Synthetic Gallery

A generative content space to visualize associative thinking based on spatial exploration

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Introduction

Synthetic Gallery is a spatial generative system that monitors the user's spatial viewing behavior to develop a growing 3D virtual gallery. We complemented our own spatial content preference calculations with some existing notions in 3D gaze visualization [Stellmach, Nacke and Dachselt, 2010] to develop new gallery rooms with content that are endlessly self-generated. At the same time, it visualizes the resulting creative associative thinking - the mental process of making associations between subjects, without necessarily drawing on past experience [Casakin, 2011], - as a an interactive trail. To this end, three crucial developments are explained: 1) the room's design, suitable for replication and generation, 2) capturing user's preference based on spatial viewing, and 3) the users viewing history - "Your Trail".
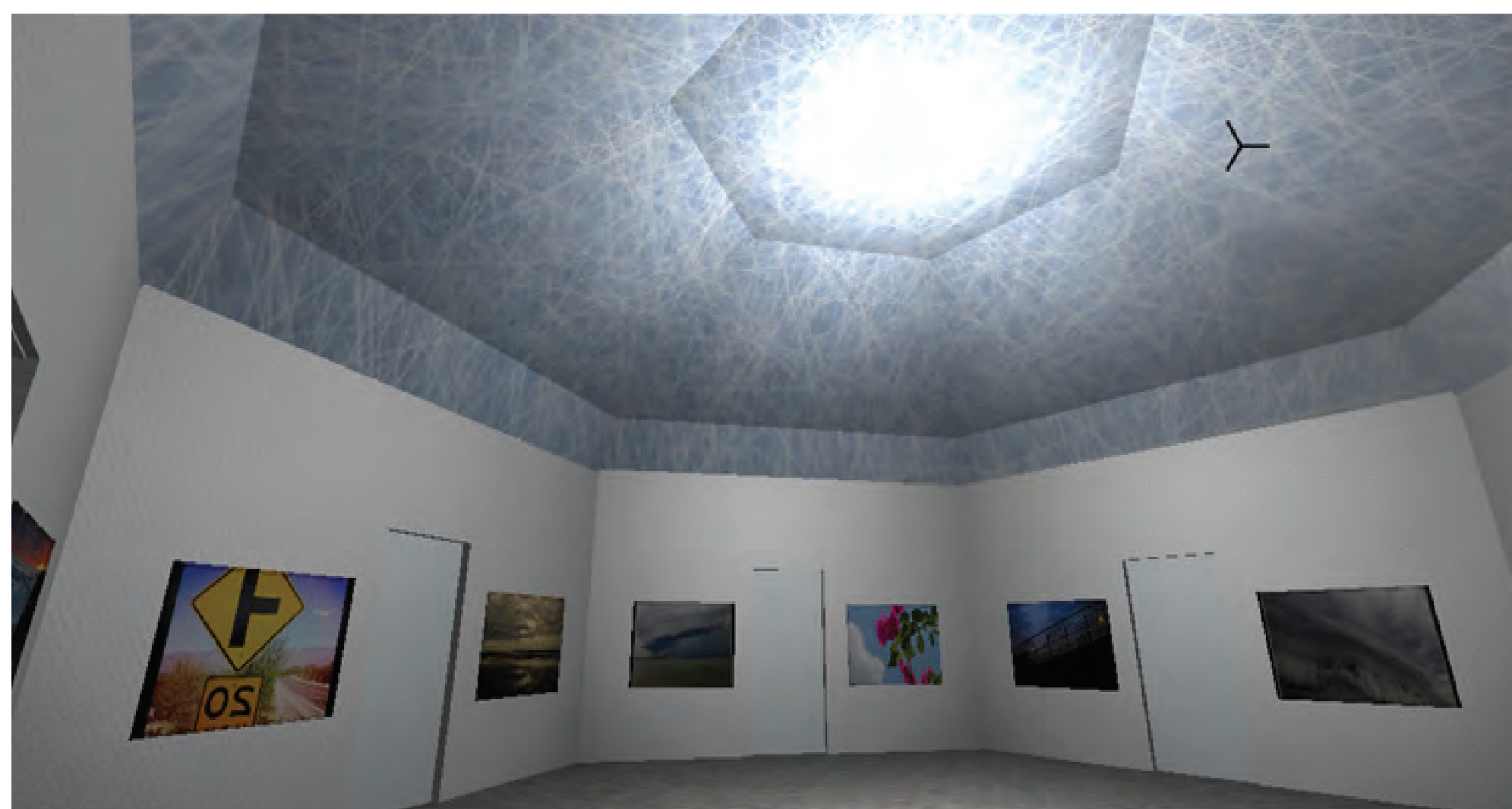

