CLAIMS

1. A method comprising:

obtaining scene description data for a 3D scene,

wherein the scene description data comprises:

scene element information describing each of a plurality of scene elements in the scene,

trigger information describing at least one trigger condition,

action information describing at least one action to perform on one or more scene elements associated with the at least one action, and

behavior information,

wherein the behavior information comprises:

a trigger list of at least one trigger,

an action list of at least the at least one action,

trigger combination information, the trigger combination information indicating a combination of a first trigger condition corresponding to a first trigger of the trigger list with other trigger conditions corresponding to other triggers of the trigger list, and

activate information, the activate information indicating when to perform the at least one action depending on a combined result of the trigger combination information; and

in response to a logical determination that: (i) the combination of the first trigger condition corresponding to the first trigger of the trigger list with the other trigger conditions corresponding to the other triggers of the trigger list has produced the combined result and (ii) the combined result meets the condition indicated in the activate information, performing the at least one action on one or more scene elements associated with the at least one action.

2. The method of claim 1,

wherein the trigger list comprises one trigger, and there are no other triggers of the trigger list,

wherein the trigger combination information comprises a unary operator operating on the one trigger, and

wherein the activate information indicates when to perform the unary operator on the one trigger.

3. The method of claim 1,

wherein the trigger list comprises at least two triggers,

wherein the trigger combination information indicates how the at least two trigger conditions are to be combined.

4. The method of any one of claims 1-3, wherein performing the at least one action comprises performing the at least one action one or more times based on the activate information.

5. The method of any one of claims 1-4, further comprising performing a logical operation on the first trigger condition and the other trigger conditions to determine the logical determination.

6. The method of any one of claims 1-4, wherein the logical operation comprises at least one of a logical AND operation, a logical OR operation, or a logical NOT operation.

7. The method of any one of claims 1-6, wherein at least a first one of the trigger conditions is a visibility condition that is satisfied when a specified scene element is visible to a specified camera node.

8. The method of any one of claims 1-7, wherein at least a first one of the trigger conditions is a proximity condition that is satisfied when a distance from a user camera to a specified scene element is within specified bounds.

9. The method of any one of claims 1-8, wherein at least a first one of the trigger conditions is a user input condition that is satisfied when a specified user interaction is detected.

10. The method of any one of claims 1-9, wherein at least a first one of the trigger conditions is a timed condition that is satisfied during a specified time period.

11. The method of any one of claims 1-10, wherein at least a first one of the trigger conditions is a collider condition that is satisfied in response to detection of a collision between specified scene elements.

12. The method of any one of claims 1-11, wherein at least one of the scene elements in the scene is a virtual object.

13. The method of any one of claims 1-12, further comprising rendering the 3D scene according to the scene description data as operated on by the at least one action.

14. The method of any one of claims 1-13, wherein the trigger information comprises an array of two or more triggers in the 3D scene.

15. The method of any one of claims 1-14, wherein the action information comprises an array of two or more actions in the 3D scene.

16. The method of any one of claims 1-15, wherein the scene description data is provided in a JSON format.

17. The method of any one of claims 1-16, wherein the scene description data is provided in a GLTF format.

18. The method of any one of claims 1-17, wherein the activate information comprises an activate flag and the condition indicated in the activate information comprises a state and a value of the activate flag.

19. An apparatus comprising:

a processor; and

a non-transitory computer-readable medium storing instructions operative, when executed by the processor, to cause the apparatus to:

obtain scene description data for a 3D scene,

wherein the scene description data comprises:

scene element information describing each of a plurality of scene elements in the scene,

trigger information describing at least one trigger condition,

action information describing at least one action to perform on one or more scene elements associated with the at least one action, and

behavior information,

wherein the behavior information comprises:

a trigger list of at least one trigger,

an action list of at least the at least one action,

trigger combination information, the trigger combination information indicating a combination of a first trigger condition corresponding to a first trigger of the trigger list with other trigger conditions corresponding to other triggers of the trigger list, and

activate information, the activate information indicating when to perform the at least one action depending on a combined result of the trigger combination information; and

in response to a logical determination that: (i) the combination of the first trigger condition corresponding to the first trigger of the trigger list with the other trigger conditions corresponding to the other triggers of the trigger list has produced the combined result and (ii) the combined result meets the condition indicated in the activate information, perform the at least one action on one or more scene elements associated with the at least one action.

20. A method for rendering an extended reality scene relative to a user in a timed environment, the method comprising:

obtaining a description of the extended reality scene, the description comprising:

a scene tree linking nodes describing timed objects, virtual objects or relationships between objects;

behaviors data items, a behavior data item comprising:

at least a trigger control parameter, a trigger control parameter being a description of conditions related to one or more triggers;

an activate condition related to the trigger control parameter;

at least an action, an action being a description of process to be performed by an extended reality engine on objects describes by nodes of the scene tree; and

on condition that a logical combination of at least one of the triggers of the behavior data item is triggered and the activate condition related to the trigger control parameter of the behavior data item is met, applying actions of the behavior data item to associated objects.