

Conclusion

Knowing through making

Materials influence the way in which they are used in the landscape. Expressive construction encompasses staying true to a material's properties, and revealing their construction techniques in an exaggerated and patterned way. A repetitive pattern of folded textiles used as a canopy not only reveals its construction (folding) but this acts as aesthetic element. Regional aesthetics also plays a role in revealing the material's context. Shweshwe is a textile typically used in traditional Sotho garment construction, and is iconically South African. Landscape architectural tectonics harvests natural forces to reveal, sustain, and guide the form-making of pre-manufactured elements. The patterned and repetitive use of a functional element such as folded surface panels that allow the growth of plants through their openings over time reveals natural processes over time. Through the process of hand-making, combined with computer modelling, the properties and potential of textiles were discovered, leading to an iterative design response which progressed from a detailed to a larger scale.

References

- Adkins, I. & Bell, C. (Eds.). 2014. *Space Unveiled: Invisible Cultures in the Design Studio*, edited by Carla Jackson Bell. Abingdon: Routledge.
- BROUGHTON, J.R. 2012. *Tectonic Sites: Structuring the Landscape with Textile-Derived Construction Techniques*. M.L.A. thesis, University of Illinois, Urbana-Champaign.
- CANDY, L. 2006. *Practice based Research: A guide*. Creativity and Cognition Studios Report 2006:1. *Internet*: <http://www.creativityandcognition.com/resources/PBR%20Guide-1.1-2006.pdf>. Access 17 April 2016.
- CHING, F.D.K. 2007. *Architecture: Form, Space and Order*, third edition. Hoboken: John Wiley & Sons.
- CREATIVITY & COGNITION STUDIOS. 2015. CC15: Definitions and terms. *Internet*: <http://www.creativityandcognition.com/research/practice-basedresearch/definitions-and-terms/>. Access 17 April 2016.
- DEE, C. 2001. *Form and Fabric in Landscape Architecture*. London: Spon Press.
- DESIGN WITH COMPANY. 2014. Pavilion MMM Narrative. *Internet*: <http://www.designwith.co/testersite/category/pavilion-mmm#3785/pavilion-mmm-narative>. Access 29 August 2016.
- FRAMPTON, K. 1995. *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*. Cambridge: The MIT Press.
- GAVENTA, S. 2006. *New Public Spaces*. London: Mitchel Beazley.
- GHARIPOUR, M. 2013. *Persian Gardens and Pavilions: Reflections in History, Poetry and the Arts* (Electronic Version). New York City: Pallgrave Macmillan.
- GILLOW, J. & Sentence, B. 2005. *World Textiles: A Visual Guide to Traditional Techniques*. London: Thames & Hudson.
- HANSEN, A. 2011. From Hand to Land: Tracing Procedural Artifacts in the Built Landscape. *Internet*: <http://scenariojournal.com/article/digital-relics/>. Access 2 October 2016.
- HEIDEGGER, M. *The Question Concerning Technology and Other Essays*, translated by William Lovitt. New York: Harper and Row.
- HERZOG & DE MEURON. 2006. 143 Fünf Höfe. *Internet*: <https://www.herzogdemeuron.com/index/projects/complete-works/126-150/143-fuenf-hoefe.html>. Access 30 August 2016.
- HIMEDE, J. 2013. Lilienthal | Zamora. *Internet*: <https://blog.juliohime.com/2013/07/12/lilienthalzamora-is-a-collaboration-between-etta-lilienthal-and-ben-zamora-both-performance-designers-who-together-have-worked-on-many-striking-stage-sets-i-especially-love-last-years-unde/>. Access 30 August 2016.
- HUNT, J.D. 2012. *A World of Gardens*. London: Reaktion Books.
- INGOLD, T. 2013. *Making*. Abingdon: Routledge.
- ISRAEL, K. 2015. Rounding up fashion's grand tour: the Paris Haute Couture A/W 2015-16. *Internet*: <http://www.wallpaper.com/fashion/rounding-up-fashions-grand-tour-the-paris-haute-couture-aw-2015-16>. Access 29 August 2016.
- KIRKWOOD, N. 1999. *The Art of Landscape Detail: Fundamentals, Practices, and Case Studies*. New York: John Wiley & Sons, Inc.

