

Graduation Project

Bachelor of Computational Design
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” What are the ways of Visualizing the Relationships between Design options & Regulatory requirements ”

Research Objectives

- To maintain a high quality of living environment, the Australian government released a series of regulatory standards such as Building Code of Australia (BCA)
- Provides a minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new developments
- Architects are forced to verify numbers of documents as reference throughout the design process
- Barely no tools that help architects with simulating and/or visualising the regulatory standards in order to have a fully understanding on each requirement
- 3D printing, digital fabrication and such cutting edge digital technologies and softwares are barely known/used under traditional architecture industry

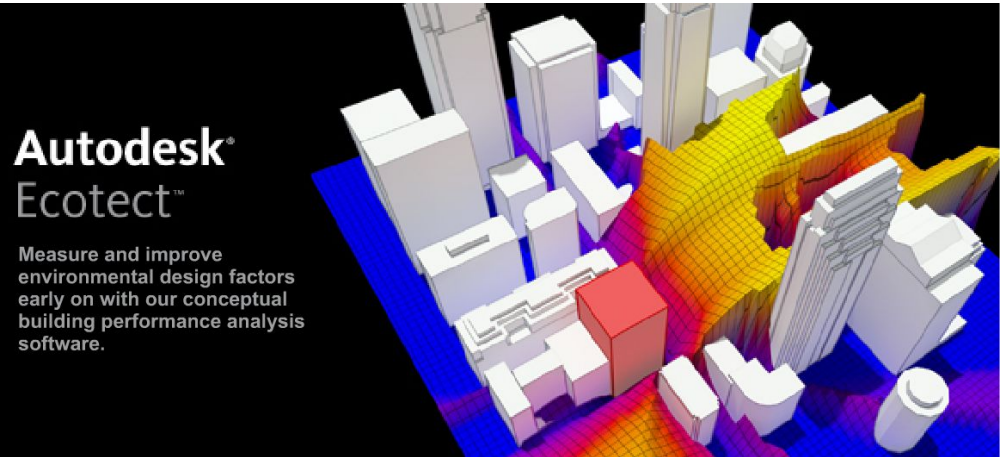
Research Thinking

- In what ways, can the relationships between design options and regulatory requirements be visualised/spatially modelled to better inform design decision making?
- How can we improve the design outcome by using tools as assistance, and what are the benefits
- How computational design tools can mitigate against errors in interpreting regulations