Fig 1. Viewing images in the gallery room

Fig 2. Doors are closed during regular viewing

Fig 3. One door opens when the most preferred image is determined

Implementation

1. Designing the rooms

We chose the hexagon layout for the gallery's room design to measure the user's viewing behavior in a virtual 3D space and determine the most preferred image, which will be used to generate new rooms with new images. Hexagon is a geometric structure that can tessellate offering us a good condition for generating a controllable self-generative space. The hexagonal interior is both circular yet angular offering the viewer the access to engage with content and convenience for us to evaluate the viewing angles. Each wall carries two images and a door in between them. Stone hexagon tile floors, white 3D walls with natural shadows and light blue dome ceiling render the space invisible in its research utility. The purpose of simple textures is to avoid distracting too much users' attention. The clean and light textures also offer users a comfortable environment. We developed the system using Unity. Images are retrieved from Flickr.
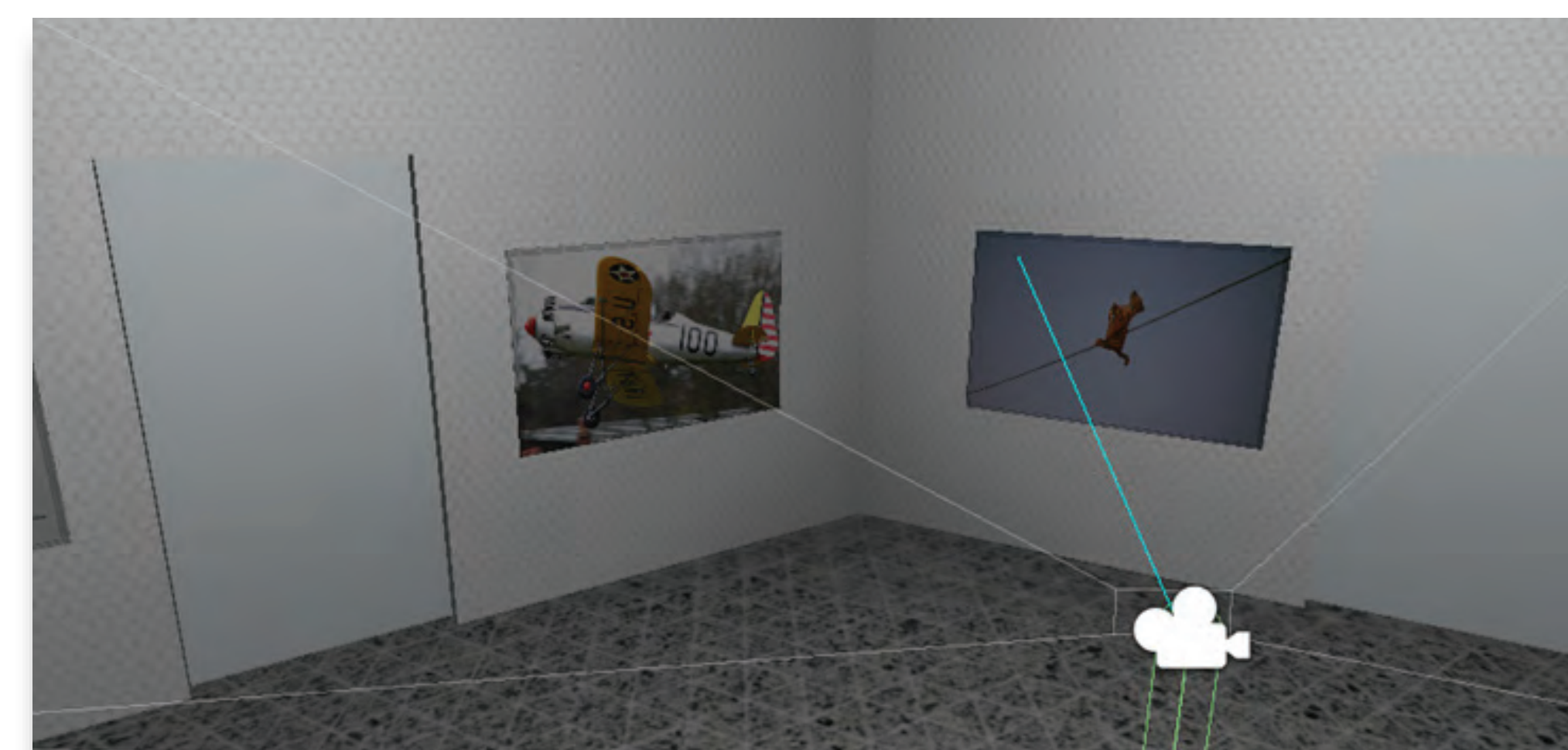