- KRÜGER, S. 2009. *Textile Architecture*. Berlin: Jovis Verlag.
- LAVINIA. 2009. Exhibition in Spain by Cadaval & Solà-Morales. *Internet*: <http://freshome.com/2009/12/01/exhibition-in-spain-by-cadaval-sola-morales/>. Access 30 August 2016.
- LISE, B. 2006. Fashion and Landscape: A Bricolage Navigation. MLA Thesis, University of Manitoba, Winnipeg, Canada.
- MOORE, R. 2013. The Pop-Up Designs Changing the City Landscape. *The Guardian*, 3 August 2013. *Internet*: <https://www.theguardian.com/artanddesign/2013/aug/03/pop-up-designs-architecture-london>. Access 27 August 2016.
- NIMKULRAT, N. 2012. Hands-on Intellect: Integrating Craft Practice into Design Research. *International Journal of Design*, 6(3):1-14.
- PLUMTRE, G. Palmer, H. & Garnock, J. 1998. *Garden Ornament: Five Hundred Years of History and Practice*. London: Thames and Hudson.
- RYAN, T.R. 2011. *Detailing for Landscape Architects*. Hoboken: John Wiley & Sons
- SAMSON, M.D. 2015. *Hut Pavilion Shrine: Architectural Archetypes in Mid-Century Modernism*. Abingdon: Routledge.
- SCHRÖDER, S. 2016. General Properties of Bamboo and Maintenance Tips. *Internet*: <https://www.bambooimport.com/en/blog/properties-of-bamboo-and-maintenance-tips>. Access 5 December 2016.
- SCHWARTZ, M. 1993. Landscape and Common Culture since Modernism, in *Modern Landscape Architecture: a Critical Review*, edited by M. Treib. Cambridge: The MIT Press.
- SOUTH AFRICAN LED NETWORK [S.a.]. Informal Economy. *Internet*: <http://led.co.za/topic/informal-economy>. Access 22 October 2016.
- STAMP, E. 2015. Architecture Firm SelgasCano Constructs a Colorful Pavilion at Denmark's Louisiana Museum of Modern Art. *Internet*: <http://www.architecturaldigest.com/story/louisiana-hamlet-pavilion-selgascano>. Access 29 August 2016.
- STERN, A. 2015. The Para-Pavilion: towards a new aesthetics of parametrically designed pavilions. The Human (Parameter) - Parametric Approach in Israeli Architecture exhibition book, Curated by Jonathan Lazovski & Yuval Kahlon for ZEZEZE Architecture Gallery, Tel-Aviv.
- TRAMONTIN, M.L. 2006. Textile Tectonics: An Interview with Lars Spuybroek. *Architectural Design*, November/December 2006:52-59.
- WAINWRIGHT, O. 2013. Louis Kahn: the Brick Whisperer. *Internet*: <https://www.theguardian.com/artanddesign/2013/feb/26/louis-kahn-brick-whisperer-architect>. Access 2 October 2016.
- WEE, D. 2013. Yasumichi Morita Redesigns Kyoto's Arashiyama Station. *Internet*: <http://www.blouinartinfo.com/news/story/930630/yasumichi-morita-redesigns-kyotos-arashiyama-station>. Access 30 August 2016.
- WHERRY, L. 2015. Knowing Through Making. MInt(Prof) dissertation, University of Pretoria, Pretoria.
- WINSTON, A. 2016. Burnt, Recycled, Sold: the Fate of 2015's Temporary Pavilions. *Internet*: <http://www.dezeen.com/2016/06/14/2015-temporary-pavilions-fate-burnt-recycled-storage-sold-serpentine-gallery-milan-expo-moma-ps1/>. Access 28 August 2016.
- WINTERBOTTOM, D.M. 2000. *Wood in the Landscape*. Hoboken: John Wiley & Sons, Inc.

Other works consulted:

- BOOTH, N. K. 2012. *Foundations of Landscape Architecture*. Hoboken: John Wiley & Sons.
- GARCIA, M. (Ed.) 2006. Architecture + Textiles = Architextiles. *Architectural Design*, November/December 2006:5-12.
- SHULMAN, N. 2014. Fashion & Gardens exhibition booklet, Garden Museum, London.
- VLOK, E. 2006. The Textile and Clothing Industry in South Africa, in *The Future of the Textile and Clothing Industry in Sub-Saharan Africa*, edited by H. Jauch & R. Traub-Merz. Bonn: Friedrich-Ebert-Stiftung.

