Dissertation Review Form
-for members of the Dissertation Commission-

Please write a review of the dissertation taking the following criteria into account, where appropriate:

- General remarks
- The significance and status of the dissertation in the field
- The sufficiency and quality of the material
- The adequacy of the methods used
- The validity of results
- The logic of the dissertation's structure
- The knowledge and use of literature in the field
- The project's contribution to the research area
- The author's input into the achievement of the dissertation results
- Language
- The shortcomings of the manuscript

Name of the PhD Candidate : Mr Leung Tze Ming
Planned Date of Graduation : October, year: 2019

Title of the Dissertation: «Principles of comprehensive device generating urban spaces (utilizing parametric technologies)»

Would you please elaborate upon your review with reference to the above mentioned criteria in the box below. Please add extra pages if needed

Logic of the dissertations structure:
Good
The general structure of the dissertation appears logical. However, the distinction in chapter 3 vs. chapter 5 what is physical attribute, constraint etc. seems not entirely coherent. This is described more in the Questions/specific remarks later.

Knowledge of literature
Sufficient
There could be probably additional references like Reinhard Koenig or Kees Christiaanse, Stephen Cairns from Future Cities Lab

Language
Good

Questions/specific remarks:

Chapter 2
Page 16.
Paper based design being deterministic. Not always. There are design techniques to overcome that. What about e.g. diagramming? – A design technique to transform step by step from e.g. topological relations into a metric drawing (actual design). See FOA "The Yokohama Project" how the whole design is based on the "No return diagram".
Also, OMA's massive production of design options (blue foam models), then sorting and evaluating them is a way to overcome determinism.

Page 24.
On Associative geometry.
The critique is specifically towards the DLR approach evaluating space syntax afterwards. However, such an evaluation (or any evaluation for that matter) could be integrated earlier and is not necessarily a problem of Associative Geometry.

Regarding the statement that both Associative Design and Shape Grammar cannot be used to evaluate design is missing a bit of an explanation.

Regarding Performative Approach. Also, not very clear. How is this happening? More concrete examples?

To my understanding specific design methods e.g. Associative Design & Shape Grammar are bit confused with a general design philosophy like Performance Driven Design. Both could be set up in such a way that performance aspects are used for validating the design results. The question then would be how well (manually or automated) is the evaluation step integrated into the design (iteration) process e.g. feedback loop.

Page 36.
Parametric modelling tools are by far not complete. The way this is presented in the thesis it appears it wants to show a complete picture. Instead it seems to show the author's experience with specific software packages. May be, it could be interesting instead of going only into specific software packages to also make the distinction of how a certain degree of automation is achieved, the level of real time response for change in input parameters etc. (adding to the table on page 42)
What about Generative Components or even the first CAD program Sketchpad (which was associative)? Also, scripting can be found in Auto CAD or Rhino not only in Maya. For instance, Arnold Walz (Design to Production) used scripting to produce entirely the 3-D drawings for UN Studio's Mercedes Benz Museum. What about references in urban design?

Further the description of Grasshopper and other software is somewhat mushy, and it is not entirely clear how the four presented software packages work. Also, what about writing components in C# or Visual Basic script in grasshopper as possibility? In fact, the author by using ladybug and other plugins makes indirectly use of that.

Page 42/43.
The conclusion to use Grasshopper could be more elaborated. Surely, it requires additional programming knowledge to use scripting vs. Grasshopper's ease of use graphical user interface and the mentioned integration of other software packages or plugins. However, beyond that, in order to be able to make proper use of the tools with respect to performance driven design and inverse simulation, one cannot just start out "just like that" without having some form of (expert) knowledge. Firstly, the designer needs to know how to set up inverse simulation properly and what are the advantages of such an approach in comparison to other ones. Secondly, a designer needs to be able to use simulation/evaluation methods or software packages and with having a multi parameter/performance approach the software packages/plugins of several different disciplines are required. Here, the designer needs to be able to set up e.g. a simulation properly and being able to interpret the results whether those are correct or realistic, also understanding and being able to compare the level of performance of different design solutions. Thirdly, even a more "beginner friendly" environment like grasshopper requires ample time of usage and experience to be able to even get results but also to be able to understand the possibilities and limitations. Looking at the body of knowledge and experience as such required one could argue that the choice of grasshopper vs. scripting in terms of being "beginner friendly" is almost irrelevant since one needs to become rather knowledgeable in the first place to do something meaningful with it. However, in my opinion the far more important aspects are the grasshopper community (one can always find help via the grasshopper forum page), grasshopper being flexible as a software platform (being able to program your own components and plugins), grasshopper being wide spread within the community, therefore has a broad user base, being taught at a lot of universities and finally a lot of architectural/urban design related disciplines in form of environmental simulation tools can be integrated.

Chapter 3
Page 47.
Web bulb globe temperature should be wet bulb globe temperature

Was UTCI chosen because it is the most useful for the design task or because it was available as plugin?

Page 50-53.
Distinction between physical attributes and performance attributes and page 67 onward, chapter 5: Distinction between constraints (fixed input parameters), physical parameters (which can be altered) and defining performance.
Chapter 3 describes Green Open Spaces in Cities and Chapter 5 is an applied case study. Both use similar elements but there could be the same categorization and terminology in both chapters to increase consistency in the thesis. Alternatively, it could be made clearer (e.g. graphically) how physical attributes are split up later (chapter 5) into constraints and physical parameters, etc.

A lot of focus and differentiation is given to seating within physical attributes, facilities. However, among other attributes seating is not used in chapter 5. Why then giving so much attention/detail?

