Appendix A.

Image segmentation comparison and score calculation for four frames of the path planning task.

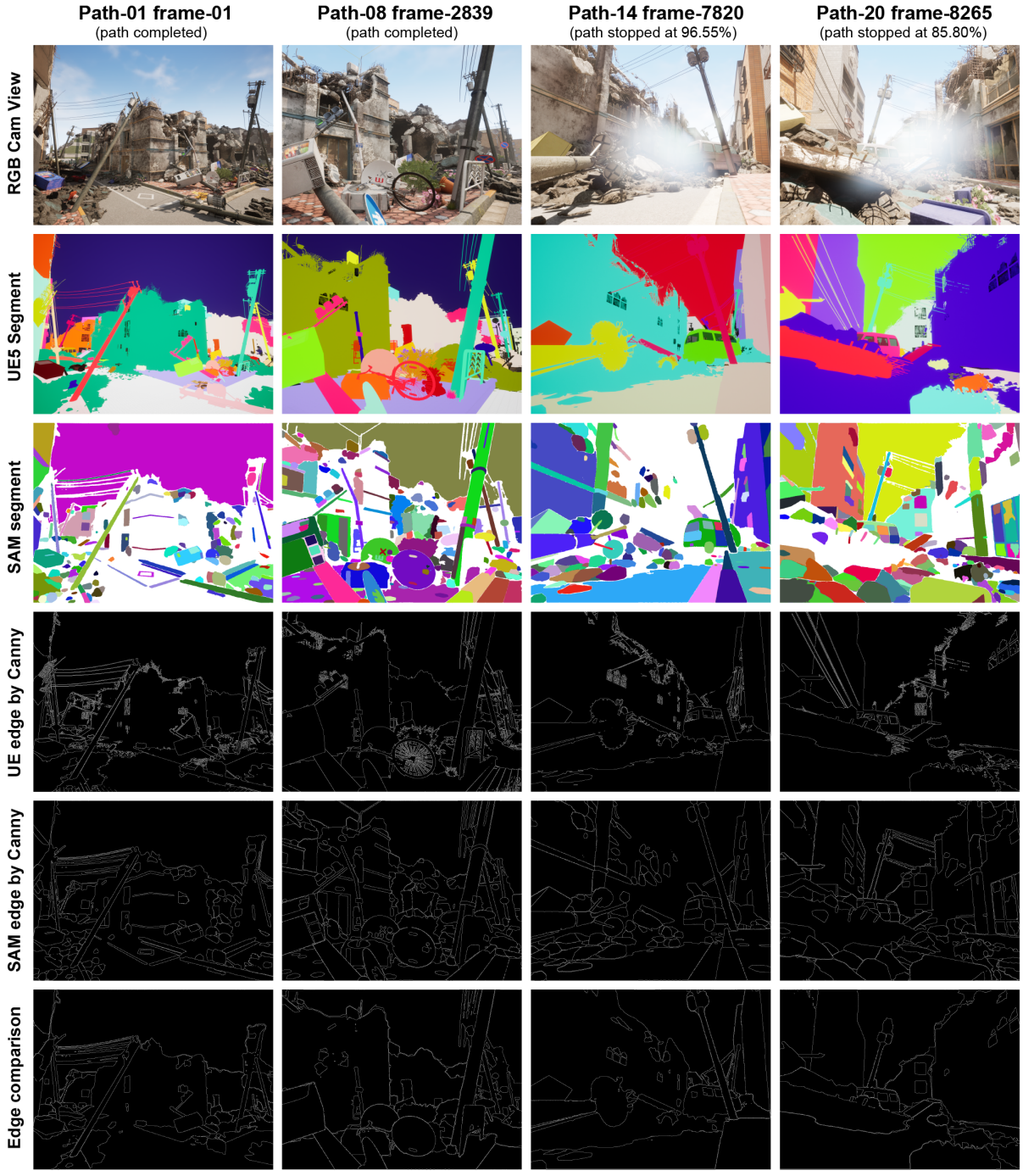

Figure 8: *Comparison of image segmentation and score calculation for 4 typical paths.* ***Row 1:*** *Synthetic RGB camera shot.* ***Row 2:*** *Object image segmentation using UE5 built-in camera post-processing material (ground truth).* ***Row 3:*** *Image segmentation of the RGB shot image using the SAM model.* ***Row 4:*** *UE segmentation edge map calculated using the Canny algorithm with edge dilation.* ***Row 5:*** *SAM segmentation edge map calculated using the Canny algorithm with edge dilation.* ***Row 6:*** *The segmentation score was calculated as the proportion of overlapping edge pixels to the total edge pixels in the UE segmentation.*

Appendix B.

Algorithm 1 Constraint Force Implementation in UE using C++

Inputs: Building model, Virtual terrain, Earthquake waveform data ("BH1", "BH2", "BHZ")
Output: A simulated environment where buildings are anchored to moving terrain based on real earthquake data.
procedure ANALYZEFOUNDATION(Building model)
    Extract the building model's foundation shape.
    Compute planar geometry to represent the foundation.
    Identify edge transitions and major inflection points on the planar shape.
    return List of identified points for PCA placement
end procedure
procedure BINDBUILDINGTOTERRAIN(Building model, Virtual terrain)
    Load building model and virtual terrain into UE environment.
    Initialize "Physics Constraint Actor" (PCA) based on UE physics system.
    foundationPoints = ANALYZEFOUNDATION(Building model)
    Set initial PCA at the first point from foundationPoints.
    for each subsequent point in foundationPoints **do**
