
MODELLING OF TEXTILE STRUCTURES AT FIBER AND YARN LEVEL –

SOFTWARE AND DATA STRUCTURES

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Personal Data:

M.Sc. Textile Engineering

M.Sc. Applied Mathematics

PhD Textile Engineering

**Professor for „Textile Materials, Textile Technology and Quality Management“,
Hochschule Niederrhein, Mönchengladbach, Germany**

**Since 2011 Founder and main developer of company „Texmind“ – CAD for
engineering design and modelling of textile materials**

Expertise in the areas:

Polymer and inorganic fibrous material

Filaments/Fibers

Fibrous Structures (yarns, fleece)

Textile Structures (at yarn and macro level)

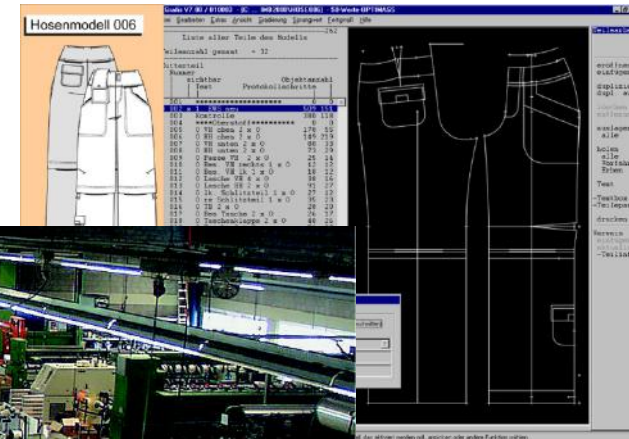
Niederrhein University of Applied Sciences

Department of Textile and Clothing Technology

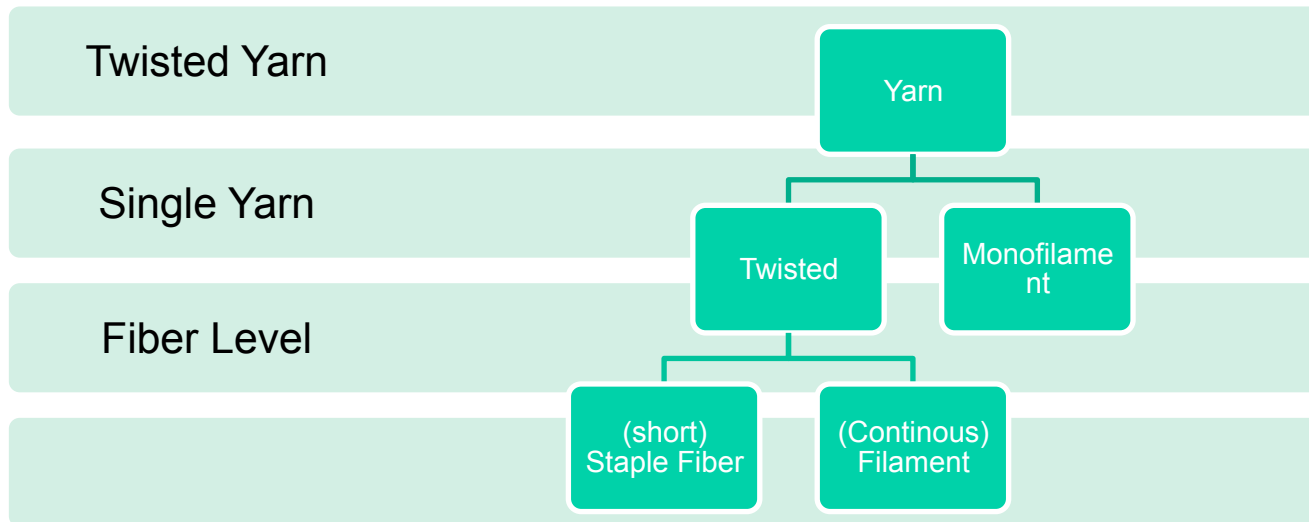
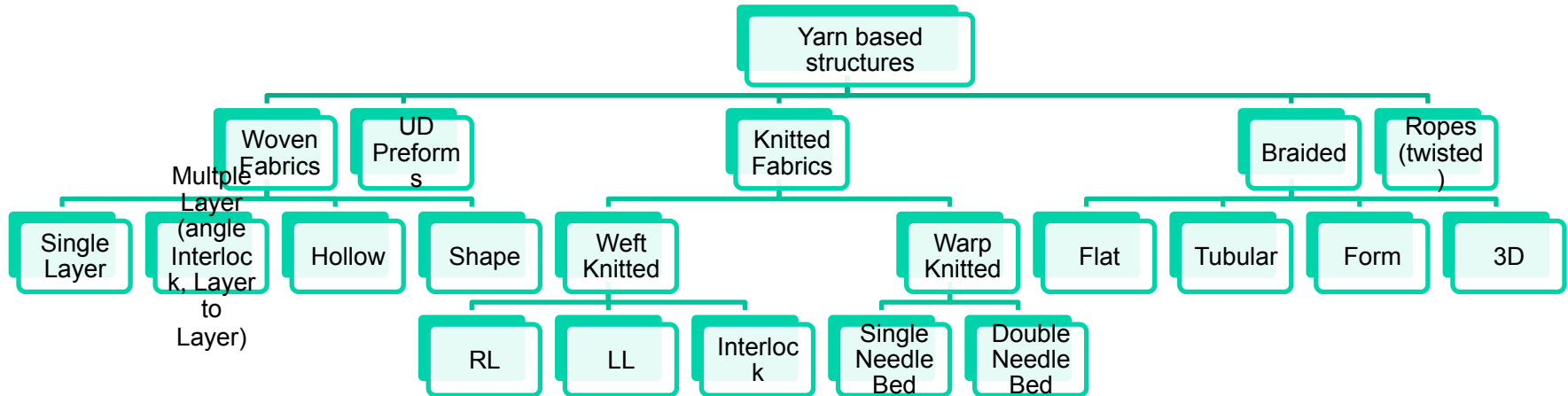
32 Teaching and Research Laboratories