Chapter 4
Page 57/58.
Interaction among performances. Some more concrete examples would help to understand the interaction better. E.g. "performances can be considered separately if there are no

intersections among parameters", p.58. How does this play out in a real design application? Could be explained similar to how it is done on the same page with constraints.

Page 60.
Inverse simulations need a forward approach to gain initial results to be able to calculate back from target parameters towards a design solution. I assume one needs to get several performance simulation samples in order to figure out an equation to be used in inverse simulation. What is then the difference or advantage to an automated feedback loop or genetic algorithm which uses also several cycles of design iteration and computational power (brute force) while the outcome in performance results is similar?

Chapter 5

It would be good to discuss this chapter in person because I have plenty of questions about it.

Identification of Physical parameters (and its potential effect on performances):
Length, width, tree density, fountain location. Tree density does not affect acoustic performance, agreed. However, the length and width does.
That bears the question what else can be done to improve the acoustic performance other than increasing the distance to the source of noise? No barrier? So why is it even considered a performance criterion when nothing else than increasing distance to the source can be done about it?
How does the fountain have an influence on the acoustic performance? Is it that loud or an obstacle? It seems to be not loud with 65dbA (5dbA louder than normal conversation) in comparison to traffic.
Why is the fountain not included in the spatial syntax? Further why is the fountain not included in the thermal performance through e.g. evaporative cooling (cannot be modelled)?
Site length and width should have an indirect effect on thermal performance in relation to adjacent building height casting shadow on the site?
Why is site size part of the design scenario (physical parameter)? Should it not be part of the constraints since a site is always given? If it is for the sake of testing why is neighboring building height a constraint and not a parameter too (the higher the buildings the better for the thermal performance)?
On what basis is decided whether something is a constraint or a parameter?

p.75 chapter 5.3. Graph shows the denser the trees the bigger the delta of UTCI in degrees. More trees = More cool

Noise performance
p.77 noise evaluated in form of empirical questionnaire from earlier paper. What are the results? In Annex? Using "ordered Logit regression model"?
How is the probability of Sound annoyance defined?

p.79 image below. Graphic representation of acoustic performance. I only see 2 different colored balls…pink and red

How is the noise source modelled? Linear? Point?Moving?

Page 81 chapter 5.3 spatial structure
More trees less connectivity…because of tree trunks or visually towards the sky and adjacent higher buildings?
Basically, connectivity is radially and gradually changing from the center to the perimeter. Where is the fountain in that?
Does a connectivity within an open field even make sense? It is not exactly a street layout.

P.85. conclusion the denser the trees the more shade the less visibility…

p.86 5.3.5 Parametric Model development
Results…trees and what?
Is the result tested? What is the performance in terms of acoustics, UCTI and space syntax also regarding the input parameter hierarchy? A final (simulation) test would validate the approach.

Chapter 6 As such seems a bit self-referential and unclear

II A bit common place to say that performance must be quantifiable. Also is there more to say to it?

III The introduction of non-physical parameters seems somehow daring especially regarding the complexity of the already presented research and difficulty to integrate acoustics, thermal performance and space syntax with each other. The way how e.g. acoustics was represented in the thesis, one could question how well life cycle assessment would be integrated, especially when considering the complexity of that subject which affords PhD thesis on its own. The research and databank required for e.g. embedded energy or re-use/re-cycle, etc. would be in my opinion by far more complex than acoustics, thermal and spatial performance presented in this thesis.

Chapter 7
Parametric models can be only a democratic tool if all parties have the same access to the tool and are equally able to use it. How to solve the issue of laymen vs. expert? Not only in terms of computational design expertise but also complexity of parameters and understanding thereof. The issue of how information is presented is tackled in the thesis although debatable. How to implement such a decision-making process practically is not really answered. According to my practical experience as architect it is difficult due to limitations and education of clients (being often laymen) to make them understand when they see a design solution what they must take literal versus what elements are still conceptual and open for change. However, arguing that the approach can provide a larger design solution space rather than a final solution goes into the right direction. It would be therefore more logical to treat this as internal design approach to be discussed among “experts”.

Shortcomings:
It seems that software choices or even performance evaluation choices e.g. UTCI were made not because of being the best choice for the task, but because of being already integrated or being easily available for grasshopper. This is as such not a bad thing if the body of work would be more argued from a standpoint to look at inverse simulation being useful for a large audience. However, the thesis argues for inverse simulation vs. other approaches and with that it one could wonder what is the real motivation for choosing grasshopper?

The biggest problem I see in chapter 5. The application or validation of the thesis via a rather “simplistic” case study. There is not enough local complexity which can afford a differentiated design outcome. If the site (not of rectangular shape) as well as the neighboring buildings (both constraints) would be given, then one could see the impact the buildings and shape of that park would have on tree distribution for a given target thermal performance. I would take a least 3 parks in the same city with different constraints and run the inverse simulation. Currently the result is simply: The more trees, the better the thermal performance, but the worse the spatial connectivity. Only spatial diversity in form of constraints would lead to a more differentiated design outcome. Also, I wonder why the tree density at the perimeter is the same as at the center of the park. Should the neighboring buildings not have an impact on the tree distribution? The role and placement result of the fountain in response to a may be linear noise source is not entirely clear. How much is the fountain canceling out traffic

noise? Would a low barrier of shrubs not be perform better at the street perimeter to protect from noise?

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Date : 28.07.2019

Signature : …… *

** No signature required when submitted per email.*

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