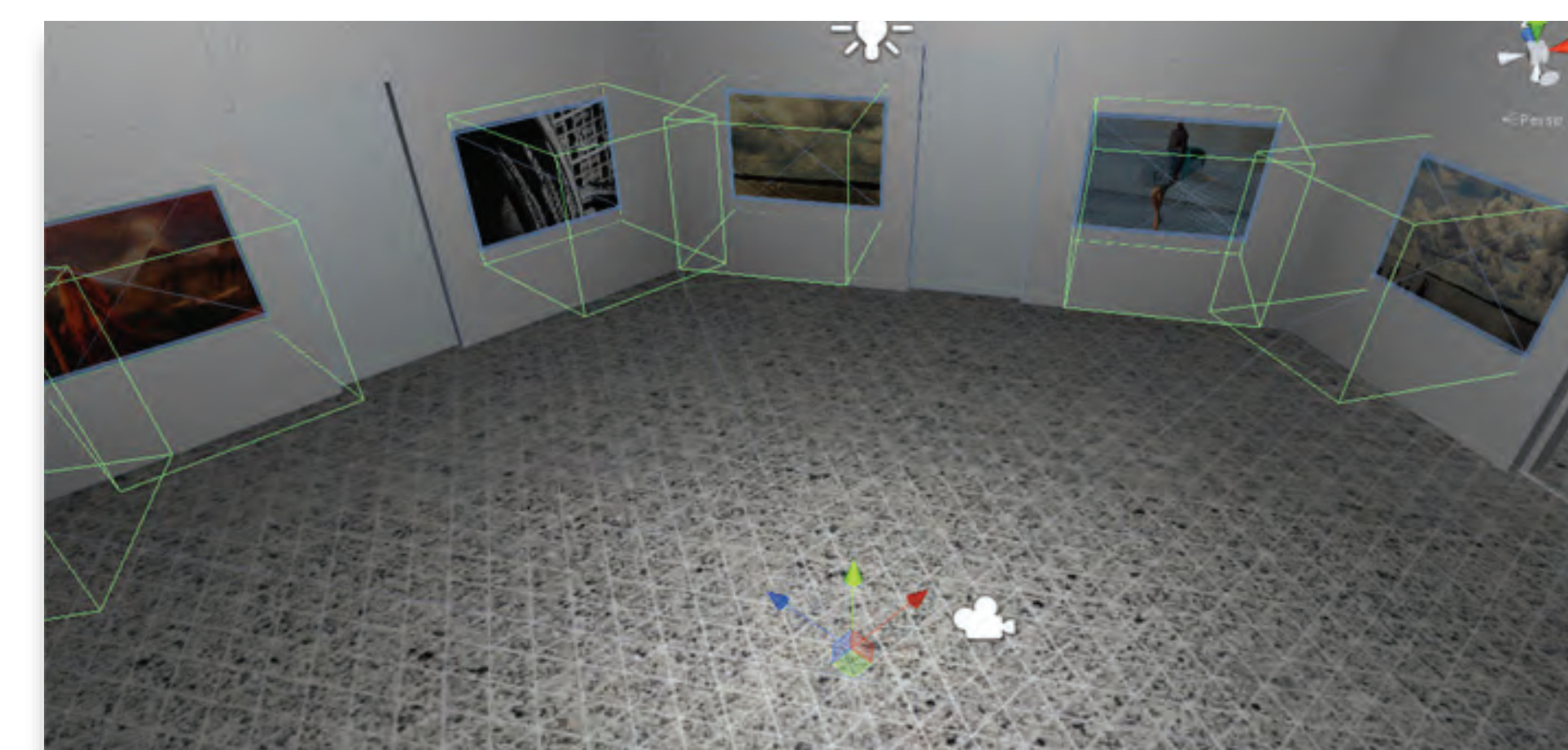Fig 4. Using ray-casting as part of image preference determination

