

Group 5

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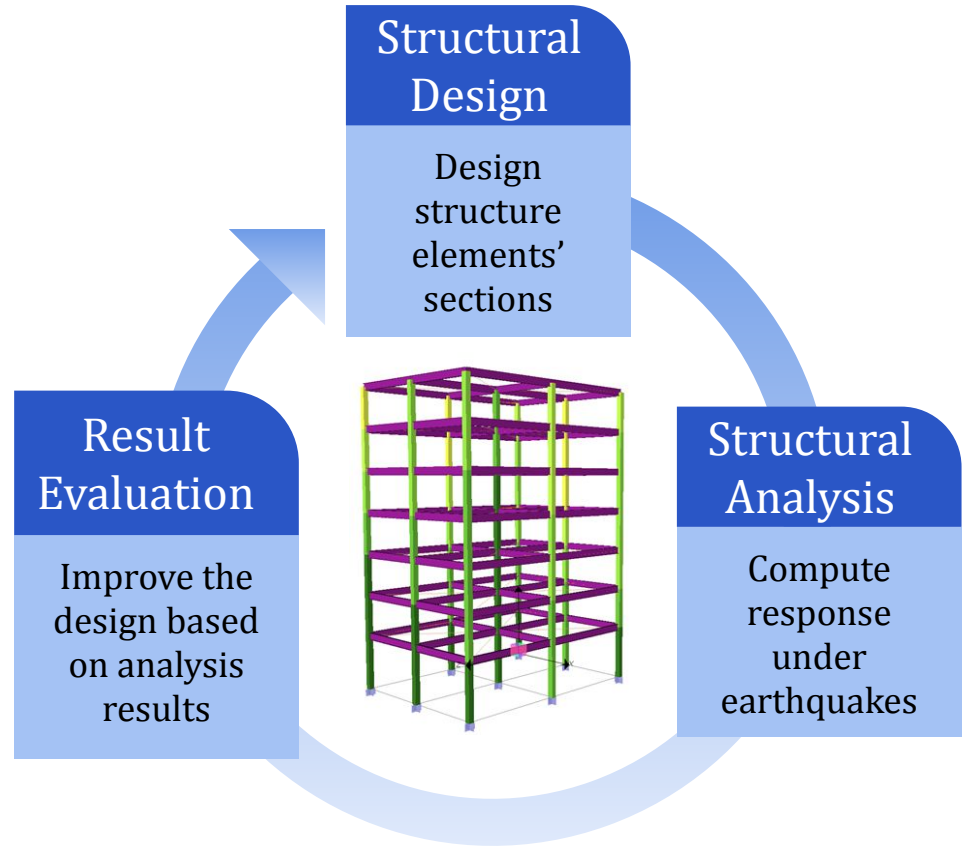


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Motivation & Background

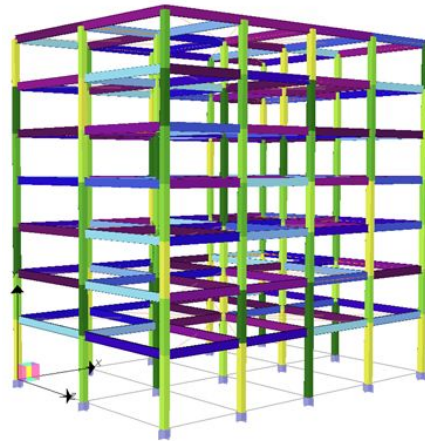
- Structural design is a continuous iterative process, which takes engineers lots of time and effort. The design is hard to be optimized due to the time-consuming structural analysis. However, our ongoing research can speed up the analysis process using AI.
- Hence, without the high cost in structural analysis, we find the potential using AI to optimize the structure design in terms of economical material usage and sufficient seismic resistance.



Target Problem

We form the structural design problem as a series of searching decisions, where

1. each beam/column should have 1 section type assigned
2. the most important elements (ex: 1F columns) will be decided first
3. we can get a design score after all elements are assigned with a section type
4. the design score can be used to improve the design in the next round



Column Types

- HSSQ 16x16x0.875
- HSSQ 16x16x0.75
- HSSQ 16x16x0.625
- HSSQ 16x16x0.5
- HSSQ 16x16x0.375

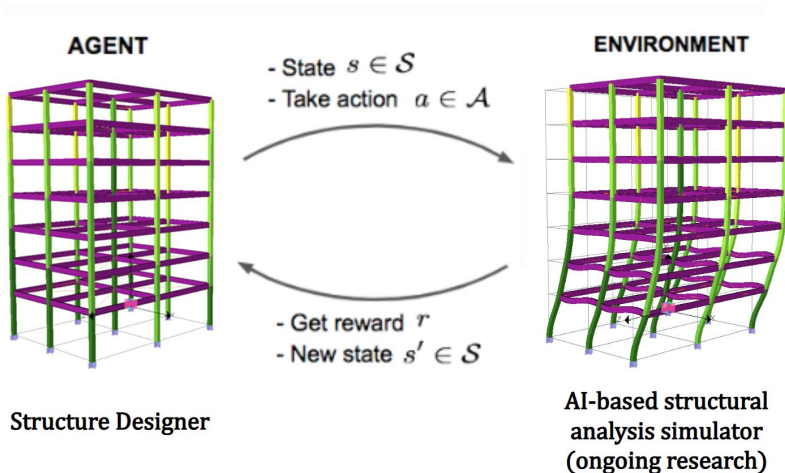
Beam Types

- W 21x93
- W 21x83
- W 21x73
- W 21x68
- W 21x62
- W 21x57
- W 21x50
- W 21x48
- W 21x44

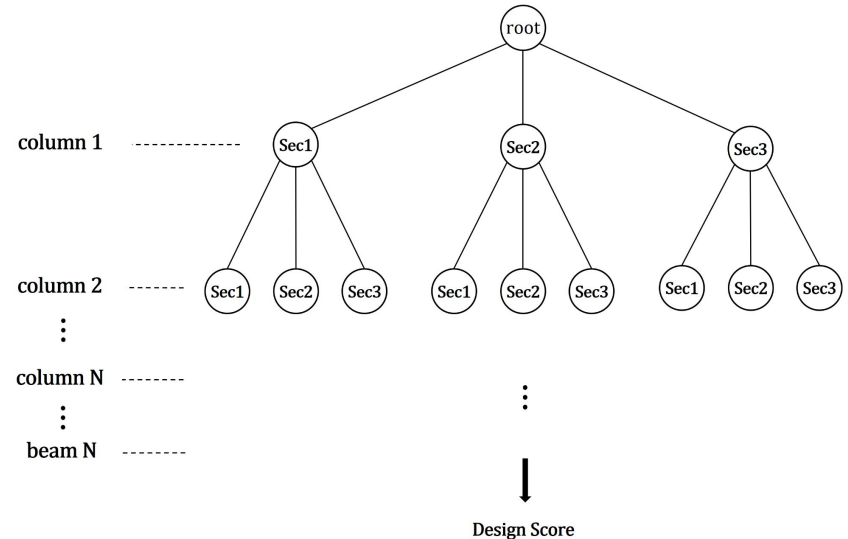
Proposed Solution

We propose using the following methods to make a series of structure section design:

1. Monte Carlo Tree Search
2. Genetic Algorithm
3. Reinforcement Learning



Using RL to optimize structure design



Using MCTS to get good design candidate