Image references:

- BAMBOO IMPORT EUROPE. 2016. Bamboo discolouration. *Internet*:
<https://www.bambooimport.com/image/Blog/eigenschappen/bamboe-vergrijzing.jpg>. Access 5 December 2016.
- CADAVAL & SOLÀ-MORALES. 2009. Eyes of the World. *Internet*: http://www.caso.com/project.php?project_id=29. Access 24 October 2016.
- DESIGN WITH COMPANY. 2014. MMM Pavilion. *Internet*: <http://www.designboom.com/wp-content/uploads/2014/05/design-with-co-pavilion-mmm-designboom-01.jpg>. Access 24 October 2016.
- DIOR. 2015. Dior Haute Couture Fall Winter 2015-2016. *Internet*:
http://www.dior.com/diormag/sites/default/files/styles/dn_grid_mobile_full/public/slideshow_grid/multiple_media/01_defilehcah1516_scenophotos.jpg?itok=KPnhg1R1. Access 24 October 2016.
- DIRAND, A. 2015. Dior Spring 2015 Couture Presentation. *Internet*:
http://tmagazine.blogs.nytimes.com/2015/01/26/dior-couture-stage-set-design-history/?_r=0. Access 24 October 2016.
- DIVINECACTUS. 2014. Ceropegia woodii. *Internet*: <https://www.amazon.co.uk/DivineCactus-CEROPEGIA-WOODII-String-of-Hearts-11cm-wide-hanging-pot/dp/B00M27CAP2>. Access 25 October 2016.
- FLEUR. 2016. String of pearls. *Internet*: <http://oururbanbox.com/string-of-pearls/#comment-7714>. Access 25 October 2016.
- JAYJAYC. 2011. Chlorophytum comosum 'Variegatum' with green leaves and white margins. *Internet*:
<https://www.flickr.com/photos/jayjayc/6206521819/in/album-72157594392643445/>. Access 25 October 2016.
- KVARTBLOG. [S.a.] Asparagus densiflorus. *Internet*: <http://econet.ru/articles/117622-rasteniya-v-interiere-vashego-doma>. Access 25 October 2016.
- LAURENS. 2007. A sunken garden in Venning Park. *Internet*:
https://commons.wikimedia.org/wiki/File:Venningpark_-_gesonke_tuin_2.jpg. Access 5 December 2016.
- LILIENTHAL, E. 2012. Through Hollow Lands. *Internet*: <http://www.ettalilienthal.com/thl/>. Access 24 October 2016.
- MATSUE VOGEL PARK. 2008. Pelargonium tongaense. *Internet*: <http://vogelpark.blog47.fc2.com/blog-entry-179.html>. Access 25 October 2016.

SANYO. 2013. *Internet*: <http://iecetech.org/issue/2013-10/Helping-turn-solar-power-into-electricity>. Access 5 December 2016.

SELGASCANO. 2016. Louisiana Hamlet Pavilion. *Internet*: https://static.dezeen.com/uploads/2016/02/kibera-louisiana-selgascano-humanitarian-architecture_dezeen_936_14.jpg. Access 24 October 2016.

SUBTILITAS. 2011. Hanging Plants, Pendant Lights, and Reflective Glass. *Internet*: <http://www.subtilitas.site/post/2861893036/its-difficult-for-me-to-appreciate-shopping-mall>. Access 24 October 2016.

TODODESIGN. 2014. Paradise on Earth. *Internet*: http://www.arq4design.com/tododesign/wp-content/uploads/1374208_566082976779705_1456939151_n.jpg. Access 24 October 2016.

Parametric definitions

BUTHKE, J. & Brauer, R. 2011. Folded structures. *Internet*: <http://oooja.dk/2011/09/04/folded-structures/>. Access 5 December 2016.

WALLACE. 2011. Grasshopper tutorial: folded plate structure. *Internet*: <https://vimeo.com/33136318>. Access 5 December 2016.