Fig 5. Collision boxes are used as part of user proximity detection

Using a 1st-person controller scheme, the user virtually walks around the gallery to browse the images, while the system measures their spatial behaviors to determine their preference and attention. After a period of time, the system decides which one is the "most preferred image" based the behaviors measured. Then the system generates a new set of images based on the user's preference, and displays the new images in a new room. A door is opened to let the user continue browsing. A new round of preference measurement/determination and room generation will occur once the user enters the new room. The content preference measurement/determination is based on the user's spatial movements and notions from 3D gaze visualization [Stellmach, Nacke and Dachselt, 2010]. These include:
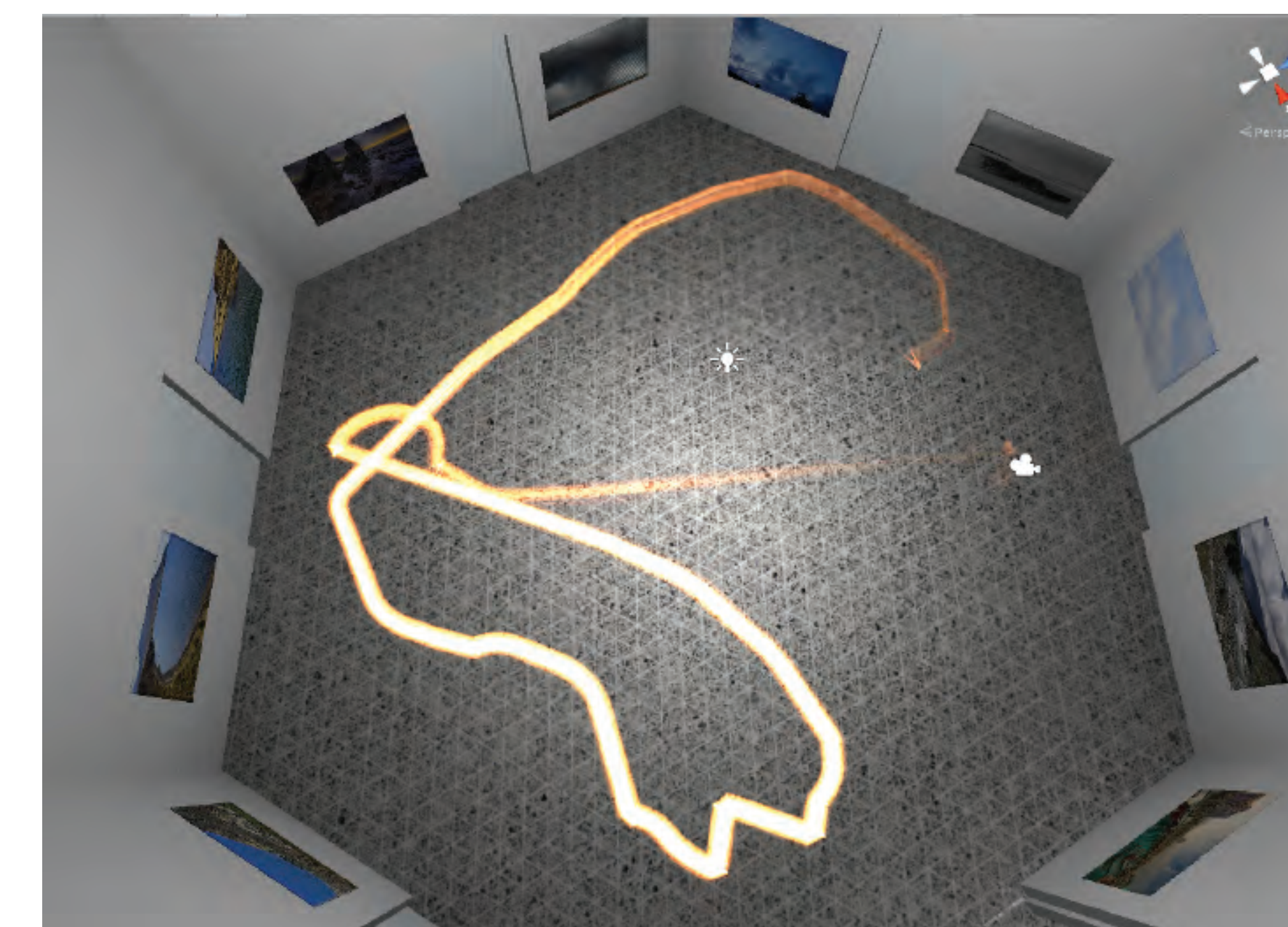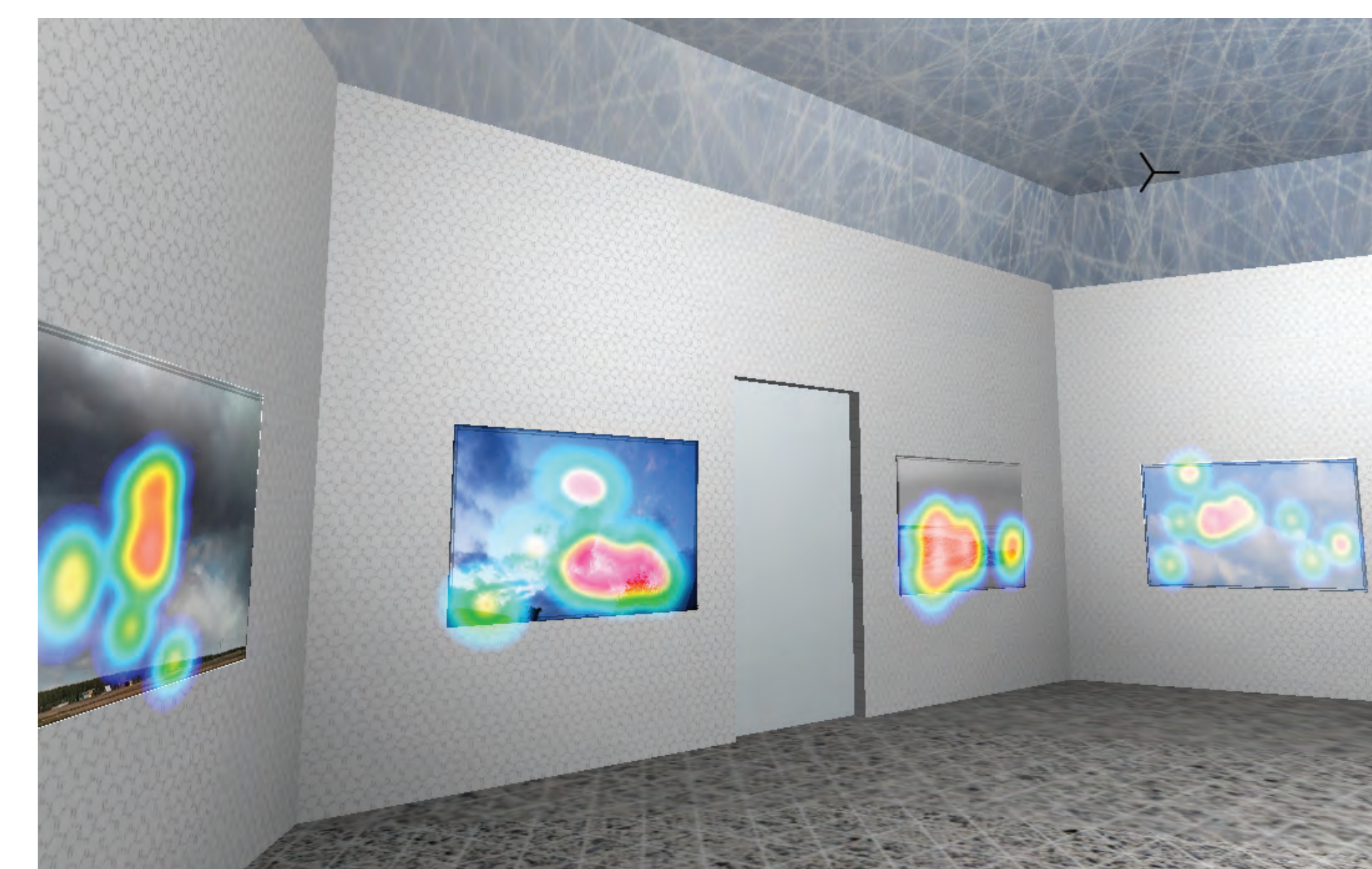