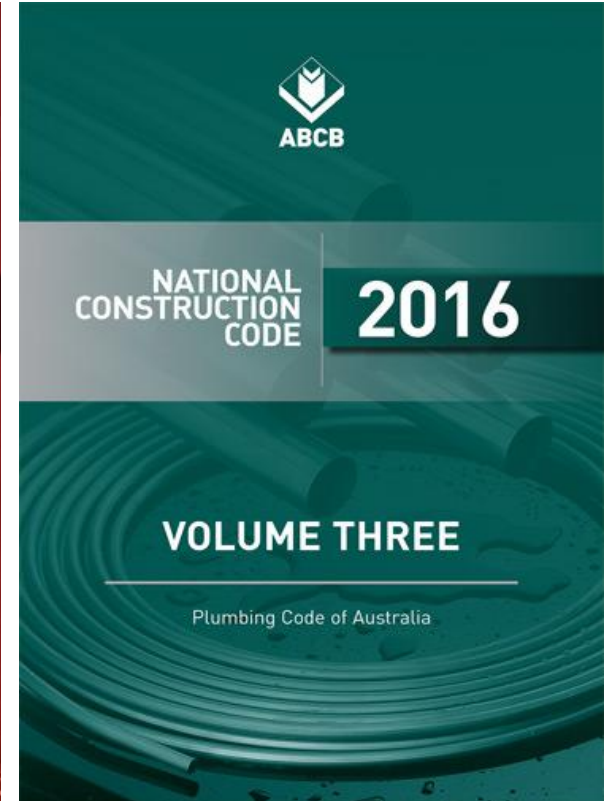
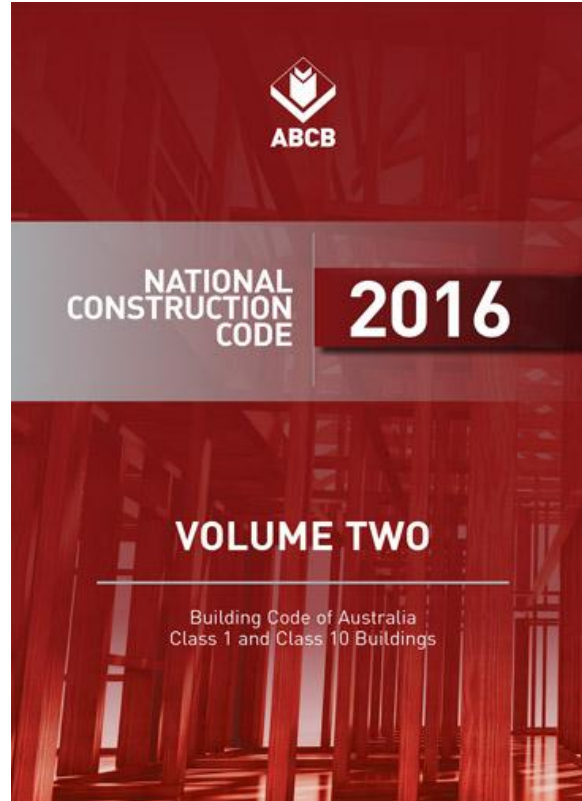
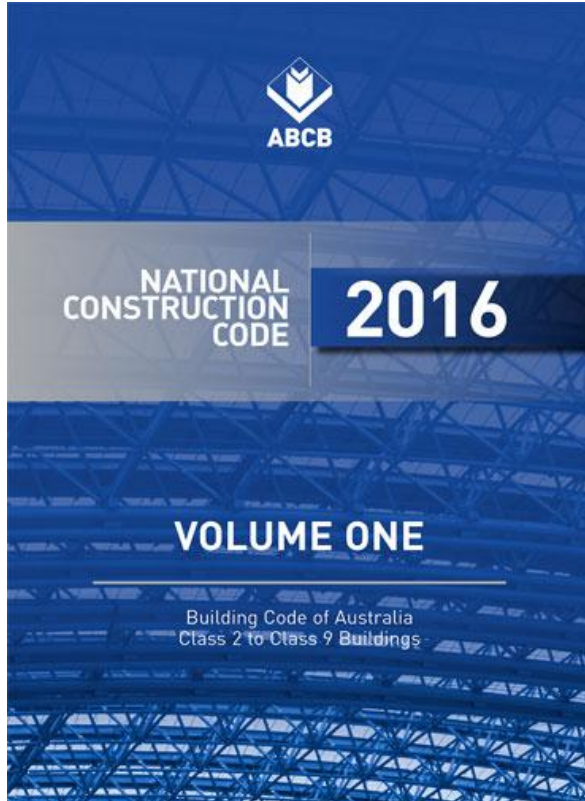
Existing Tools



SOLIBRI
A NEMETSCHEK COMPANY



Building Code of Australia



Part 3.9 Safe Movement and Access

Table 3.9.1.1 RISER AND GOING DIMENSIONS (mm)

STAIR TYPE	RISER (R) (see Figure below)		GOING (G) (see Figure below)		SLOPE RELATIONSHIP (2R+G)	
	Max	Min	Max	Min	Max	Min
Stairs (other than spiral)	190	115	355	240	700	550
Spiral	220	140	370	210	680	590

125 mm sphere must not pass through treads

Table 3.9.1.2 RISER AND GOING DIMENSIONS (mm) — STAIRWAYS SERVING NON-HABITABLE ROOMS USED INFREQUENTLY

RISER (R)		GOING (G)		SLOPE RELATIONSHIP (2R+G)	
Max	Min	Max	Min	Max	Min
225	130	355	215	700	540

Note: The *going* (G) shall be not more than the tread depth plus a maximum gap of 30 mm between the rear edge of one tread and the nosing of the tread above.

Figure 3.9.1.1

MEASUREMENT OF SLOPE RELATIONSHIP — Plan view

Diagram a. Stair with 2 flights

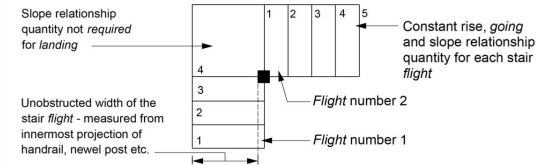


Diagram b. Tapered treads — not more than 1 m wide

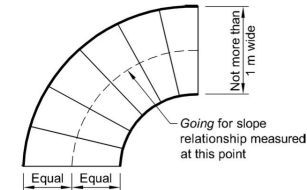
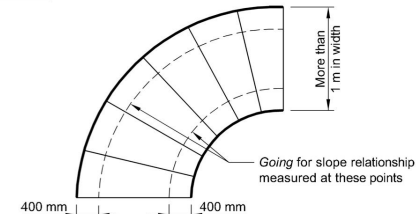