Appendix

A

Instructions

Samples 1, 2, 3:

1. Make slipknot:

- 1.1. Measure three forearm-lengths of rope/twine (henceforth referred to simply as “yarn”) for the tail
- 1.2. Place the working yarn to the left; make a loop with the yarn and ensure that the long end of the tail crosses the shorter end; hold the crossing between index and middle fingers
- 1.3. Pull the short end of the tail through the loop and tighten

2. Slide slipknot over right wrist

3. Create stitches:

- 3.1. Hold the working yarn in between the ring- and pinkie fingers of left hand, with the palm of the hand facing towards the knitter. Ensure the working yarn is further away from the body, and that the tail is the strand closer to the body
- 3.2. Place left thumb and left middle finger in gap between the working yarn and tail
- 3.3. Slide the working yarn over the left middle finger, and the tail over the thumb. Ensure that palm faces upwards.
- 3.4. Place right hand in gap between the yarn on left hand closest to the body, and then over the one furthest away from body. Loop hand towards the body and slide the loop over wrist.
- 3.5. Repeat until the required number of stitches is achieved (10 stitches in Samples 1, 2 and 3)

4. Hold the working yarn in the right hand. Ignore the tail end for the remainder of the knitting process.

5. Pull the stitch closest the wrist over the right hand, and drop it. Keep the working yarn in the right hand.

6. Place the left hand through the loop created, from the back towards the body.

7. Tighten the yarn slightly over the left arm.

8. Repeat Steps 4 and 5.

9. Place the left hand through the loop created, from the front and away from the body.

10. Repeat Steps 8 and 9 until all of the stitches are on the left arm.

11. Hold the working yarn in the left hand.

12. Pull the stitch closest the wrist over the left hand, and drop it. Keep the working yarn in the left hand.

13. Place the right hand through the loop created, from the back towards the body.

14. Tighten the yarn slightly over the right arm.

15. Repeat Steps 11 and 12.

16. Place the right hand through the loop created, from the front and away from the body.

17. Repeat Steps 15 and 16 until all of the stitches are on the right arm.

18. Carry on knitting until the desired length of sample is achieved.

19. Cast off (if stitches are on the right arm):

- 19.1. Follow Steps 4, 5 and 9 to make two stitches over the left arm
- 19.2. Take the stitch closest to the body with the right hand, and pull over the left hand. Drop the stitch.
- 19.3. Follow Steps 4, 5 and 9 to make one more stitch.
- 19.4. Repeat Step 19.2.
- 19.5. Repeat Steps 19.1 to 19.4 until all of the stitches have been cast off.

If stitches are on the left arm, follow Steps 19.1 – 19.5, but switch the arm orientation.

20. Trim the tail yarn and working yarn with scissors.

Sample no.	Purpose	Material	Fabrication technique	Notes
1	To create shade-providing, overhead-defining element	Polypropylene twine: 3 mm diameter Breaking strength: 50 kg	Warp arm knitting- no tools required	Based on 10 garter stitches
2	To create shade-providing, overhead-defining element	Flat polyethylene braided ski rope: 10 mm diameter Breaking strength: 330 kg	Warp arm knitting- no tools required	Based on 10 garter stitches
3	To create shade-providing, overhead-defining element	Jute braided rope: 7 mm diameter Breaking strength: 154 kg	Warp arm knitting- no tools required	Based on 10 garter stitches
4	To explore folding as spatial element	210 g/m ² paper	Folding by hand	Basic parabola fold (Jackson 2011)
5	To explore the possibilities of folding as a means to create space as well as to containment for plants	160 g/m ² paper	Folding by hand	Basic V-pleat (Jackson 2011)
6	To explore the possibilities of folding as a means to create space as well as to containment for plants	160 g/m ² paper	Folding by hand	Multiple V-pleats (Jackson 2011)
7a	To make a mould to shape textiles	2 sheets of 1mm thick cardboard	Folding by hand	Based on sample 6.
7b	To explore textile manipulation	Weed-control textile © University of Pretoria	Oven-baking in cardboard mould at 120 °C for 60 minutes.	Based on sample 6