Fig 6. Visualizing the user's movement in a room

Fig 7. Attention map can be used to determine use preference

1) Checking if the user stands in a trigger zone assigned to each image and how long they stand in a particular trigger zone.

2) Using a ray-casting method, the system casts a gaze ray from the user's 1st person character.

3) Analyzing the user's exploration path in the room.

4) Allowing the user to click on an image on a wall so as to be taken to in front of that image, facing it with a right angle.

By combining those calculations, we can determine the user's most preferred image based on:

1) If the user is in the vicinity of a particular image and how long the stay is;

2) if the user is facing an image;

3) the viewing angle between the user and a viewed image (an around 90 degree angle is considered of high interest);

4) the path pattern of the user's movement;

5) an attention map created for each image.

Fig 8. User's viewing history: Your Trail

Fig 9. User selects a visited room to restart the image viewing

3. User Interface and Your Trail

The overall graphic style was drawn from the room's tessellating hexagon. 'Your Trail' is the key UI functionality of Synthetic Gallery. It offers users the opportunity to see and interact with the trail they have 'walked'. It has a number of functionalities:

1) It lays out the pathway travelled, and helps the user recall the galleries by the most viewed image visually tiling the rooms in the map,

2) The user can return to a previously visited gallery by clicking on a hexagon image,

3) they can either re-walk the old path, or open a new door and start a new journey from it.

References

Casakin, Hernan (2011) "Associative Thinking as a Design Strategy and its Relation to Creativity", Human Behaviour in Design, pp 22-31

Stellmach, S., Nacke, L., Dachselt, R., (2010) "Advanced gaze visualizations for three-dimensional virtual environments", ETRA '10 Proceedings of the 2010 Symposium on Eye-Tracking Research & Applications, pp 109-112.