Diagram c. Tapered treads — more than 1 m wide



Practice Strategy



- Getting the requirements



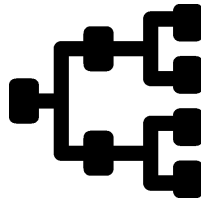
- DATA collection



- Build 3D model in Rhino



- Providing feedback on the model is compliant or not



- Script will check the model by using the requirement as reference



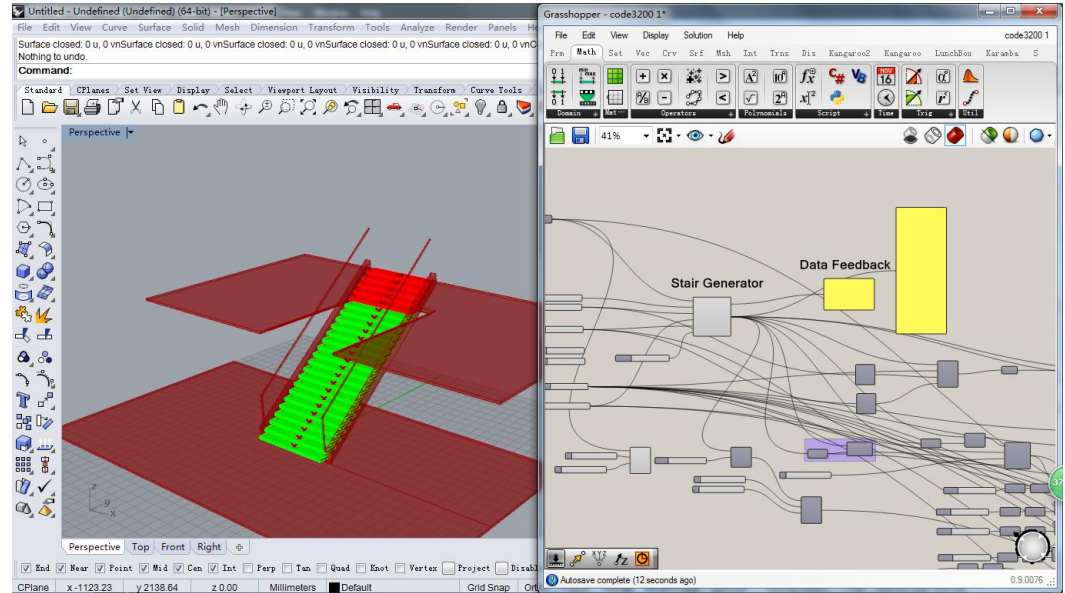
- Import into Grasshopper script

Availabilities