30 Professors

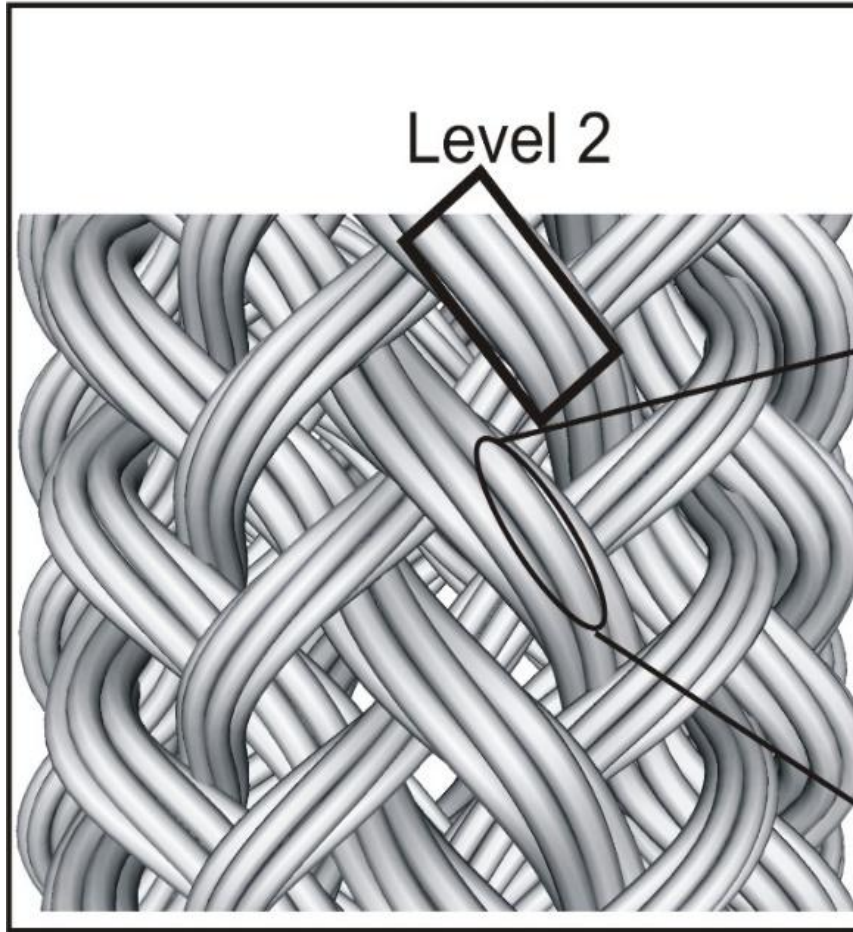
77 Technical, Research and Teaching Assistants



