink embroidery, tufting embroidery, eyelet embroidery, sequins embroidery, taping and feather embroidery, standing embroidery, frill embroidery, cording embroidery, blind embroidery.

The following paragraph explains the stitch methods of a multi head computerized embroidery machine.

1. Auto Punch - This creates an embroidery pattern from

shapes and colors in the image. The most appropriate image to use is those with few and distinct colors, images or photos that are intricate or have gradations cannot be clearly converted. If the image contains complicated shapes, some stitching may not be created correctly.

2. Photo Stitch - This creates a color embroidery pattern from a photo. This type of embroidery pattern has detailed and overlapping stitching mode. Photos where the subject to be embroidered appears clearly are most appropriate. When embroidering portraits, photos where the size of the face is at least 75 x 75 mm (3 x 3 inches) should be used. Photos that are bright and sharp are most appropriate.

3. Photo Stitch Sepia - This creates a Sepia (or grayscale) embroidery pattern from a photo. This type of embroidery pattern has detailed and overlapping stitching. Photos that are bright and sharp are most appropriate. Photos taken in a room or with backlighting cannot be clearly converted. Detailed areas cannot be converted to embroidery. If the subject to be embroidered is small, the stitching may not clearly connect.

4. Photo Stitch Mono - This creates a monochrome embroidery pattern from a photo. This type of pattern has detailed and overlapping stitching.

5. Photo Stitch Multi color - This creates a multi-color embroidery pattern from a photo. The embroidery pattern contains repeating zig zag stitches. This produces a more general rendering than with photo stitch 1. However the data is created with well-regulated stitching.

The photo Stitch Multi color option was used to convert an image to stitch format with the help of Tajima High speed multi head computerized embroidery machine. The procedure involved in Digital Modulation, legibility, Scaling and formatting the Typographic Logo, Generating the Logo for color separation, color reduction, Position layering, digitizing and the Testing of embroidered pattern has been clearly explained in the experimental procedure [6].

2. EXPERIMENTAL

2.1 Machinery details

Table - 1: Computerized embroidery machine Specifications

Model	Heads	Head Interval	Needles				Embroidery space	
			6	9	12	15	DXW	Con Design
TFMX	4	360	0	0	0	0	450 x 360	1440

- **Stitch Length** Time Scale : 0.1 ~ 12.1 mm
Binary Scale: 0.1 ~ 12.7 mm
- **Machine Speed** Max 1000 rpm
- **Motor** AC Servo Motor x 1
Pulse Motor x 2
- **Electricity** 3 Phase : 200 ~ 240V,
350/380/400/415V, 50Hz/60Hz
Single Phase: 100 ~ 120V, 200 ~
240V 50 Hz/ 60 Hz
- **Power Consumption** 310 ~ 420 W

2.2 System Requirements

• Hardware

- IBM compatible INTEL Pentium Core Processors / 750 MHz or higher
- 512 MB RAM or higher
- 2GB HDD (SCSI) preferable or higher
- CD drive
- LAN card
- 32 MB (SIS 6326 or equivalent) [24 bit color support]
- 17" or 21" color monitor (1240 x 1024 x 24 bit or 32 bit color support)
- Keyboard
- Mouse

• Operating System

MS Windows 2000 / XP / NT / Windows 7 / Windows 8

• Peripherals

- Flat bed Scanner
- Cordless digitizer (preferably 12 x 12 inches)
- Plotter (24" x 36" x 42")
- Laser printer
- Zip drive or CD drive (for backup purposes)
- UPS (1KVA)

• User Interface

- Desktop customization
- Key board customization
- Tool bar customization
- Different view facility
- Design view
- Graph view
- Repeat view
- Multiple design view

2.3 Raw Material

Embroidery Thread – DMC 100% Cotton machine embroidery thread was used to produce the Typographic Logo. The length of the embroidery thread is 547 yards which is very fine. The price of DMC cotton embroidery thread is cheaper when compared to Polyester, Rayon, wool and metallic threads.

- Thread Brand – DMC
- Fibre type – 100% Cotton
- Count – 52/3 Tex
- Ply – 3
- Length 5000 m

Fabric – 100% cotton as base fabric for embroidery.

Interlining – Interlinings are used to prevent the shifting of fabrics during embroidery processing due to the elastic property of the fabric and preventing the breakage of the threads. There are two types of interlinings.

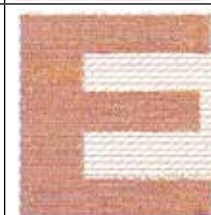
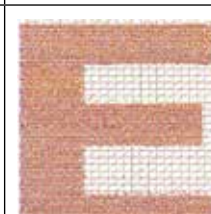
The upper interlining is used to prevent the needle from sinking and being jammed by the 3D surface of fabric like wool. The base interlining under the fabric is used to stabilize the fabric during embroidery process especially for elastic one. Most of the interlining residues can be removed from the embroidery piece by cutting or tearing away after embroidery process.