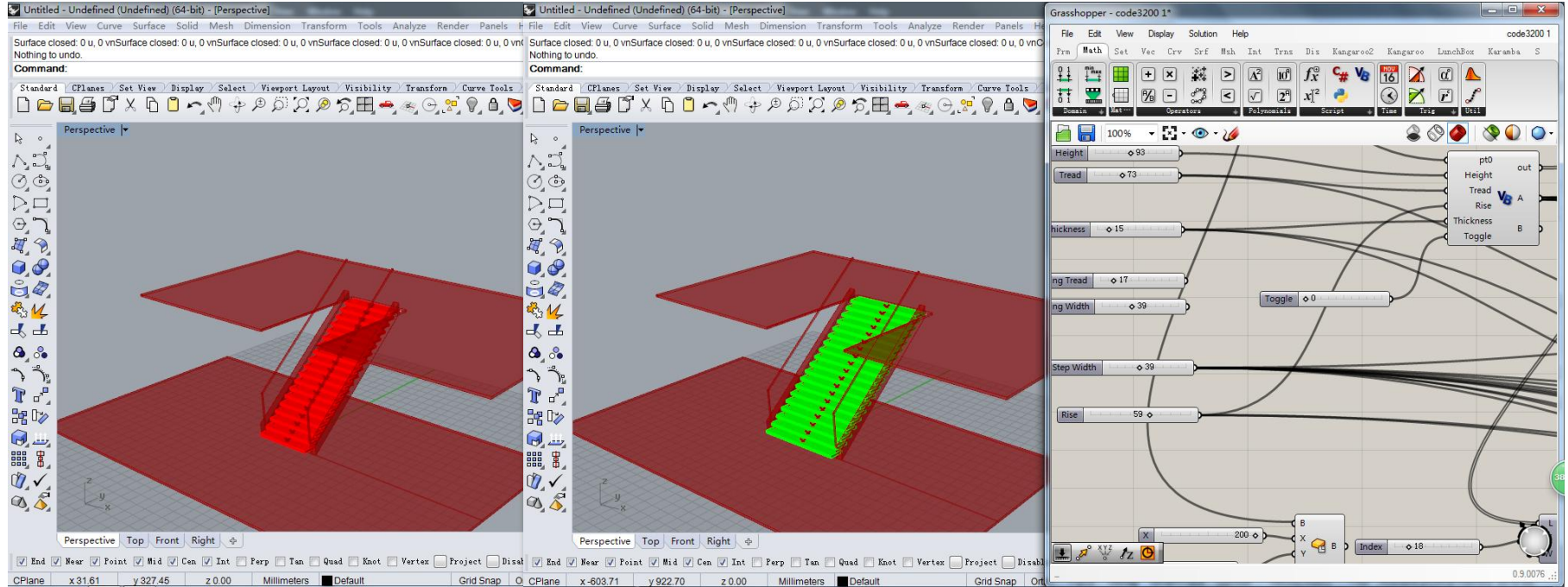
This research is focusing on staircase as an experiment object. The concept of this practice can be developed further for other requirements that needs for visualizing such as walls, bathroom dimensions, ramps and etc.

In this case, the stair requirements are mainly focusing on:

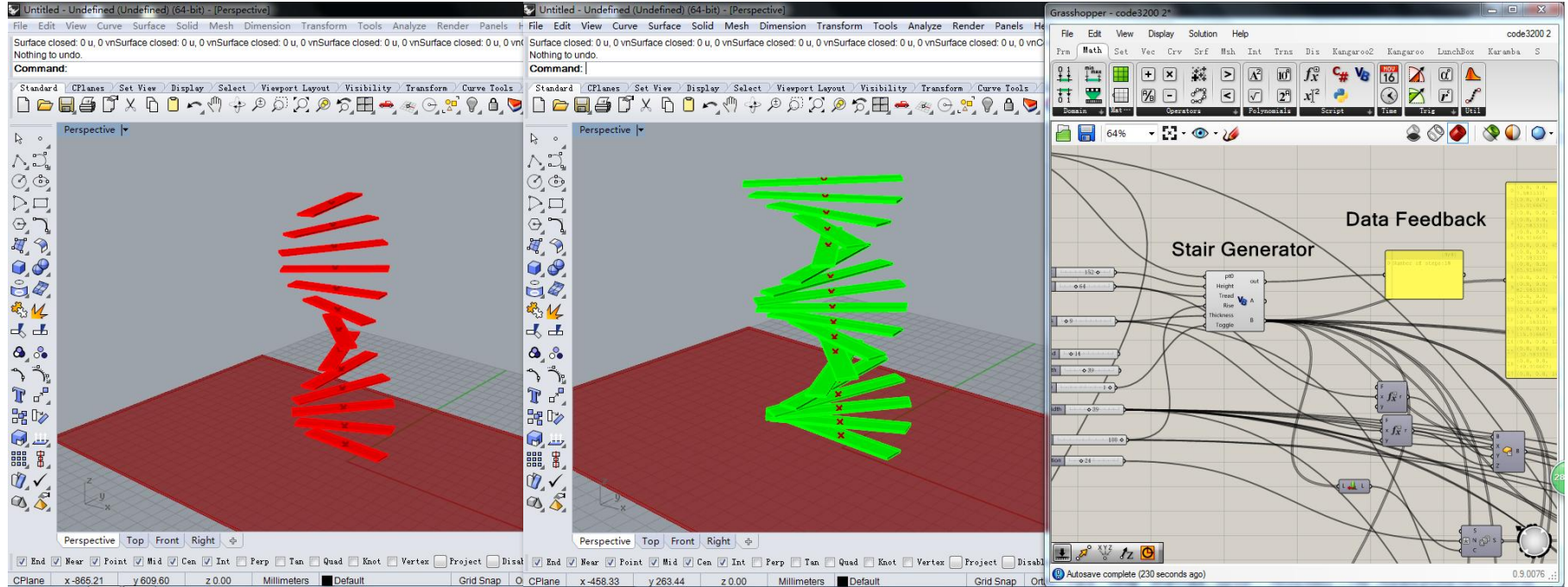
- Number of risers
- Depth of the riser
- Height of the riser
- Width of the stair



