Tour into the picture

Wenbo Ji [1]   Xiang Ji [1]   Hongru Li[1]   Yuming Li[1]   Shilin Zhang [1]

[1]Technical University of Munich
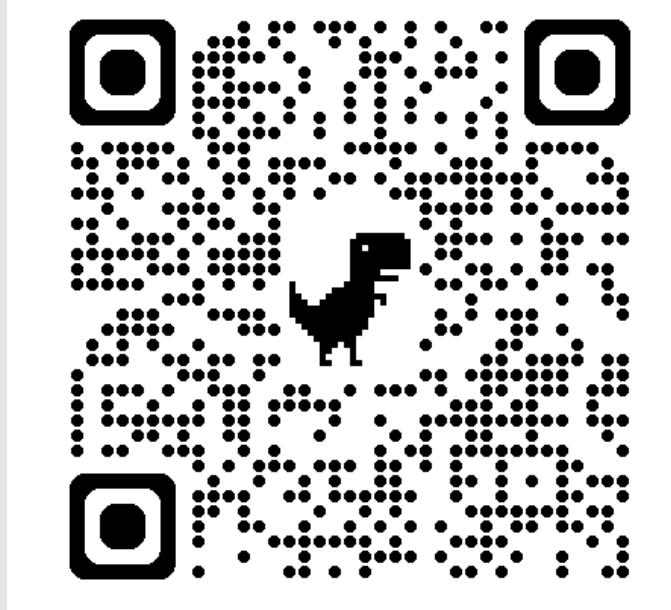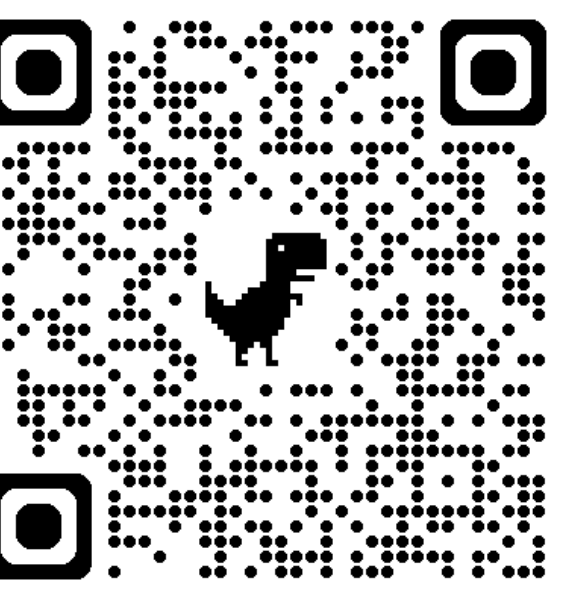
Motivation

Based on "Tour into the Picture" (TIP) [2] approach, we aim to develop autonomous algorithms that infer two key structures from a single 2D image: the regular, program-like textures or patterns on 2D planes and the 3D positioning of these planes within the scene.

For example, from a single Metro Station image in Fig.1, we can infer the camera pose, partition the image into distinct planes (walls, floor, ceiling, and far plane), and recognize repeated patterns.
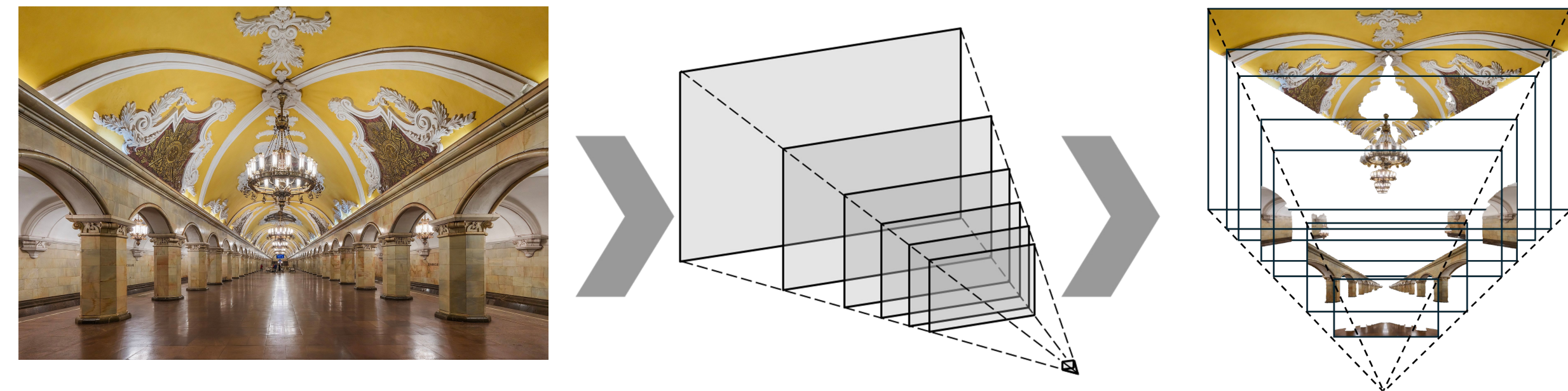
Contributed by **Hongru Li**.

