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## Walking through the forests of the future: using data-driven virtual reality to visualize forests under climate change

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摘要

Communicating and understanding climate induced environmental changes can be challenging, especially using traditional representations such as graphs, maps or photos. Immersive visualizations and experiences offer an intuitive, visceral approach to otherwise rather abstract concepts, but creating them scientifically is challenging. In this paper, we linked ecological modeling, procedural modeling, and virtual reality to provide an immersive experience of a future forest. We mapped current tree species composition in northern Wisconsin using the Forest Inventory and Analysis (FIA) data and then forecast forest change 50 years into the future under two climate scenarios using LANDIS-II, a spatially-explicit, mechanistic simulation model. We converted the model output (e.g., tree biomass) into parameters required for 3D visualizations with analytical modeling. Procedural rules allowed us to efficiently and reproducibly translate the parameters into a simulated forest. Data visualization, environment exploration, and information retrieval were realized using the Unreal Engine. A system evaluation with experts in ecology provided positive feedback and future topics for a comprehensive ecosystem visualization and analysis approach. Our approach to create visceral experiences of forests under climate change can facilitate communication among experts, policy-makers, and the general public.

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