

# Tour into the Picture

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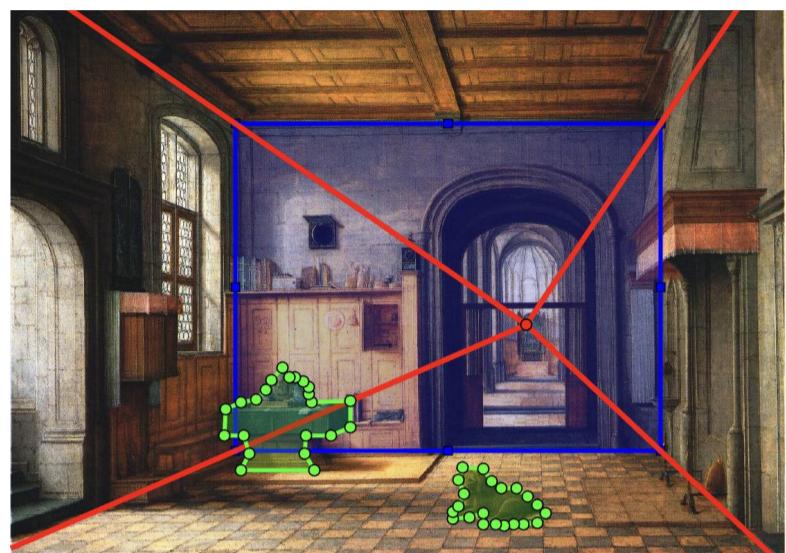
## Motivation

- Simplifying animation creation from 2D images
- Enhancing accessibility of animation tools: expanding applications of 2D to 3D animation
- Optimizing user experience in animation tools

## Research Questions

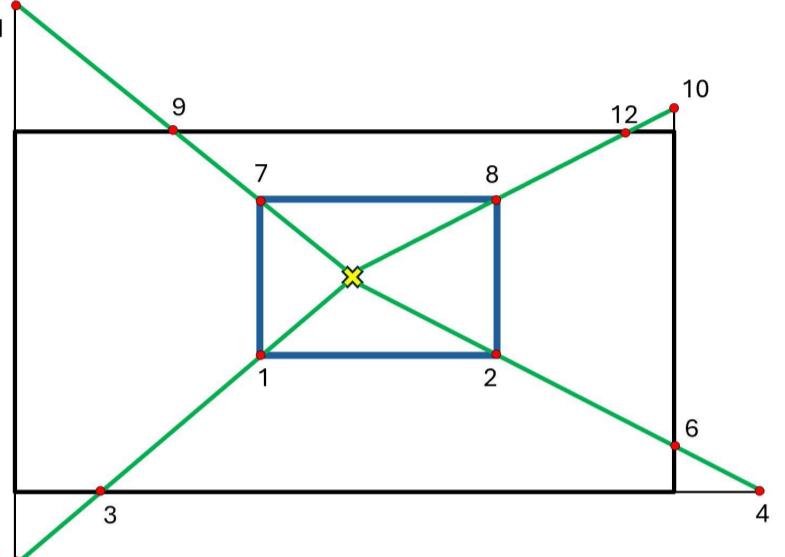
- How can we effectively convert a single 2D image into a navigable 3D-like model?
- What techniques can be employed to ensure the accuracy and reliability of the 3D scene model generated from a single 2D image?

