

Digital Twin as a Catalyst for Sustainable and Smart City: A Case Study for Austin, TX

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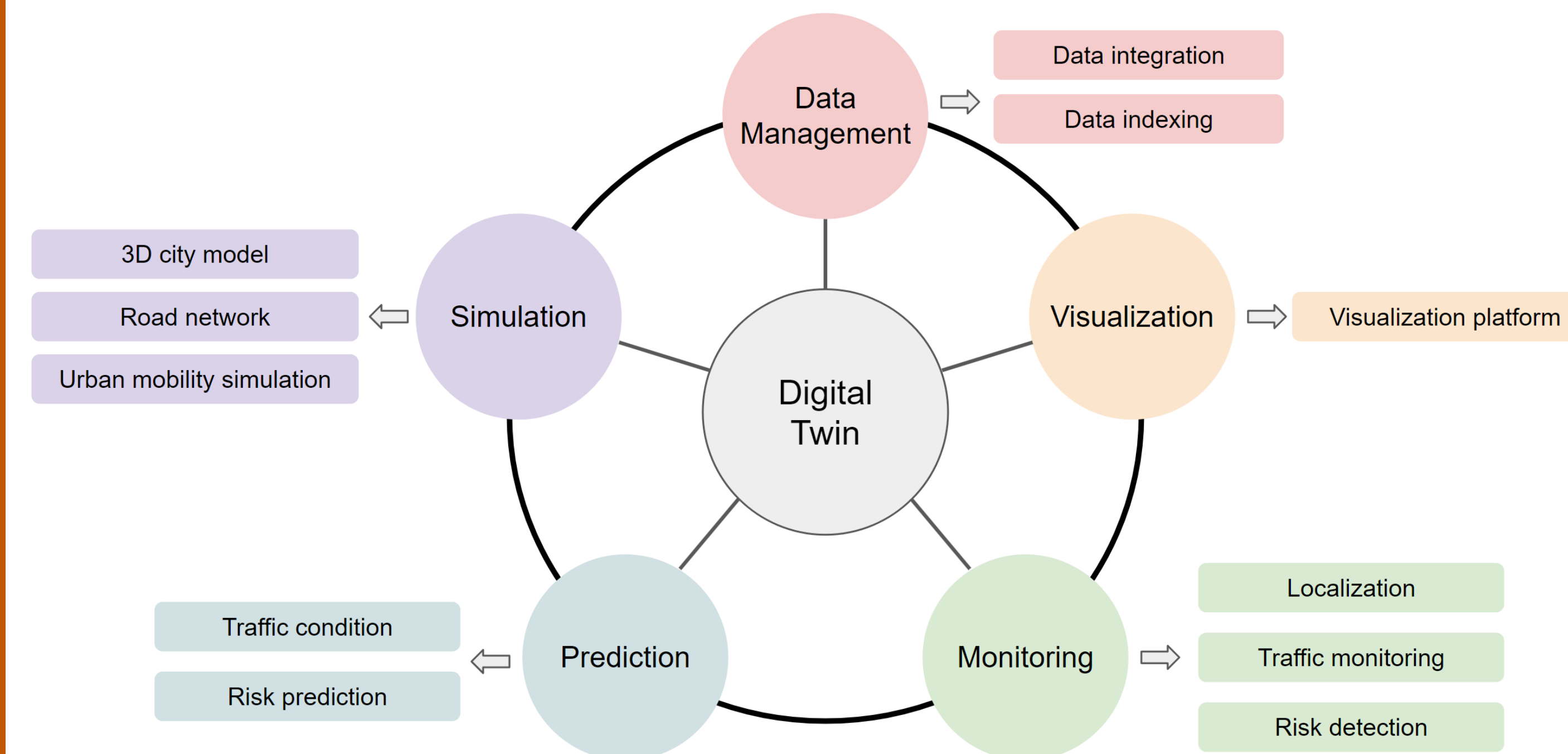
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Introduction

- Digital twin is a **digital representation** of a city or urban environment.
- Digital twin provides tools for city planners and managers to achieve more effective **management**, better **resource allocation**, and more proactive **responses to risks**.
- Digital twin enhances sustainable transportation operation and management by advanced **data management**, **monitoring**, **prediction**, and **simulation** tools.
- We developed an digital twin for **Austin, TX**, which enables multi-source data management, real-time risk detecting, and reliable simulation.

