**Highlights**

 U-Net learned the neighborhood, gravity, and linear tendency in urban development

 Transition rules are created automatically in the U-Net

 The Landscape Shape Index of simulated and actual urban maps is well aligned

 U-Net achieves similar accuracies to CA-based models in a comparable urbanization context

27th April 2022

To the Editor, Computers, Environment and Urban Systems

Dear Professor Alison Heppenstall,

Re: Revision of CEUS-D-21-00877 Wang et al. "Simulating large-scale urban land-use patterns and dynamics using the U-Net deep learning architecture."

We are very grateful for your interest in our work. We greatly appreciate the valuable comments and suggestions from the reviewers.

We are delighted that reviewers broadly appreciated the significance of our work on introducing deep learning to the simulation of urban land-use changes. We note that Reviewer #1 said that "the subject addressed in this article is worthy of investigation," and Reviewer #2 thought "it is a promising new idea to apply U-Net to urban growth simulation and prediction." We also appreciate the Reviewers' more critical comments and suggestions, which helped us to greatly improve the novelty, reliability, and impact of our research.

Reviewer #1 suggested that we clarify the data used in the study and the description of the two trained models. This reviewer also suggested a consistent use of “urban land-use” throughout the manuscript and several specific modifications regarding the figure layouts, the use of adjectives, etc. In response, we added a table to detailly describe the data used in this study, changed “urban dynamic map, urban map, urban pixels, urban images” to “urban land-use”, and supplemented more descriptions to the figures.

Reviewer #2 advised us to discuss if deep learning helps the understanding of urban land-use change mechanisms and if deep learning had more robust performance than CA-based methods. In responses, we added a discussion on “there are techniques to transform deep learning structures into human-recognizable knowledge. But it is uncertain if these methods can be applied to this study, and, thus, future studies are needed.” Meanwhile, we emphasized that the primary goal of introducing deep learning to urban land-use simulation is to explore how deep learning could add up to, rather demonstrate deep learning is better than, CA-based land-use modeling. We also modified the discussion on comparing deep learning with CA so that readers will be clear that deep learning architecture had learned the urban land-uses patterns and achieved close accuracies as those CA-based models which underwent a length calibration process.

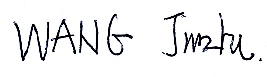
We have addressed each comment one by one as detailed in the attached "Response to Reviewers" document. All comments are reproduced and our responses are given directly afterward in a different color (blue). We have made our best effort to address all reviewer's comments. We believe that these modifications will significantly increase the novelty, reliability, and impact of our research. We kindly ask that if, after considering our responses, the Reviewers and Editors still have further comments on our manuscript, we remain very open to further discussion and revision of the manuscript.

With warm regards.

Yours Sincerely,

Jinzhu WANG, on behalf of all authors

Sincerely, and with warm regards



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