Details	Observations		Opportunities
Length of twine used: 100 m Dimensions: 1800 x 210 mm Area: 0.378 m ² at rest Time taken: 1.5 hours	 <p>UNIVERSITEIT VAN PRETORIA UNIVERSITY OF PRETORIA YUNIBESITHI YA PRETORIA</p> <ul style="list-style-type: none"> -Elastic properties of the sample cause irregularities in shape-expansion at points of restraint and contraction in areas with no contact to external support. -Twine is too thin to provide sufficient shade -Sample weighed down at its centre of gravity- appears drooping and “weak” -Yarn to surface ratio is small. -Shadows and texture form visual interest 	<ul style="list-style-type: none"> Use thicker twine for <ul style="list-style-type: none"> -sturdier sample -smaller stitch sizes to increase shading capacity <p><i>How is this sample more appropriate than conventional shade structures?</i></p>	<ul style="list-style-type: none"> -Even though sample appears “weak”, it can have poetic and dynamic movement and shadow-casting properties -Can be draped
Length of rope used: 15 m (longest available length in-store) Dimensions: 500 x 160 mm Area: 0.08 m ² Time taken: 20 minutes	<ul style="list-style-type: none"> -Sample area very small -Difficult to achieve a uniform knit with rope of that diameter -Untidy appearance -Keeps its shape -Unravels easily: rope surface is smooth, and too thick for sufficient control -Provides more shade than sample 1 	<ul style="list-style-type: none"> -Use rope or twine that is thinner than sample 2, but thicker than sample 1. -Rope or twine to have better gripping qualities. 	<ul style="list-style-type: none"> -Can have robust qualities on ground plane
Length of rope used: 30 m (longer lengths did not fall within allocated budget) Dimensions: 700 x 240 mm Area: 0.168 m ² Time taken: 45 minutes	<ul style="list-style-type: none"> -Sample area relatively small- <i>not cost-effective?</i> -More effective as shade-providing element than sample 1 -More sturdy than sample 1 -More neat than sample 2 -Rope doesn't unravel like sample 2 -Shadows and texture form visual interest - Provides greater width for same number of stitches used (in comparison to sample 1) 	<ul style="list-style-type: none"> -Natural fibres have more grip than synthetic rope <p><i>Is knitting the most effective method to create space-defining elements?</i></p>	<ul style="list-style-type: none"> -Can have robust qualities on ground plane
Paper dimensions before folding: 380 x 380 mm Dimensions at rest: 360 x 360 mm Span area at rest: 0.130 m ² Time taken: 45 minutes	<ul style="list-style-type: none"> -Can expand and collapse -Offers spatial definition in multiple dimensions and planes -Can be up-scaled easily 	<ul style="list-style-type: none"> -Use different V-folds to investigate containing properties further 	<ul style="list-style-type: none"> -Can offer visually appealing spatial definition
Paper dimensions before folding: 280 x 200 mm Dimensions at rest: 265 x 190 mm Span area at rest: 0.018 m ² Time taken: 30 minutes	<ul style="list-style-type: none"> -Can expand and collapse more easily than sample 4 -Valleys have intrinsic containment capacity 	<ul style="list-style-type: none"> -More “compartments” could further define overhead pockets for planting. 	<ul style="list-style-type: none"> -Can offer spatial definition on different planes
Paper dimensions before folding: 200 x 150 mm Dimensions at rest: 170 x 140 mm Span area at rest: 0.0238 m ² Time taken: 45 minutes	<ul style="list-style-type: none"> -Pattern appears more promising for containment 	<ul style="list-style-type: none"> -Edges are open, thus patterns with contained edges should be investigated as containment options. 	<ul style="list-style-type: none"> -Due to its flexible yet rigid nature it can be used on the ground plane for e.g. erosion control.
Cardboard dimensions before folding: 250 x 250 mm Dimensions at rest: 230 x 230 mm Span area at rest: 0.053 m ² Time taken: 20 minutes per sheet			
Dimensions before folding: 250 x 250 mm Dimensions at rest: 230 x 230 mm	<ul style="list-style-type: none"> -Successful transfer of paper folding onto textile. 	<ul style="list-style-type: none"> -Folded textiles can be reproduced easily with the mould. 	See sample 6



