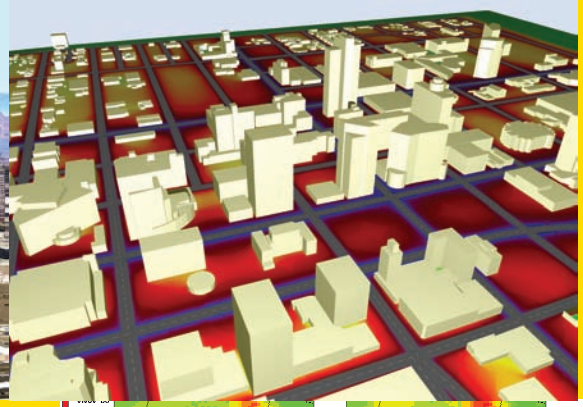
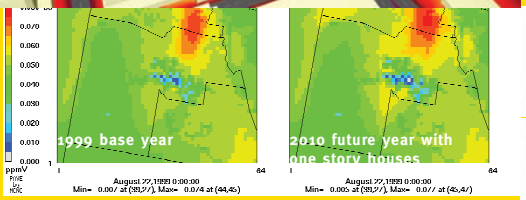
Digital Phoenix:



Noise – Predicted from Development Patterns and Traffic Patterns

[Image: Courtesy Ariane Middel]



Difference of ozone distribution between base & future years

[Image: Courtesy H. J. Fernando]

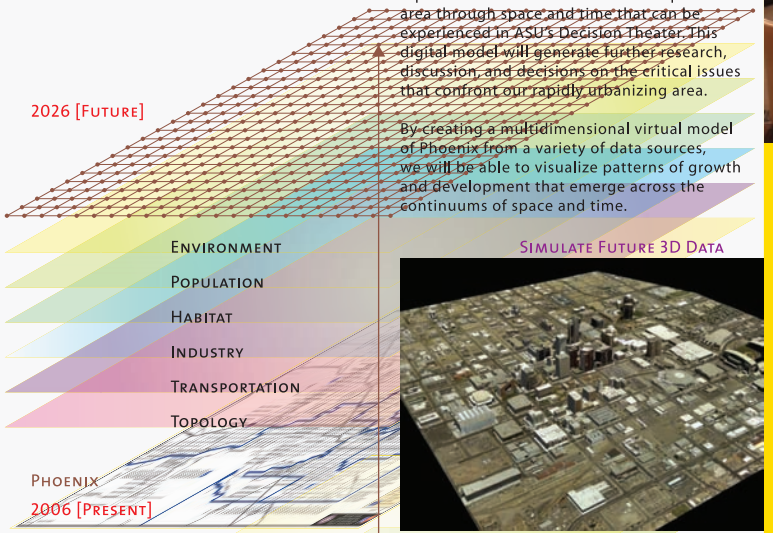
Household increse from 1991 until 2010

Proposed Digital Phoenix Project

The Digital Phoenix Project was created in response to concerns of members of the public, private, and university communities who have expressed a long-term interest in developing and maintaining a high quality of life for this region.

The primary goal of this multiyear project is the development of a realistic digital representation of the Phoenix metropolitan area through space and time that can be experienced in ASU's Decision Theater. This digital model will generate further research, discussion, and decisions on the critical issues that confront our rapidly urbanizing area.

By creating a multidimensional virtual model of Phoenix from a variety of data sources, we will be able to visualize patterns of growth and development that emerge across the continuums of space and time.



Simulate Future 3D Data

The three time components—past, present, and future Phoenix—integrated into a unified framework through common data structures, will leverage the Decision Theater's capabilities.

Develop Current 3D Data

The modeling of future environments will enable the assessment of policy scenarios as they play out in future urban-environmental patterns. A digitally constructed model of the city will also allow us to discover what Phoenix could have been like, starting with historical data as the basis for projecting to the present and into the future.

An immediate objective is the creation of realistic three-dimensional images of the city for navigation purposes.

This visual ground work will allow specialized visualizations for specific studies, such as one that shows patterns of economic development through time.

A multi-dimensional journey through time

Research Components and Methods

The project has three main components:

1. The development of a digital representation of Phoenix in the present. The creation of a digital map of Phoenix requires developing a data repository containing
   - architectural, demographic, and environmental information about Phoenix
   - visualization capabilities to extract and combine information from the data repository and display them in the Decision Theater
   - a software framework that allows for interactive exploration of the data
   - controls to drive or fly through the city and zoom in or out of particular features
   - mathematical capabilities for microsimulation of events to create a living virtual city

These five components will generate a virtual map of Phoenix in the present time and place. To date, no digital archive of Phoenix exists, but a few other cities have maps of the cities in this form. The Virtual London project is the most advanced, containing wire-frame renderings of all buildings.

2. Historical records of Phoenix that can recreate the city at previous points in time
   As we create the ability to digitally document the present, we will also begin to use that information to reach into the past. With the advent of computers, historical information is more and more available in digital formats, but often important qualitative information and details that do not easily convert to digital formats are lost. This project aims to advance the digital archives of Phoenix's history with a specific emphasis on the following objectives:
   - Examine changes in travel behavior and transport modes
   - Trace the evolution of urban form and urban morphology
   - Digitally transcribe the transformation in construction materials, architectural styles, and housing attributes
   - Study historical changes in environmental metrics such as air quality, water availability, and resource use

3. Modeling tools and theories to generate future representations of Phoenix
   We will also create a digital future using Digital Phoenix data and from the Phoenix UrbanSim application currently in development. This will generate scenarios that allow for the creation of "virtual futures." The specific objectives of this component of the Digital Phoenix Project are as follows:
   - Implement "UrbanSim" as a land use, household, real estate, and employment allocation model for Phoenix futures based on a high resolution of available data (150 meters)
   - Implement TranSims to generate traffic patterns and travel behavior to interface with UrbanSim and study travel scenarios
   - Conduct sensitivity analysis on a large range of future scenarios to determine how different policies result in both intended and unintended consequences

What will the built and natural environment of the Phoenix metropolitan region look like in the year 2025 and beyond? How will the decisions we make today impact the future of this region? How can the impacts of these decisions be visualized, analyzed, and communicated to the affected population?

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The Herberger Center for Design Research supports scholarly inquiry and applied research in the College of Design for the disciplines of architecture, industrial design, interior design, landscape architecture, planning, and visual communication design.

Organizational Structure and Management Team

The Digital Phoenix project is a special research initiative of the Herberger Center for Design Research in the College of Design at Arizona State University. The task of visualizing the current physical attributes of Phoenix in a dynamic and immersive environment will be supported by teams from Phoenix Urban Research Laboratory (PURL) and Partnership for Research in Spatial Modeling (PRISM). The Herberger Center for Design Research Urban Simulation and Modeling Lab is already closely associated with the Material Use, Science, Engineering, and Society (MUSES) project at ASU and with the Decision Center for Desert City (DCDC), both of which have had National Science Foundation grants. In addition to the principle collaborators in the research community, the project will also benefit from partnerships with organizations outside ASU, such as the Maricopa Association of Governments (MAG) and the Urban Land Institute (ULI).

The project is led by a small team of principle investigators comprised of leaders from various specialized components of this project. The team leaders will be supported by a larger group of faculty investigators who will be called upon to develop specific tools and engage in related research questions within individual components.

The project is also well connected to strategic Arizona State University research initiatives and to the various regional and municipal institutions that serve the public and work to enhance the quality of life in metropolitan Phoenix.

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