Textile Materials - Levels



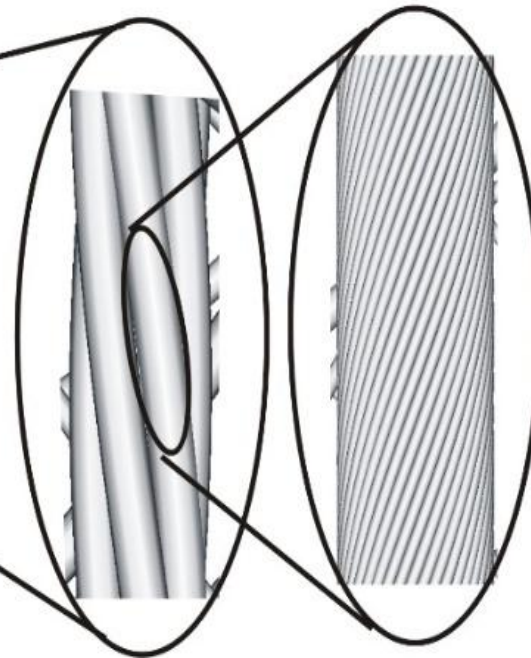
Level 3



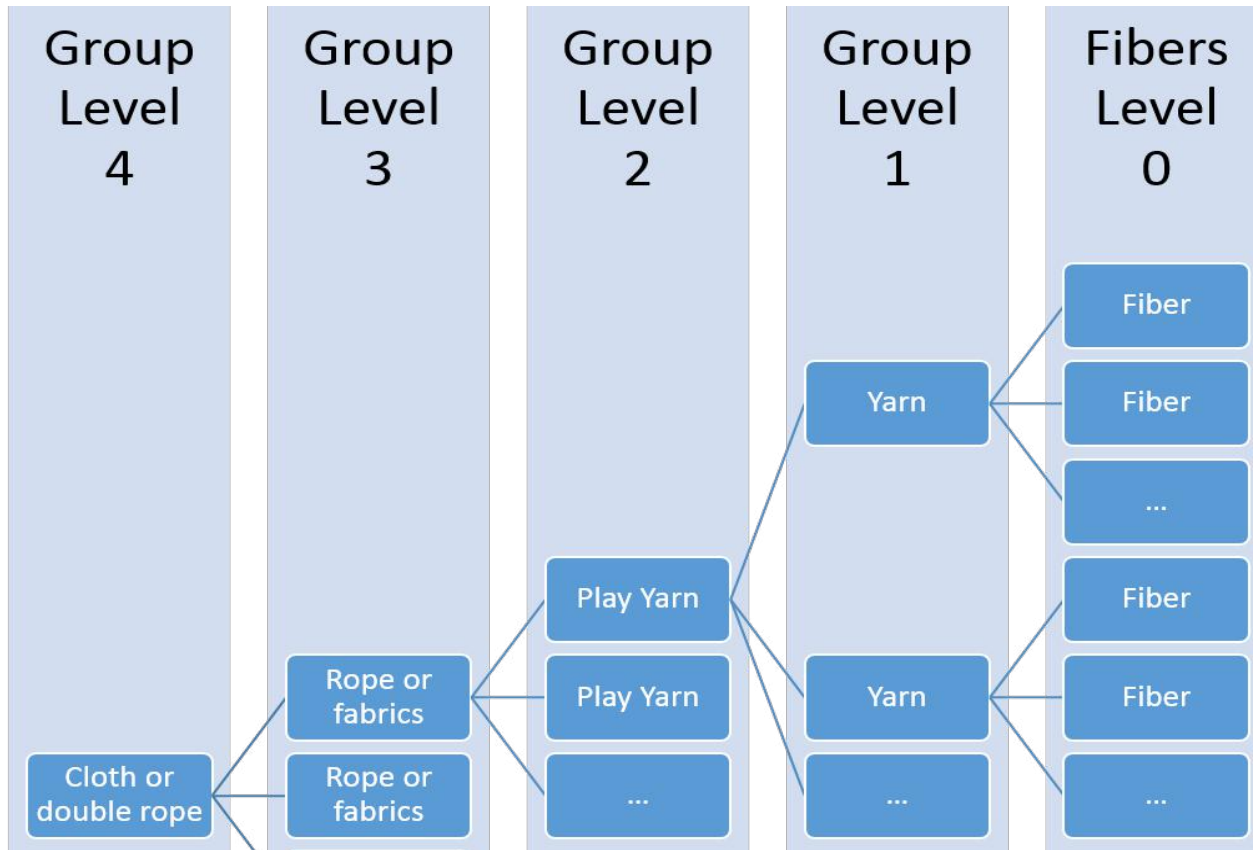
Level 2

Level 1

Fibers/Filaments
(Level 0)



How many?



Basic “classes”

Fiber

- Fineness
- Diameter/Cross section
- Colour
- Mechanical Param.
- List of Coordinates

Group of Fibers

- List of „Group of Fibers“
- Group Properties as „Macro-Fiber“
 - Diameter/Cross section
 - Colour
 - Mechanical Param.
 - List of Coordinates

SOME Programms

Generators	Wisetex Suite	TexGen	TexMind Suite	VTMS Virtual Textile Manufacturing Suite	Multifil	Multiscale Designer
Some sources	[11, 12, 41, 42]	[43][44]	[30, 40]	[45]	[28, 29]	[46]
Developer	KU Leuven	Univ. Nottingham	TexMind UG	The University of Dayton	Laboratoire MSSMat - Centrale Paris	Altair, Multiscale Design Systems
License	Proprietary	GPL	Proprietary	Proprietary	Proprietary	Proprietary
Source	Closed	Open	Closed	Closed	Closed	Closed
Structure Type						
Woven	Single- and Multilayer woven each yarn individually defined	Single layer, orthogonal, angle interlock, layer to layer, yarn group properties	Basic structures, Each yarn individually defined	Single layer, orthogonal, angle interlock, layer to layer, yarn group properties	Basic structures, (manual generator)	5 Basic structures
Weft Knitted	Loop based fine, Tucks need improvement	- Scripting or import from TexMind or Wisetex	Plain Loops in flat and tubular structure	- (import possible)	- (import possible)	-
Warp Knitted	Needle stitched only	- Scripting or import	Loop3D - several classes structures on single and double needle bed machines	- (import possible)	- (import possible)	-
