

CLAIMS

1. A system enabling two-way interactive operations of real-time 3D virtual replicas and real objects, the system comprising:

a persistent virtual world system comprising a data structure in which at least one real-time 3D virtual replica of at least one corresponding real object is represented, wherein the persistent virtual world system is stored and computed on a server comprising memory and at least one processor; and

at least one corresponding real object communicatively and persistently connected to the at least one real-time 3D virtual replica via a network through the persistent virtual world system stored and computed on the server, wherein the at least one corresponding real object includes a plurality of sensing mechanisms in communication with the persistent virtual world system;

wherein the at least one real-time 3D virtual replica is synchronized to the at least one corresponding real object through the plurality of sensing mechanisms providing a plurality of data points that are shared between the at least one real object and the at least one corresponding real-time 3D virtual replica, and wherein virtual physical properties and virtual world coordinates of the at least one real-time 3D virtual replica correspond to physical properties and real-world coordinates of the at least one corresponding real object.

2. The system of claim 1, wherein virtually selecting a real-time 3D virtual replica and thereafter effecting one or more changes on the real-time 3D virtual replica through at least one user device results in a real-time corresponding effect on the at least one corresponding real object.

3. The system of claim 1, wherein effecting one or more changes on the at least one corresponding real object results in a real-time corresponding effect on the corresponding real-time 3D virtual replica.

4. The system of claim 1, wherein manipulating the at least one real-time 3D virtual replica or the corresponding at least one real object generates a change on contextual data affecting the virtual-real pair.

5. The system of claim 1, wherein the persistent virtual world system is shared by two or more users via the network.

6. The system of claim 1, wherein the synchronization includes providing feedback to the real-time 3D virtual replica in order to enhance the real-time 3D virtual replica and provide further physical properties of the corresponding real object, and wherein the synchronization further enables enhancing the one or more real objects through the corresponding real-time 3D virtual replicas by employing virtual sensors, virtual resources, or combinations thereof.

7. The system of claim 1, wherein changes effected on either of the real-time 3D virtual replica or on the real object comprise a rotation motion, translation motion, selection of one or more behaviors, programming of one or more behaviors, or configuration of one or more parameters, or combinations thereof.

8. The system of claim 1, wherein the server is configured to employ artificial intelligence algorithms and group analytics in order to simultaneously and autonomously manage or assist a user in the management of a plurality of real-time 3D virtual replicas in order to manage a plurality of corresponding real objects, and wherein the artificial intelligence algorithms further enable cooperation and interaction between the real-time 3D virtual replicas based on one or more goals producing a corresponding cooperation between the plurality of corresponding real objects.

9. The system of claim 1, wherein the memory is further configured to store events in the persistent virtual world system, and wherein data from events is used by an occurrence detection module to detect and replay the events for further review.

10. A method enabling two-way interactive operations of real-time 3D virtual replicas and real objects, the method comprising:

providing, on a server, a persistent virtual world system comprising a data structure in which at least one real-time 3D virtual replica of at least one corresponding real object is represented, wherein virtual physical properties and virtual real-world coordinates of the at least

one real-time 3D virtual replica correspond to physical properties and real-world coordinates of the at least one corresponding real object;

synchronizing the real-time 3D virtual replica with the at least one corresponding real object through a combination of sensing mechanisms providing a plurality of data points shared between the at least one corresponding real object and the real-time 3D virtual replica;

receiving selection or manipulation instructions input through one or more interfaces on the at least one corresponding real object or at least one user device, the selection or manipulation instructions comprising modifications on the plurality of shared data points, wherein the instructions are sent via a network through the persistent virtual world system stored and computed on the server;

processing the selection or manipulation instructions; and

updating the persistent virtual world system comprising the at least one updated real-time 3D virtual replica.

11. The method of claim 10, wherein virtually selecting a real-time 3D virtual replica and thereafter effecting one or more changes on the real-time 3D virtual replica through the at least one user device results in a real-time corresponding effect on the at least one corresponding real object.

12. The method of claim 10, wherein effecting one or more changes on the at least one corresponding real object results in a real-time corresponding effect on the real-time 3D virtual replica.

13. The method of claim 10, wherein manipulating the at least one real-time 3D virtual replica or the at least one corresponding real object generates a change on contextual data of the at least one corresponding real object, affecting relationships between real-time 3D virtual replicas.

14. The method of claim 10, wherein the persistent virtual world system is shared by two or more human users or artificial intelligence users via the network.

15. The method of claim 10, further comprising effecting one or more changes on either of the real-time 3D virtual replica or on the at least one corresponding real object, wherein the one or more changes comprise a rotation motion, translation motion, selection of one or more behaviors, programming of one or more behaviors, or configuration of one or more parameters, or combinations thereof.

16. The method of claim 10, wherein the synchronization enhances the at least one corresponding real object through the corresponding at least one real-time 3D virtual replica by employing virtual sensors, virtual resources, or combinations thereof.

17. The method of claim 10, wherein the at least one corresponding real object is a factory machine or a vehicle.

18. The method of claim 10, further comprising employing artificial intelligence algorithms and group analytics in order to simultaneously and autonomously manage or assist a user in the management of a plurality of real-time 3D virtual replicas in order to manage a plurality of corresponding real objects, and wherein the artificial intelligence algorithms further enable cooperation and interaction between the real-time 3D virtual replicas based on one or more goals producing a corresponding cooperation between the plurality of corresponding real objects.

19. The method of claim 10, further comprising storing in memory of the server events in the persistent virtual world system, wherein data from the events is used by an occurrence detection module to detect and replay the events for further review.

20. A non-transitory computer-readable medium having instructions stored thereon configured to cause one or more computers to perform steps comprising:

providing a persistent virtual world system comprising a data structure in which at least one real-time 3D virtual replica of at least one corresponding real object is represented, wherein the at least one corresponding real object includes a plurality of sensors in communication with the persistent virtual world system, and wherein virtual physical properties and virtual real-world

coordinates of the at least one real-time 3D virtual replica correspond to physical properties and real-world coordinates of the at least one corresponding real object;

synchronizing the real-time 3D virtual replica with the at least one corresponding real object through a plurality of data points provided by the plurality of sensors relating to at least one of the physical properties of the at least one corresponding real object;

receiving input through one or more interfaces on the at least one corresponding real object or at least one user device, wherein the input is configured to effect modifications of the plurality of data points; and

updating the at least one real-time 3D virtual replica based on the modifications of the plurality of data points.