**Revised Research Abstract:**

The United States is experiencing an unprecedented housing crisis, resulting in a rising population of unhoused peoples and the inability to become a homeowner or to even afford monthly rent in many cities. Solutions to this dilemma are neither straightforward nor definite. Seattle, Washington; Portland, Oregon; and Vancouver, British Columbia are exploring the use of accessory dwelling units (ADUs) as one method to combat surging housing prices. Use of ADUs is an effective means of increasing housing density without replacing single family housing zones with new multi family residential construction. Additionally, ADUs are often designed to be rented, generating supplementary income for the homeowner. Ten detached ADU (or DADU) designs are pre-approved by the City of Seattle and are freely available online to entice homeowners. However, a 2019 city survey shows that there are calls for an increased focus on sustainability and cost. This research intends to explore whether the use of genetic algorithms via shape grammar methodology to optimize DADU plans to site context, increases building performance or further encourages construction. The proposed methodology begins by reading example site data from the city of Seattle including building and vegetation context and rental/land prices from Seattle GIS and Zillow, respectively. Next, a genetic algorithm explores the design space for a viable floor plan solution based on a fitness function. This fitness function evaluates individual designs according to predefined traits. Traits to evaluate include window to wall ratio, insulation depth/type, ventilation strategy, and shading technique. Locating the correct combination of traits to minimize (or maximize) which results in a higher performance DADU is the desired outcome. Resulting designs will be analyzed and compared via energy performance simulation. The end-goal is to develop a computational tool using the aforementioned system to conduct automated site analysis, as well as parametric generation of DADUs.