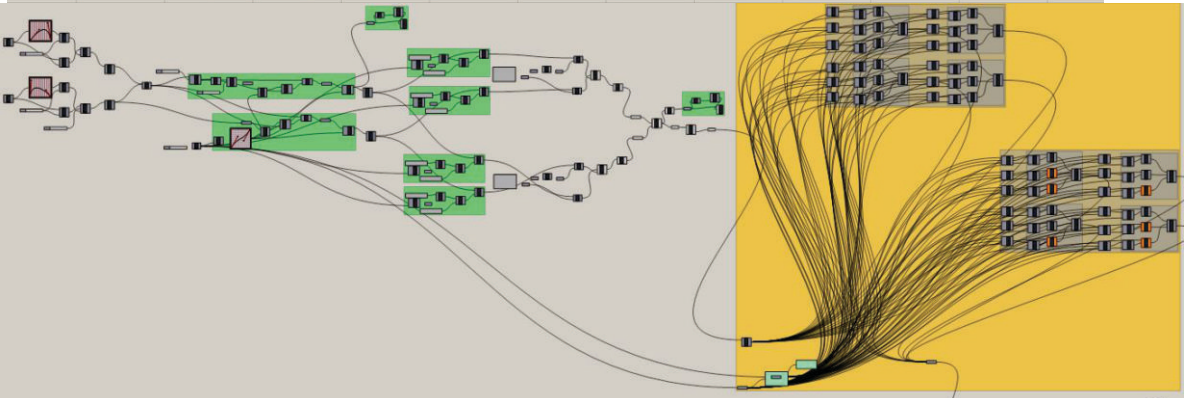
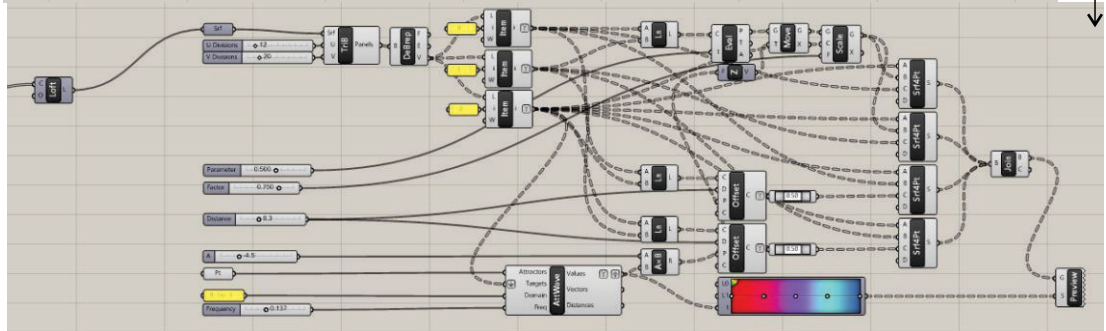
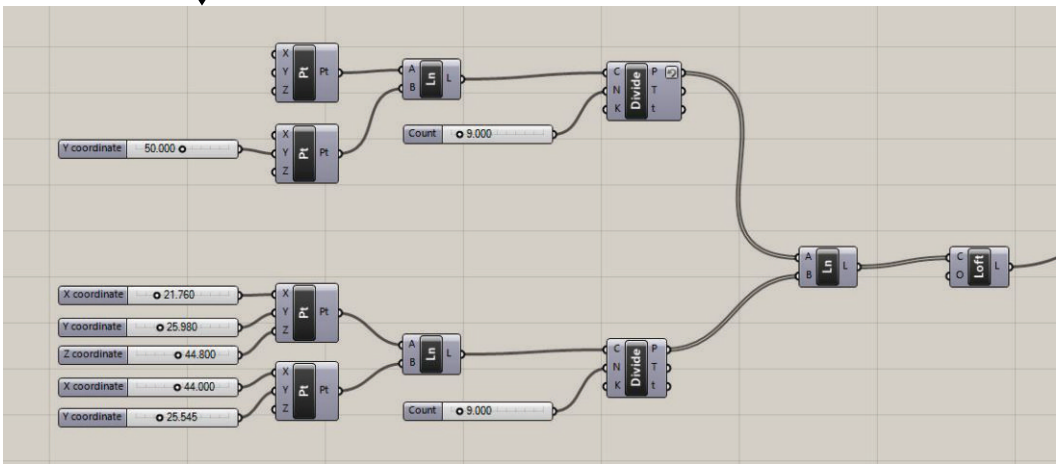
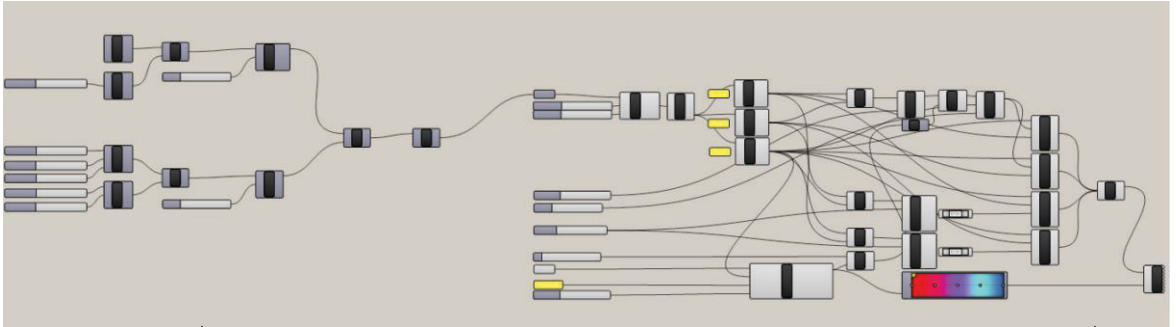
UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



