Arch 529 Preston Pape

Research Paper Outline

For my research paper, I would like to use it as a means to document the research done in the lab project. I have been thinking deeper about what I see the need to accomplish in this course to advance my work towards my thesis and have revised my decision from Tuesday's class.
As I had mentioned previously in the first course meeting, I am intending to use this course a complimentary study alongside Arch 597: Research Practicum. That is, as the technical half to the analytical other. In 597 I am proposing to write a review paper in the general space of algorithms and housing, while my intended thesis area is specifically machine learning (ML) and accessory dwelling unit (ADU) design.

My thesis concept consists of an ML algorithm utilizing shape grammars and/or expert systems to allow for more site-specific (read: high performance) design of ADUs. I intend to divide the project into three scales for introductory research into the topic: site, program/plan, and fabrication. While I was initially discussing delving into the fabrication portion, I do not aim to fully flesh out all three project scales- it would simply not allow me enough focus for effective research. Therefore, I believe it would be much more beneficial if I did pivot, and instead focus on more of the digital side of the research, to focus on the technical portions of ML algorithms.

I intend to use the open-source Google ML framework known as TensorFlow to explore the starting-point ideas of both shape grammars and expert systems. Shape grammars refers to the abstraction of design elements into a semantic ruleset of patterns that both an algorithm or human can interpret and reproduce. On the other hand, an expert system is an early method of artificial intelligence wherein a ruleset is represented in a *knowledge base*, while a logical *inference engine* runs through boolean if/else statements. I intend to look for a way to synthesize these two philosophies.

What I have discovered in some preliminary literature review in research practicum is the resemblance between shape grammars and expert systems as a methodology. Expert systems represent one of the most influential yet simple ways of driving rules-based machine learning algorithms, while shape grammars follow a similar logic, yet based in geometry. However, there is a definite lack of information on using shape grammars in place of expert systems as the driving logic of a rules-based machine learning algorithm. I would like to explore the substitution of/hybrid between shape grammars for/with expert systems logics in machine learning.