## User Interaction



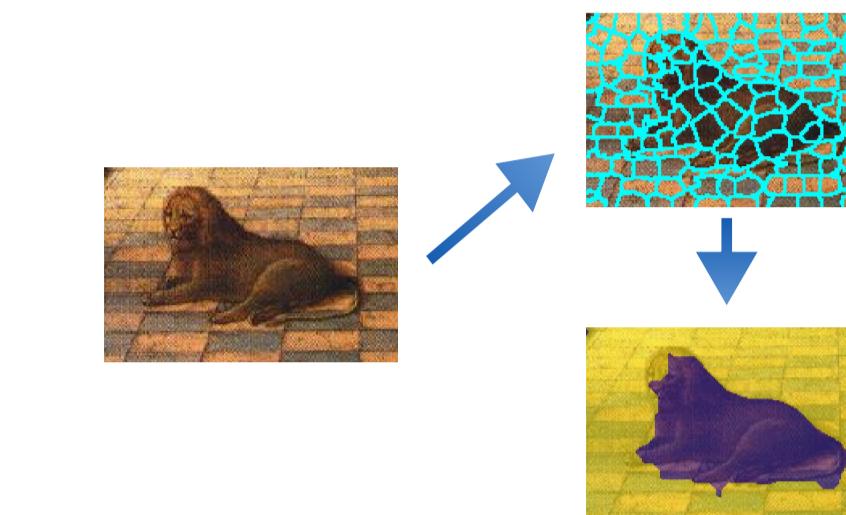
**Approach:** User-friendly window  
**Challenges:** Varying image sizes, accurate user inputs are crucial  
**Solutions:** 1-window solution, visual help for user input using vanishing lines, tests for valid user input

## Room Dimensions



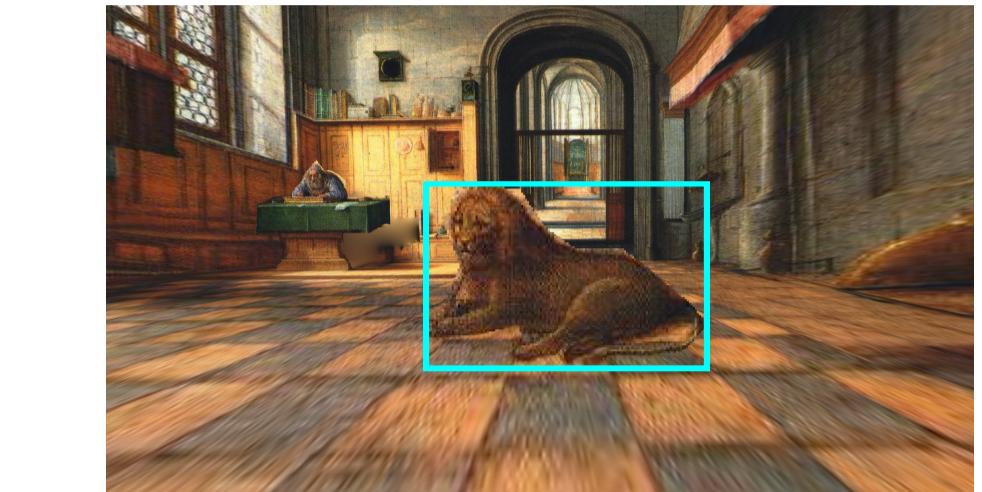
**Approach:** Compute vertices of spidery mesh and relative depths  
**Challenges:** Accurate scaling of relative dimensions, quality vs runtime  
**Solutions:** Use pixel counts for initial orientation and apply scaling adjustments afterward

## Foreground Objects



### Segmentation

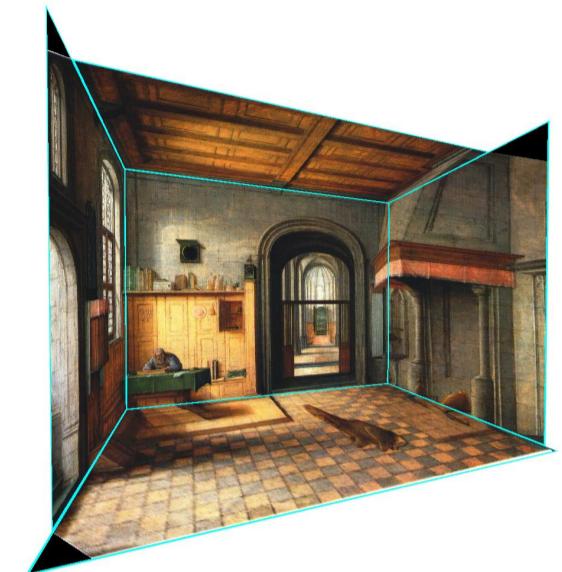
**Approach:** Refine user polygon input by foreground segmentation  
**Challenges:** Fragmented or incomplete object boundaries  
**Solutions:** Use GrabCut algorithm operating on super-pixels [2] to improve rough user estimation