Appendix

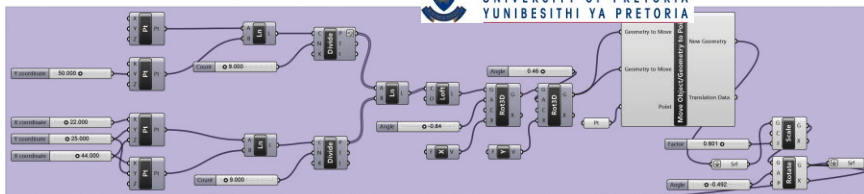
B

Parametric modeling scripts

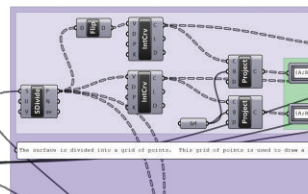




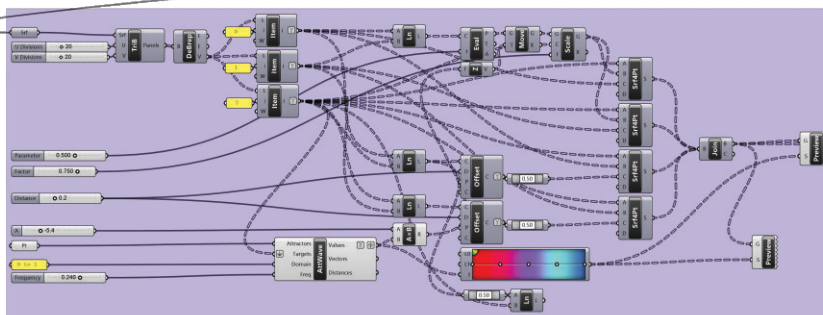
Thumbnail unit 1



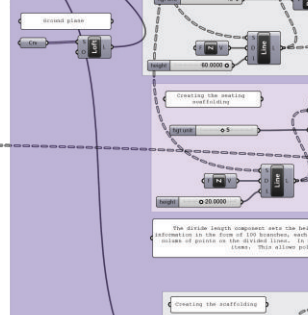
Thumbnail overview



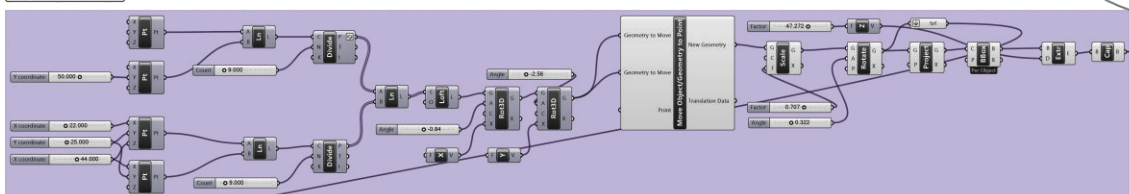
Thumbnail pattern



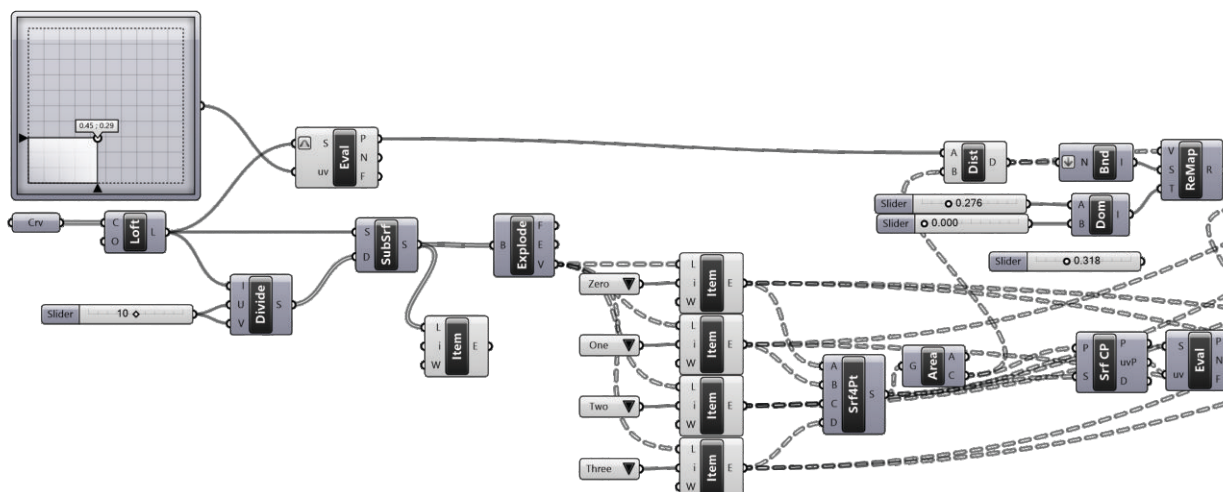
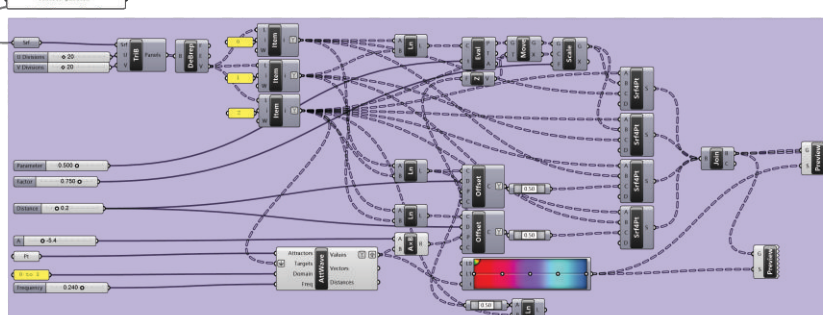