Braided	Unit Cell of biaxial and triaxial braids	- Scripting or import from TexMind or Wisetex	Braider - tubular and flat; Configurator - custom (Geometry)	Unit cell of biaxial and triaxial, Tubular braids	Manual generation (import possible)	-

Yarn Level

Generators	Wisetex Suite	TexGen	TexMind Suite	VTMS Virtual Textile Manufacturing Suite	Multifil	Multiscale Designer
Yarn Level - Mechanics	Beam - Energy minimization	- (scripting possible)	-	Digital Chain	Beam	-
Yarn Contact	Algorithmically included	-	(*)Local Sections	Mesh	Beam- Beam	Surface- Surface
Scripting	-	Python	-	-		-
Imports		WiseTex Weave Pattern	WiseTex,			Abaqus inp File
Exports	Abaqus, Ansys, WiseTex XML (TexGen)	Step, STL, Abaqus, Voxel Grid, (WiseTex)	Abaqus, Ansys, VTMS, WiseTex, TexGen, ImpactFEM, X3D, STL			
Yarn definition	Initially constant cross section	Variable cross section	Constant Cross section	Constant Cross section		Constant Cross section

Fiber / Filament Level

Generators	Wisetex Suite	TexGen	TexMind Suite	VTMS Virtual Textile Manufacturing Suite	Multifil	Multiscale Designer
Filament Visualization	-	-	Yes	yes	Yes	-
Filament Data Stored	Yes	-	Yes	Yes	Yes	
Filament Data Used for computations	Yes	-	Yes	Yes	Yes	-
Initial filament Distribution in the yarn cross section	-	-	Circular layers, flat layers and arbitrary distribution possible	Number of filaments	Program dependent	-
Structural levels	2(3): Fabrics- Yarn- (Fiber data); In LamTex: 3	3: Layered textile - Textiles - Yarn	4: Textile-4: Yarn Groups- Yarns- Fibers	3: Fabrics- Yarn- Fibers	3 Fabrics- Yarns- Fibers	1: Yarn volume mesh