Table - 2: Stitch Order for the Background image

S. No	Stitching Order	Stitch Count	Stitch Time
1		13930	20.7 min
2		2624 13930 + 2624 = 16554	3.9 min 20.7 + 3.9 = 24.6
3		2019 16554 + 2019 = 18573	3 min 24.6 + 3 = 27.6
4		1615 18573 + 1615 = 20188	2.4 min 27.6 + 2.4 = 30 min

The Stitching sequence for the background image has been listed in Table 2. The red thread forms the first sequence with 13930 stitches in 20.7 minutes approximately. The dark brown thread forms 2624 stitches in 3.9 minutes. The amber red thread forms 2019 stitches in 3 minutes and khaki embroidery thread sew 1615 stitches in 2.4 minutes. The background of the logo design is completed with 20188 stitches in 30 minutes.

Table - 3: Stitch Order for the Typographic Text E

S. No	Stitching Order	Stitch Count	Stitch Time
1		732	1.20
2		317 732 + 317 = 1049	0.52 1.20 + 0.52 = 1.72
3		100 1049 + 100 = 1149	0.15 1.72 + 0.15 = 1.87

4		71 1149 + 71 = 1220	0.13 1.87 + 0.13 = 2 min
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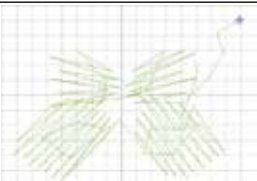
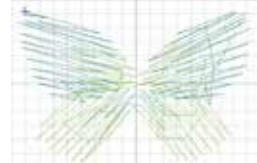
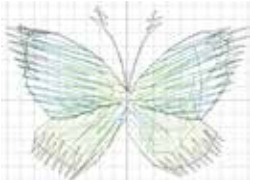
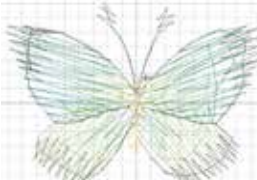
The Stitching sequence for the Typography Text E has been listed in Table 3. The amber red thread forms the first sequence with 732 stitches in 1.20 minutes approximately. The Tangerine thread forms 317 stitches in 0.52 minutes. The Silver thread forms 100 stitches in 0.15 minutes and Carmine embroidery thread sew 71 stitches in 0.13 minutes. The Typography Text E is stitched with 1220 stitches in 2 minutes.

Table - 4: Stitch Order for the Typographic Text NTICER

S. No	Stitching Order	Stitch Count	Stitch Time
1		961	2.17
2		589 961 + 589 = 1550	1.33 2.17 + 1.33 = 3.50

The Stitching sequence for the Typography Text NTICER has been listed in Table 4. The lemon yellow thread forms the first sequence with 961 stitches in 2.17 minutes approximately. The White thread forms the second sequence with 589 stitches in 1.33 minutes. The Typography Text NTICER is stitched with 1550 stitches in 3.50 minutes.

Table - 5: Stitch Order of Butterfly motif

S. No	Stitching Order	Stitch Count	Stitch Time
1		500	0.90
2		300 500 + 300 = 800	0.54 0.90 + 0.54 = 1.44
3		150 800 + 150 = 950	0.27 1.44 + 0.27 = 1.71
4		50 950 + 50 = 1000	0.09 1.71 + 0.09 = 1.80

The Stitching sequence for the Butterfly motif has been listed in Table 5. The lime green thread forms the first sequence with 500 stitches in 0.9 minutes approximately. The Teal green thread

forms 300 stitches in 0.54 minutes. The Dark gray thread forms 150 stitches in 0.27 minutes and Orange embroidery thread sew 50 stitches in 0.09 minutes. The Butterfly motif is stitched with 1000 stitches in 1.80 minutes.

3. RESULTS AND DISCUSSION

The Typography Logo required 14 threads, 23958 stitches were produced by the high speed multi head computerized machine in 37.3 minutes approximately. The Table 5 lists out the number of embroidery threads with the Brand code prescribed by the thread manufacturer along with the total number of stitches formed by each individual thread mounted on a separate needle on the head of the embroidery machine. The Stitch time required by each individual needle is also listed.

Table - 5: Typography Logo Thread Consumption

Index	Color	Code	Total No of Stitches	Stitch Time
1		800	13930	20.7
2		058	2624	3.9
3		333	2019	3
4		348	1615	2.4
5		333	732	1.20
6		209	317	0.52
7		005	100	0.15
8		807	71	0.13
9		202	961	2.17
10		001	589	1.33
11		513	500	0.90
12		534	300	0.54
13		707	150	0.27
14		208	50	0.09
Total Consumption			23958	37.3 min

Table - 6: Final Typographic Logo Design with total stitch count and stitch time

S. No	Typography Logo	Stitch Count	Stitch Time
1		20188 + 1220 + 1550 + 1000 = 23958 Stitches	30 + 2 + 3.50 + 1.80 = 37.3 min

Table 6 shows the final Typographic Logo design which was developed as proto sample on a piece of sample cloth. The logo requires a total of 23958 micro stitches sewn by 14 needles consuming a stitch time of 37.3 minutes.