Thumbnail glass



Thumbnail unit 2



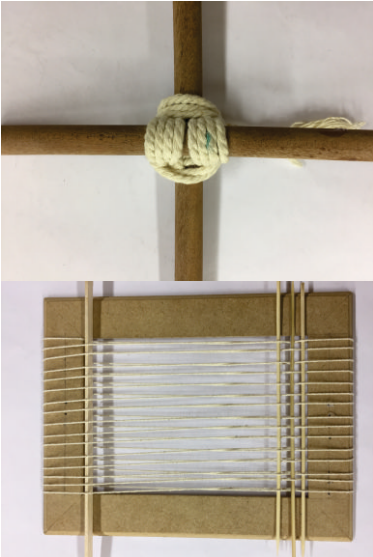
Thumbnail pattern



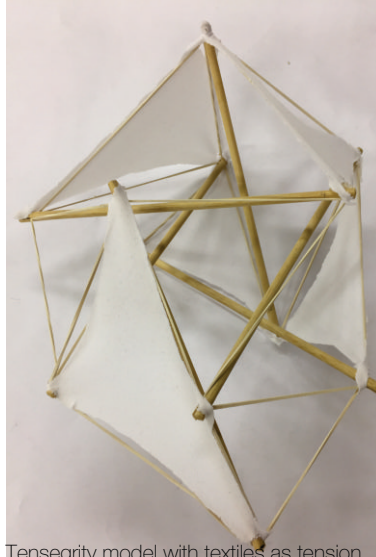
Appendix

C

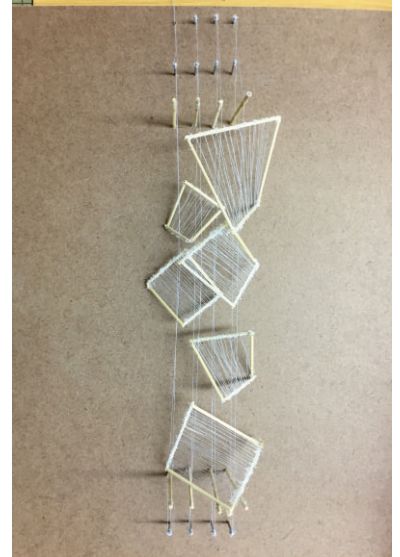
Process work



Knotting and weaving explorations



Tensegrity model with textiles as tension members



Weight of *Asparagus plumosus*



Weight of a textile pocket once saturated with water