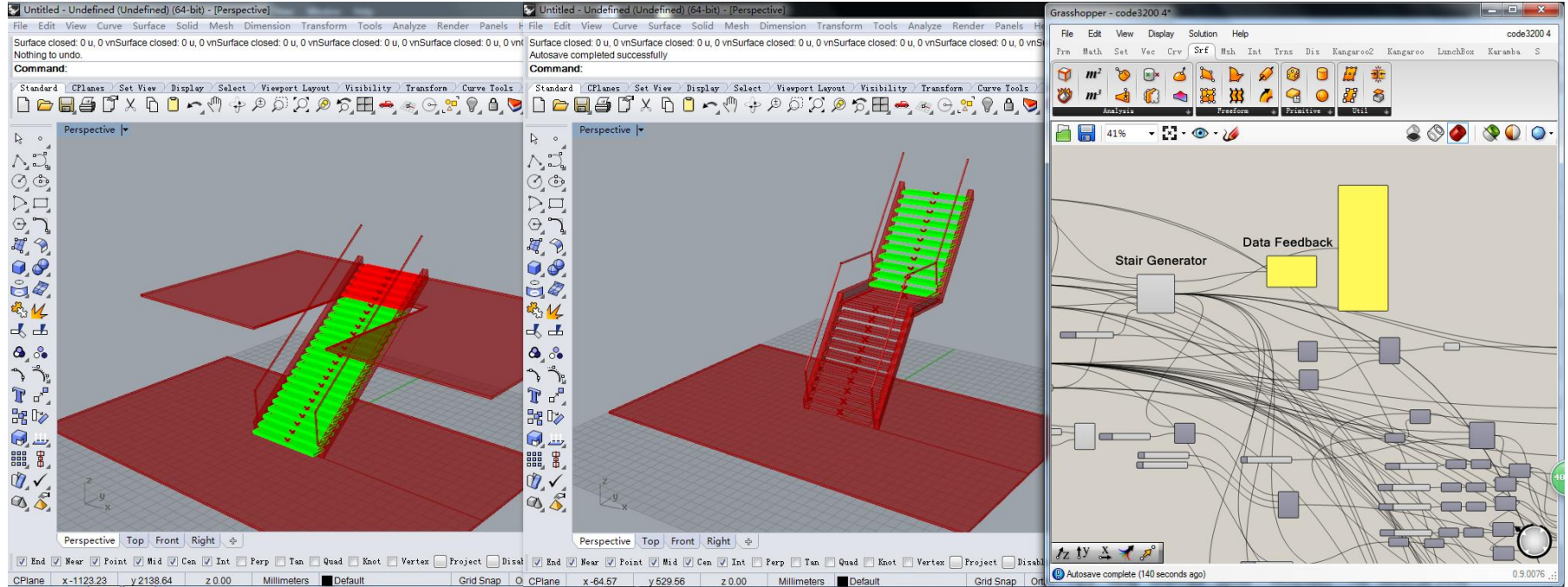
Availabilities



Availabilities



Availabilities



Significance of Research

- The importance of using computational technologies to assist architects and builders to have a better understanding of the Australian Standards
- The architecture industry is currently experiencing a paradigm shift in the process and conceptualisation of design and professional practice
- With these cutting edge technologies developing rapidly, such as Internet of Things (IoT), 3D printing and Interactive technologies are very good resources to assist us in achieving difficult target throughout the development

Evaluation

- Finalizing the workflow/script to upgrade its performance as in adopting with more complex stair models
- Yearly updating requirement from the government
- The practice is hardly to upgrade by itself, a small change of the standard from the government may affect the final outcome
- Produce a wrong design solution to the user may result in a very serious consequence

Conclusion/Future direction

- This research project explores how computational design tools can mitigate against errors in interpreting regulations and assist architects to better understand them
- Visual annotation is easier for user to have a better understanding on different design options.
- Converting data information into 3D modeling is helpful in giving user a visual impression of the design options, also, a better understanding on the regulatory requirements.
- Co-operate with government in order to develop a self-updating data base

Thank you