Figure 1. Illustration of Image Decomposition - Wenbo Ji

Introduction

The project aims to develop a graphical user interface (GUI) that allows users to extract a simple scene model from a single 2D image, facilitating easy animation and scene manipulation.

Contributed by **Shilin Zhang**.

Algorithm Structure

Step 1: Data Selection
GetDatasetList.m – read data folder

Step 2: Image Decomposition
getForegroundPoints2D.m - get coordinates of Foreground bounding box

Tool Functions
find_corner.m – draw lines
addBorder.m – draw border of image

Step 3: Spidery Mesh
Model Background
get2DPoints.m - compute the 2D points of walls
get3DPoints.m - compute the 3D points of walls
foreground_3D.m – compute 3D ponts of Foreground
splitTrapezoid.m – decomposite walls

Step 4: Time to tour
Model Transformation
transRectVertices.m - compute new vertices
getTransCoordinates2D.m - compute new vertices
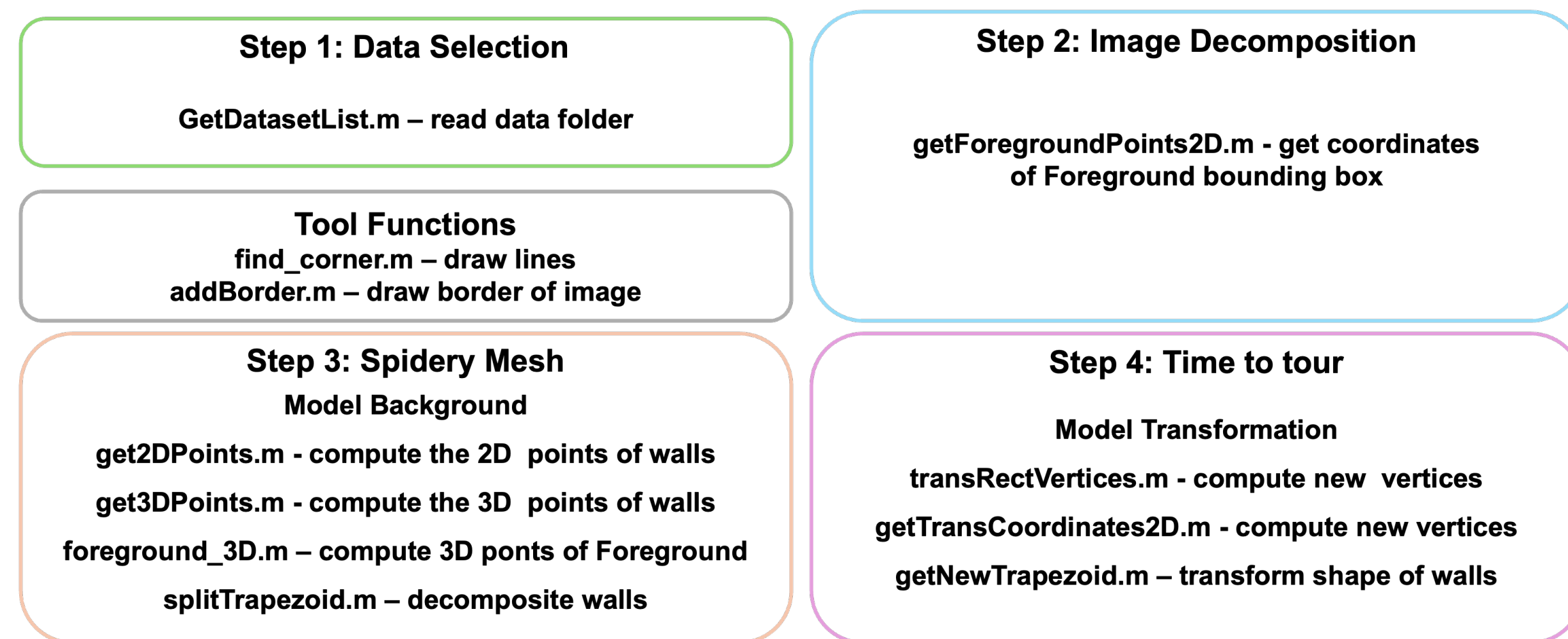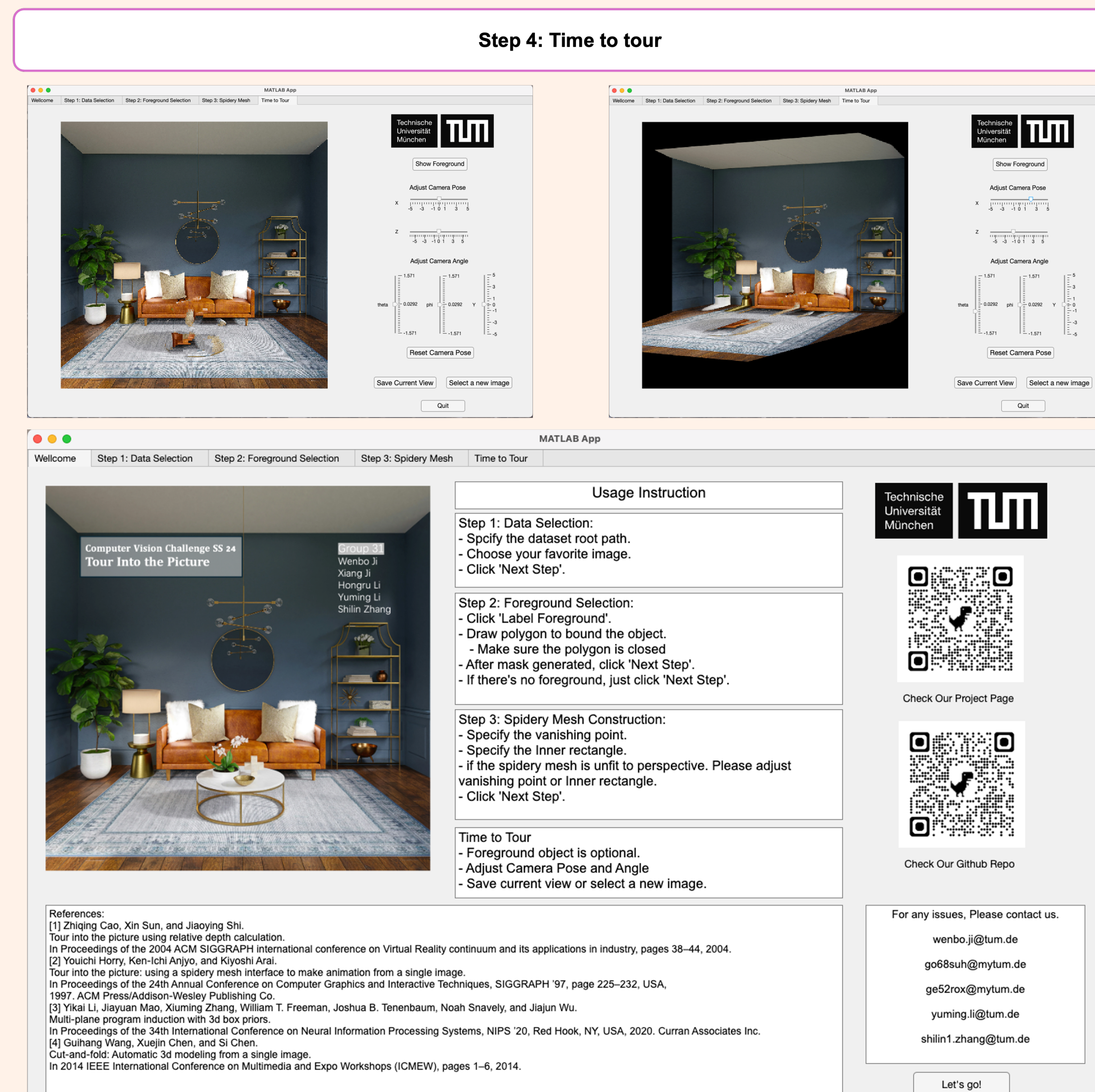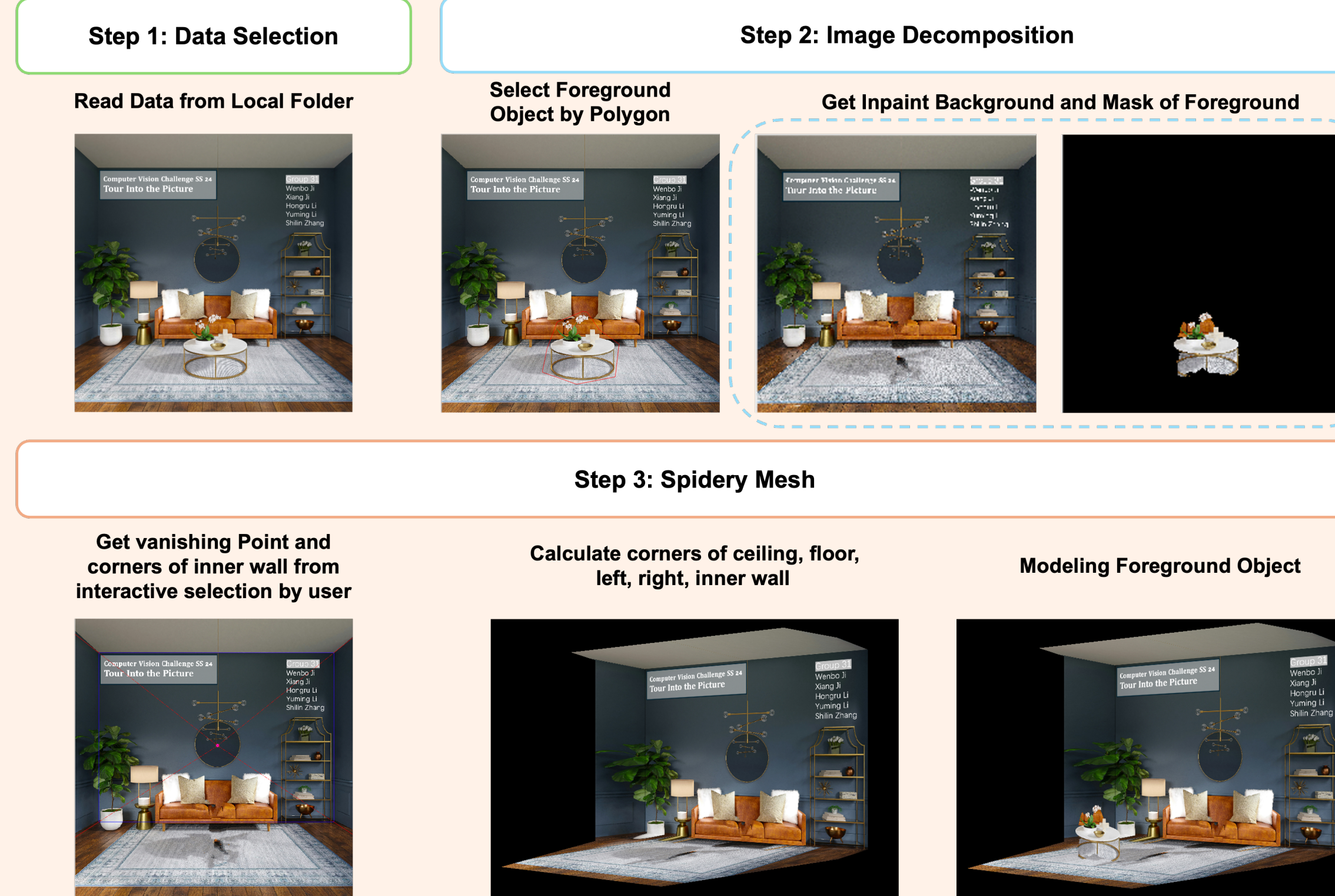getNewTrapezoid.m – transform shape of walls

Figure 2. Illustration of Algorithm Structure - Wenbo Ji

Challenge & Solution

- **Blurry Inpainting of Background** The segmentation of foreground objects can't get clean result. Also the inpainting of background sometimes fail to restore the occlusion areas.
- **Possible Solution** We can employ new inpainting method such as diffusion-based Network.

Contributed by **Wenbo Ji**.

Method

Step 1: Data Selection

Read Data from Local Folder

Step 2: Image Decomposition

Select Foreground Object by Polygon

Get Inpaint Background and Mask of Foreground

Step 3: Spidery Mesh

Get vanishing Point and corners of inner wall from interactive selection by user

Calculate corners of ceiling, floor, left, right, inner wall

Modeling Foreground Object

Step 4: Time to tour

Contributed by **Wenbo Ji**.

Experiment Results

Contributed by **Yuming Li**.

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