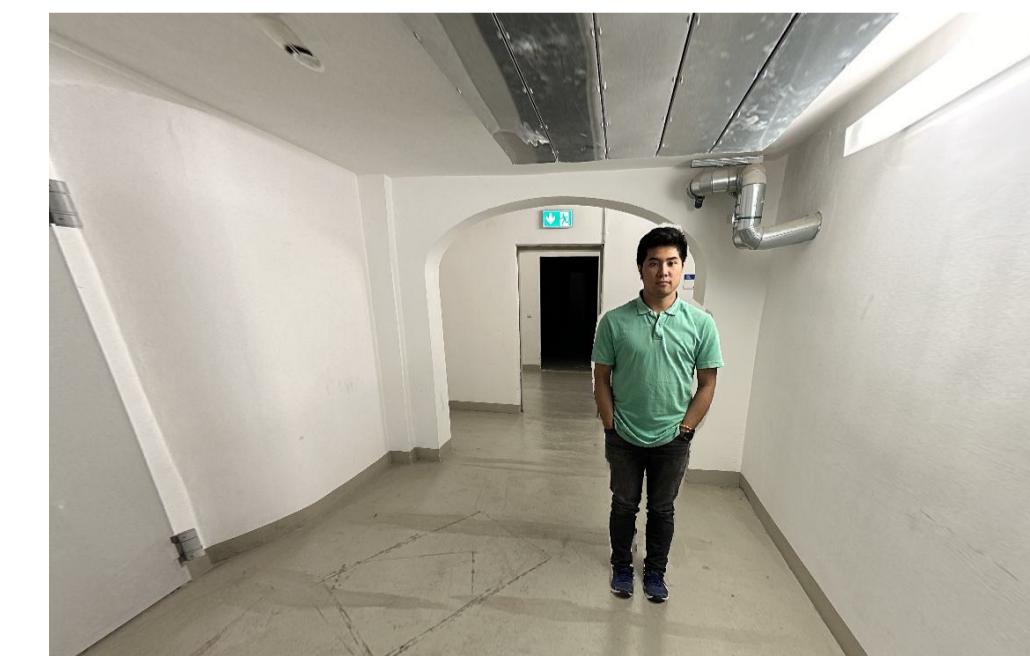
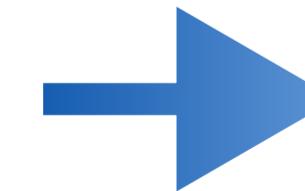
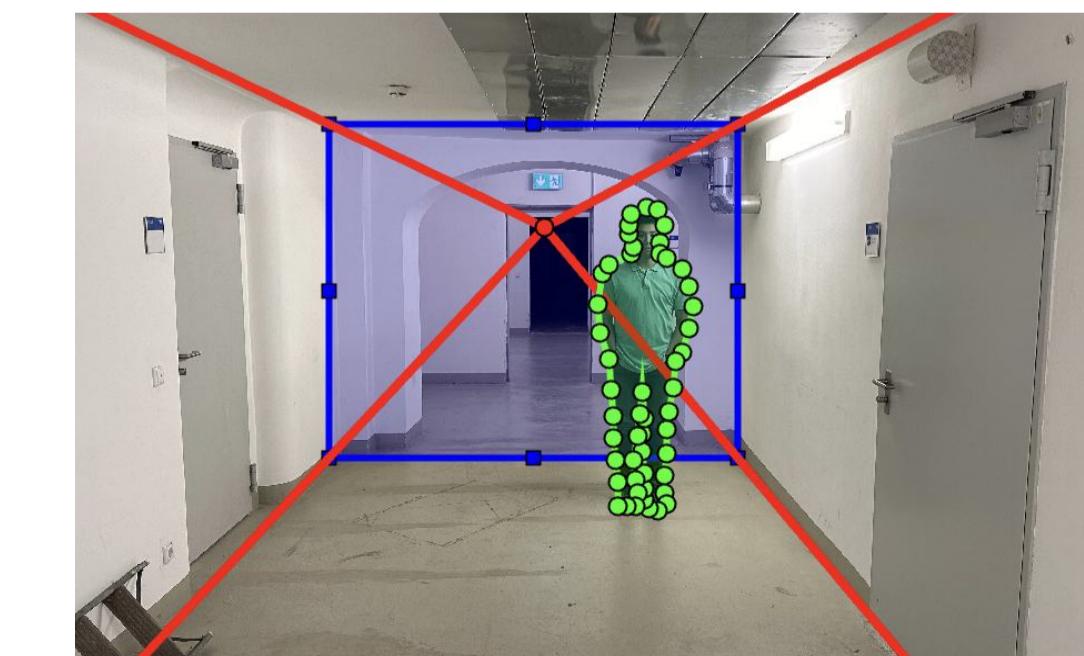
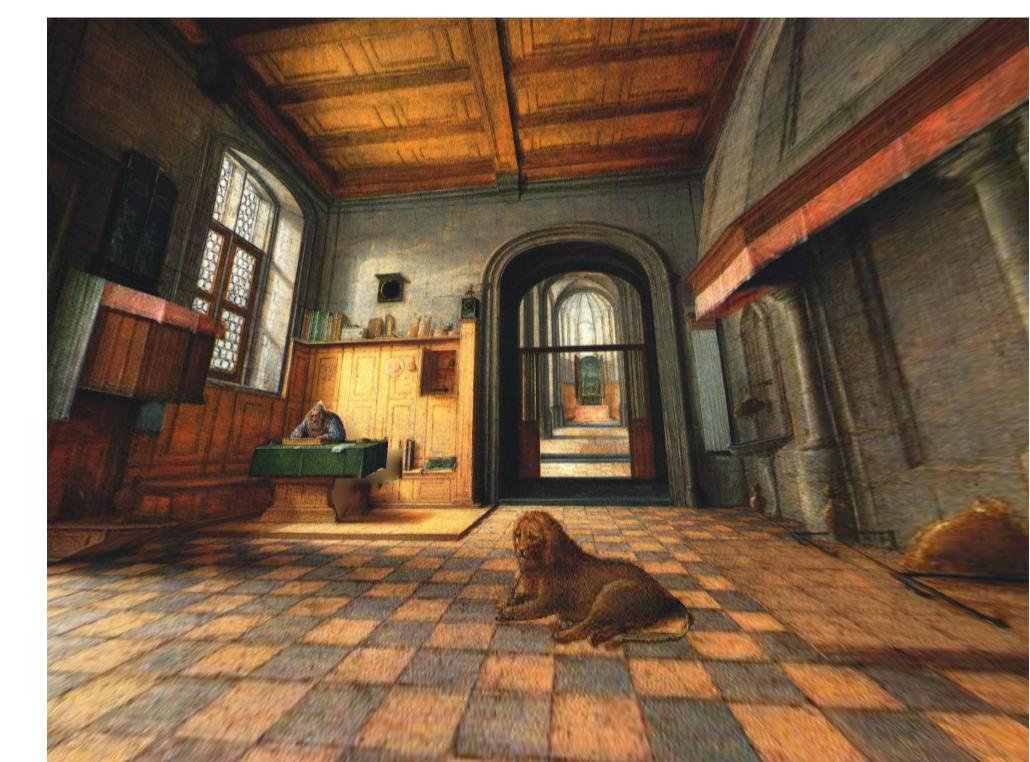
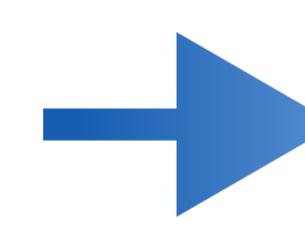
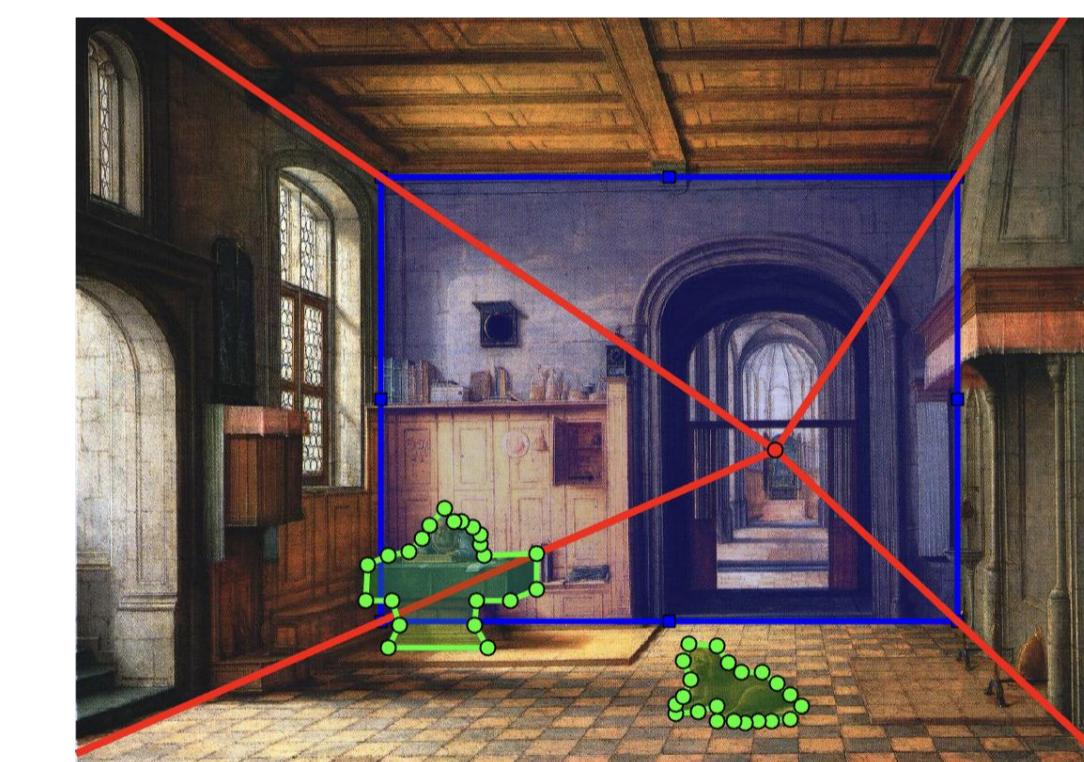
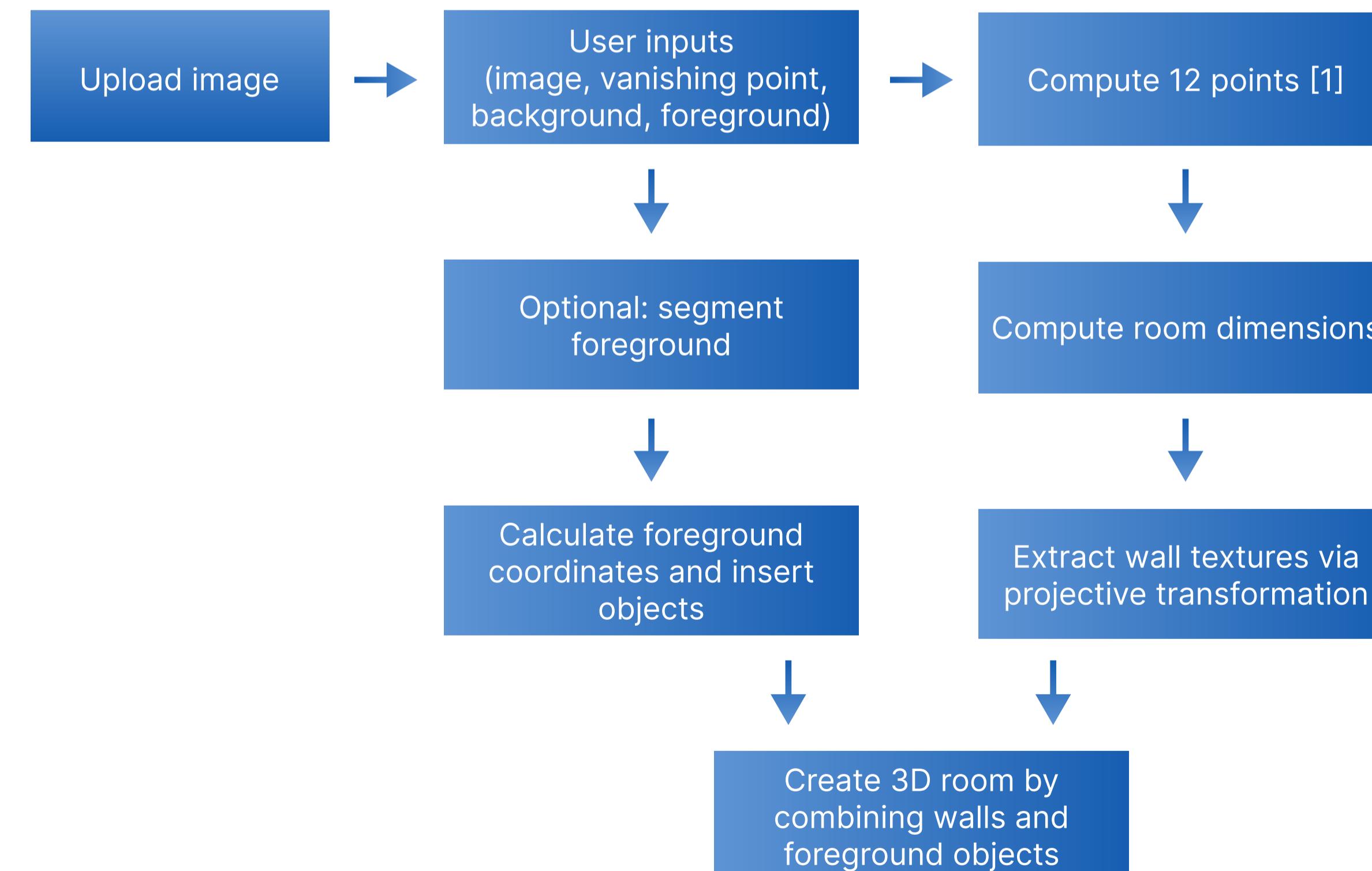
### Positioning

**Approach:** Insert 2D foreground image in 3D plot as scaled rectangle  
**Challenges:** Determine which wall the object is attached to  
**Solutions:** Utilize cross product of object rectangle corners with the vertices of the trapezoid

## 3D Room



**Approach:** Create 3D room visualization with 5 rectangular wall segments  
**Challenges:** Get rectangular walls  
**Solutions:** Use projective transformation to obtain viewpoint-independent textures



[1] Horry, Y., Anjyo, K.I. and Arai, K., 1997, August. Tour into the picture: using a spidery mesh interface to make animation from a single image. In Proceedings of the 24th annual conference on Computer graphics and interactive techniques (pp. 225-232).

[2] Rother, C., V. Kolmogorov, and A. Blake., 2004. "GrabCut - Interactive Foreground Extraction using Iterated Graph Cuts". ACM Transactions on Graphics (SIGGRAPH). Vol. 23, Number 3, pp. 309-314.

[3] Goshtasby, Ardeshir, January 1986. "Piecewise Linear Mapping Functions for Image Registration." Pattern Recognition 19, no. 6: 459-66