

HomeView



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Automatically Building Smart Home Digital Twins With Augmented Reality Headsets

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<https://jya.ng/homeview>



Problem

Digital twins are dynamic representations of physical systems, which have demonstrated great capabilities in the industrial setting.

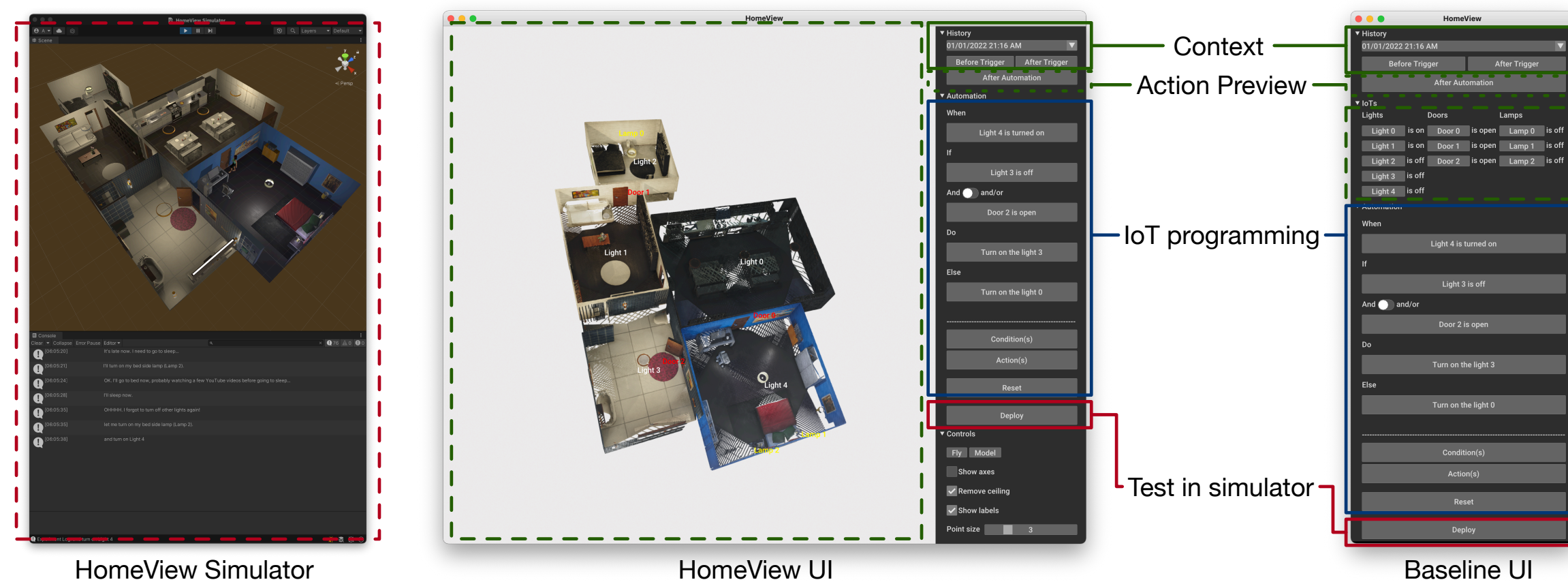
However, building digital twins traditionally have to be manually built by professionals who understand the relationship between sensor data and 3D models. The cost makes it prohibitive for home settings and limited to specific commercial applications.

Evaluation

We evaluate Homeview with a home simulator, where virtual cameras replace the AR headsets.

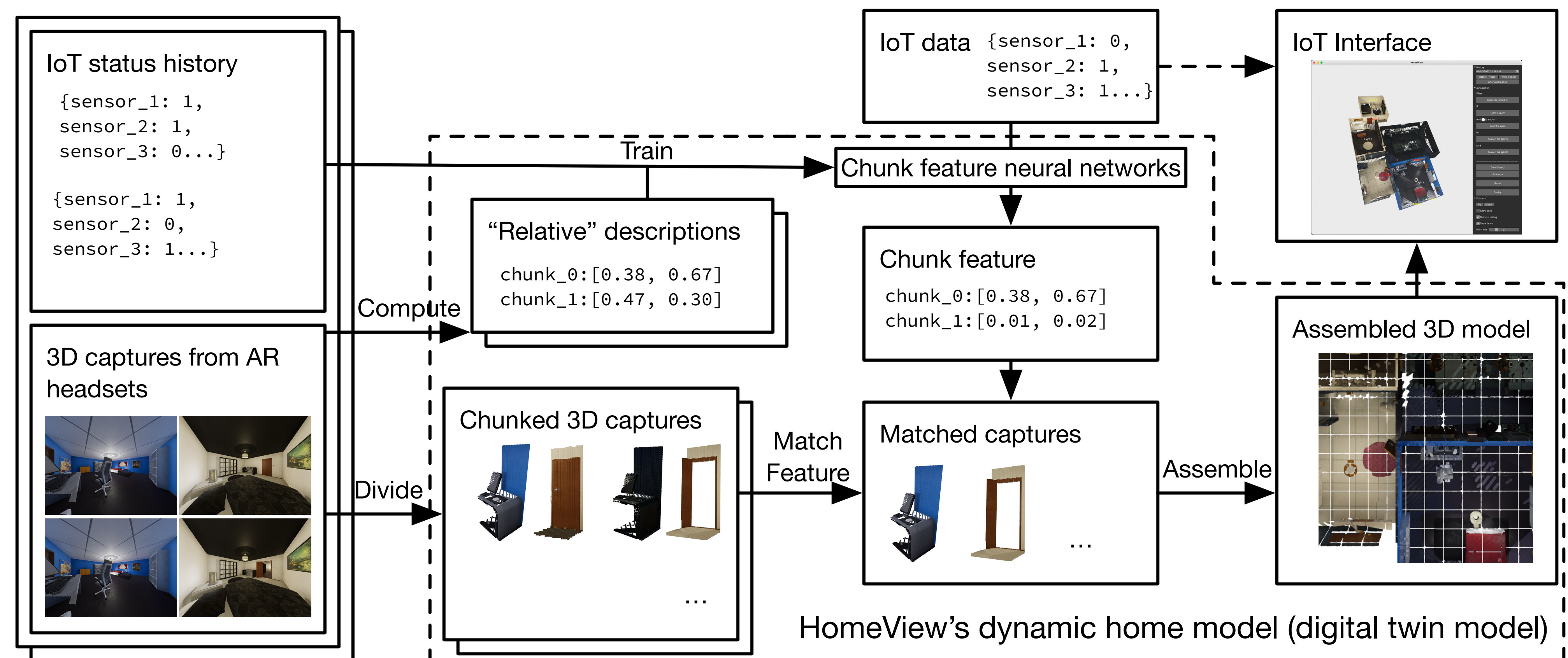
The first evaluation shows that HomeView has better visual fidelity than a baseline retrieve-from-history method.

The second evaluation shows users prefer UI build with HomeView to a baseline UI without visual modeling as it provides more contextual information.



Solution: Auto build digital twins from AR cameras and IoT data

HomeView takes colored point clouds from the AR as well as the corresponding IoT data as inputs, divides the point clouds into chunks, and learns to associate the IoT status with the chunks. In this way, Homeview can assemble new point clouds for any given IoT status.



Applications

1. HomeView is useful when the tenants are not the same as the operator who helps them set up their IoTs (assisted living). Its ability to simulate historical situations allows the operator to have the context and feel situated when they program the automation.
2. HomeView's dynamic model works nicely building-information model (BIM). Building managers can better understand the tenants' needs and program the building to reduce energy costs while not compromising the tenants' experience.