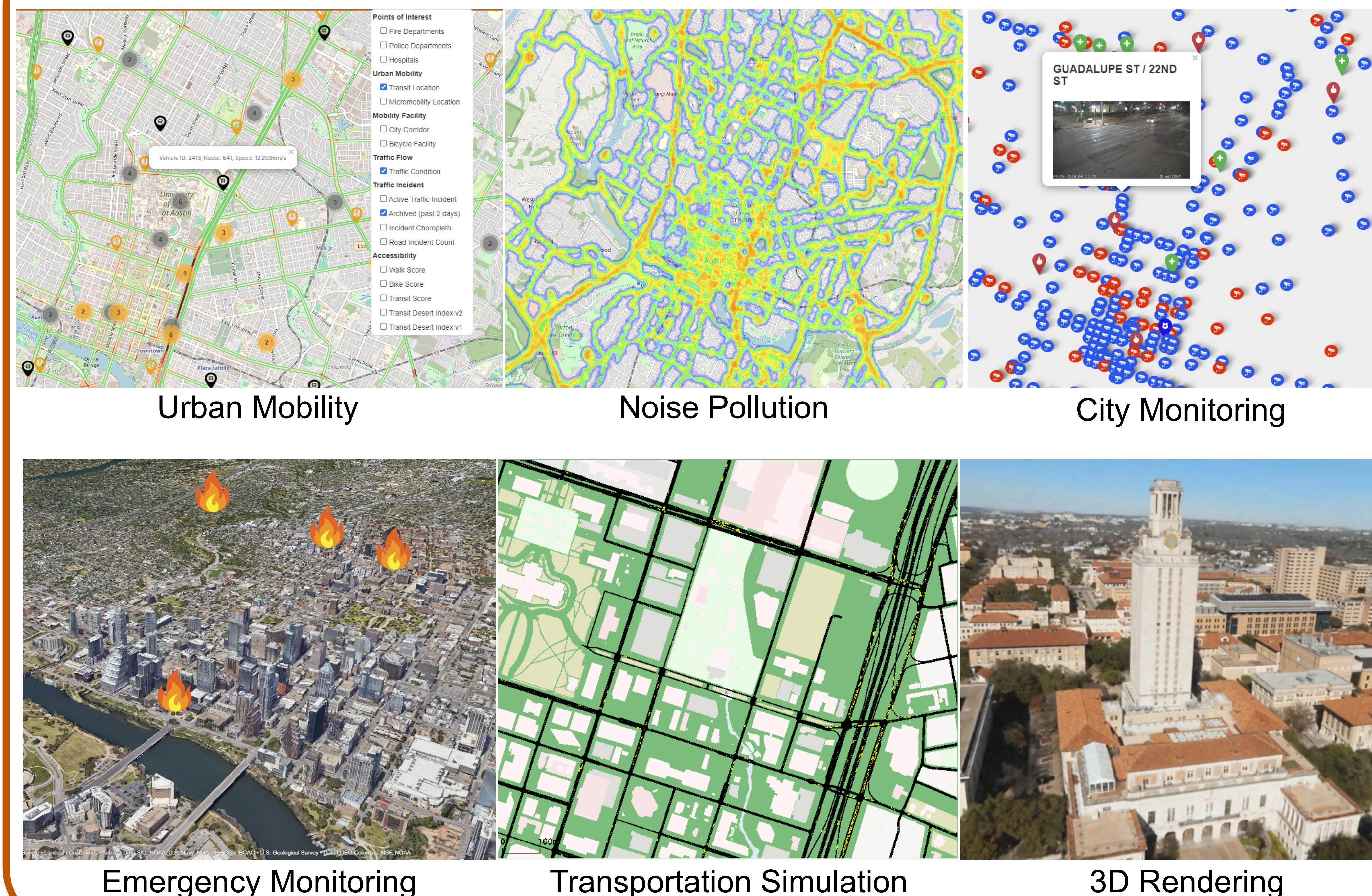


Methods



- The digital twin incorporates a data management and visualization platform, a real-time monitoring system, an integration of predicting models, and a dynamic urban simulation environment.
- The modules interact with each other in real-time and operate synchronously.

Results



Conclusion



- The digital twin consist of multiple layers such as real-time urban mobility status, noise, city monitoring, and emergency.
- The digital twin for Austin has been deployed in a website: <https://austindigitaltwin.com/>.
- Scan the QR code to access our digital twin.

Acknowledgments

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References

- Dembski, F., Wössner, U., Letzgus, M., Ruddat, M., & Yamu, C. (2020). Urban digital twins for smart cities and citizens: The case study of Herrenberg, Germany. Sustainability, 12(6), 2307.
- Austin, M., Delgoshahi, P., Coelho, M., & Heidarinejad, M. (2020). Architecting smart city digital twins: Combined semantic model and machine learning approach. Journal of Management in Engineering, 36(4), 04020026.
- Du, J., Zhu, Q., Shi, Y., Wang, Q., Lin, Y., & Zhao, D. (2020). Cognition digital twins for personalized information systems of smart cities: Proof of concept. Journal of Management in Engineering, 36(2), 04019052.
- Lee, A., Lee, K. W., Kim, K. H., & Shin, S. W. (2022). A geospatial platform to manage large-scale individual mobility for an urban digital twin platform. Remote Sensing, 14(3), 723.
- Bartos, M., & Kerkez, B. (2021). Pipedream: An interactive digital twin model for natural and urban drainage systems. Environmental Modelling & Software, 144, 105120.

Research Goal

- To develop a dynamic and interactive urban digital twin for Austin, TX.
- To help city planners and managers build and maintain a sustainable and smart city.