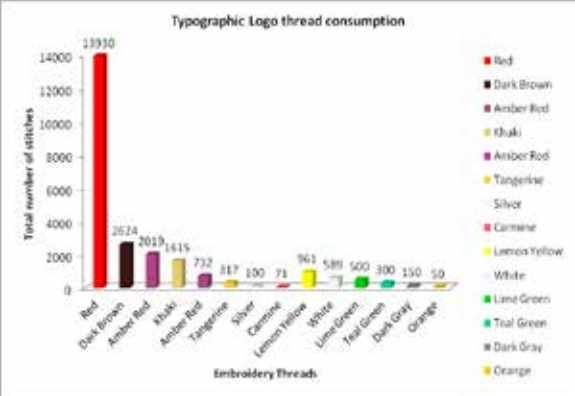


Figure - 1: Typographic Logo total stitch consumption

The total number of stitches formed by each individual needle carrying different embroidery threads has been shown in Figure 1. It clearly shows that the red embroidery thread forms 13930 stitches which is the highest consumption and hence the red thread has the maximum surface thread density.

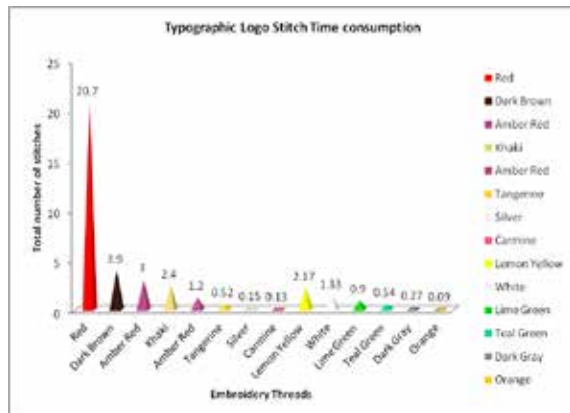


Figure- 2: Typographic Logo total stitch time consumption

The total time consumed by each individual needle carrying different embroidery threads has been listed in Figure 2. It shows that the red embroidery thread has the maximum time consumption since the thread consumption is higher compared to other threads.

3.1 Testing Embroidery Logo (As per BS)

Some important Tests were carried out to evaluate the Logo's surface consumption, Color consumption, durability of the embroidered logo, stitch strength of the Logo and color fastness. These Tests were carried out on British Standards for Quality in Textile and Apparel. The testing procedure and the Observation noted in Testing have been listed below:

a. Garment Cleanse

Wash procedure: BS EN 25077 – 1994/BS EN 26330 – 1994

Machine wash at 30° C with ECE detergent and sodium perborate, gentle cycle, Thumble dry low.

Observation:

- No obvious color change (Grade 4-5) on washed sample.
- No obvious pilling on washed sample.
- No deterioration or change in appearance of the embroidery in washing.
- No obvious spirality of washed garment.

b. Durability

Washing procedure: BS EN 25077-1994 / BS EN 26330 – 1994

Machine wash at 30° C with ECE detergent and sodium perborate, gentle cycle, Thumble dry low.

Observation:

- No obvious color change (Grade 4-5) on washed sample.
- No obvious cross staining (grade 5) on washed sample.
- General appearance of washed sample (B) is satisfactory.
- Shade change grade 3 – 4

c. Color Fastness to Washing

Washing procedure: BS EN ISO 105C06 – 1997

Machine wash at 30° C with 4 g/l ECE detergent and 1 g/l Sodium Perborate solution with 10 steel balls.

- Change in shade 4-5
- Staining on multi fibre stripe

Acetate 4-5

Nylon 4-5

Polyester 4-5

Acrylic 4-5

Wool 4-5

Gray Scale rating is based on the 5 step scale of 1 to 5, where 1 is bad and 5 is good.

d. Color Fastness to Light (BS EN ISO 105 B02 – 1999 ; use xenon arc lamp)

- Grade BS 4

e. Bursting Strength (BS EN ISO 13938 – 2 1999: Pneumatic Bursting Tester)

- 250 kpa

f. Free Formaldehyde Content (BS EN ISO 14184-1-1999)

- (PPM) ND
- ND – Not Detectable
Detection Limit = 20 ppm

4. CONCLUSION

The work describes the accuracy in Digitizing and Generation of Typographic logo created using Tajima high speed multi head computerized embroidery machine. The working principle of the computerized embroidery machine provides a feasible understanding on stitch forming mechanism, calculation of thread consumption and time consumption of the Typographic text. Based on these Statistics the total work expenditure required for bulk production can be easily estimated. This will be very much useful for the manufacturers and garment designers for timely order production and market distribution. Wide designing options are possible in Typographic text designing which could be not only used for logo designs but also for labeling, monograms, printed designs and many other text forms. Hence Typography is a better technique which is highly suitable for

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