        if distance to previous PCA exceeds threshold **then**
            Set a new PCA at this point.
        end if
    end for
    Estimate building volume distribution.
    Create a foundation weight map based on volume distribution.
    Determine anchor force magnitudes for each PCA based on the weight map.
    Bind building foundation to virtual terrain using PCA.
end procedure
procedure SIMULATETERRAINMOVEMENT(Earthquake waveform data)
    Map earthquake waveform data ("BH1", "BH2", "BHZ") to "X", "Y", and "Z" axes of terrain movement.
    Set waveform frequency (e.g., 40 Hz from IRIS database).
    Implement three different frame rates in UE (40 FPS, 90 FPS, and 240 FPS).
    For 90 and 240 FPS, generate data using the wavelet interpolation algorithm.
    Execute terrain movement simulation based on mapped waveform data.
end procedure

Appendix C.

Table 3: *Success Rates of DRL SLAM Path Planning andAccuracy of Image Segmentation edges for 20 Targets*

Tgt. Pt.	**Path Plan.**	**Edges Acc.**			
		UE Segment		UE + SAM	
		Ker. 25	**Ker. 50**	**Ker. 25**	**Ker. 50**
1	Complete	81.2%	91.9%	89.9%	96.0%
2	Complete	76.3%	86.7%	88.6%	93.5%
3	Complete	79.2%	89.8%	87.9%	94.2%
4	Complete	75.6%	85.9%	86.8%	92.6%
5	Complete	82.5%	92.7%	90.8%	97.5%
6	Complete	71.8%	82.4%	85.0%	91.3%
7	85.4%	70.4%	81.1%	84.7%	90.8%
8	Complete	7k6.9%	87.3%	96.4%	99.1%
9	Complete	79.9%	90.1%	89.5%	96.7%
10	Complete	81.0%	91.4%	90.6%	96.3%
11	Complete	80.2%	91.6%	90.4%	96.4%
12	Complete	81.6%	91.5%	89.9%	96.5%
13	Complete	80.7%	92.2%	90.2%	96.6%
14	96.55%	78.8%	90.1%	87.9%	95.2%
15	Complete	81.3%	91.8%	90.0%	96.8%
16	Complete	80.9%	91.7%	90.5%	96.1%
17	92.21%	72.4%	85.0%	89.3%	94.9%
18	Complete	80.6%	91.4%	89.8%	96.7%
19	Complete	80.8%	91.9%	90.7%	96.3%
20	85.80%	74.2%	86.2%	90.4%	95.5%