CLAIMS

1. A system comprising:

at least one server computer comprising at least one processor and memory storing a virtual world system and a location-based services (LBS) engine;

wherein the virtual world system is configured to provide spatial data to the LBS engine; and

wherein the LBS engine is configured to:

obtain, from a processing device via a network, processed or semi-processed spatial data associated with a client device, wherein the obtained spatial data is computed using data fusion algorithms by the processing device;

assess the spatial data to determine a spatial relationship between a user of the client device and at least one target interaction object stored in the virtual world system;

in response to determining that the spatial relationship matches a predetermined threshold, generate one or more location-based services for the client device based on contextual data associated with the client device; and

send the location-based services to the client device via the network.

2. The system of claim 1, wherein the processing device is a hardwired chip comprising at least one processing core installed in the client device.

3. The system of claim 2, wherein the obtained spatial data includes 6 degrees of freedom (DOF) positional and orientational data, wherein at least one processing core of the hardwired chip is a spatial core configured to:

obtain first positioning data from a global navigation satellite system (GNSS); and compute, through one or more hardwired algorithms, an initial position and orientation of the client device;

wherein computing the spatial data using the data fusion algorithms includes:

augmenting the initial position and orientation based on second positioning data received from a cellular positioning system via at least one hardware interface, based on third positioning data received from one or more short range communication systems, and based on orientational data received from one or more gyroscopes; and

performing virtual world system computations from data obtained from the virtual world system to obtain a refined 6 DOF position and orientation.

4. The system of claim 3, wherein the spatial core is further configured to further augment the initial position and orientation based on optical data obtained from optical sensors on one or

more client devices, wherein the optical sensors utilize at least one of multi-user photogrammetry, crowd-sourced LIDAR, and photographic scanning.

5. The system of claim 1, wherein the location-based services comprise at least one of collision detections, collision warnings, delay warnings, and spatial operations.

6. The system of claim 5, wherein the spatial operations comprise running a spatial operation authentication process based on the spatial relationship.

7. The system of claim 1, wherein the spatial data is embedded in captured video data, generating a positional video trajectory enabling a reconstruction of objects in a scene.

8. The system of claim 1, wherein generating the one or more location-based services for the client device based on the contextual data associated with the client device comprises:

assessing one or more contextual relationships between the client device and the at least one target interaction object, wherein the one or more location-based services are adjusted based on the contextual relationship.

9. The system of claim 8, wherein the contextual data includes one or more of interest data, demographics data, service data, priority data, security data, and relationship data; and

wherein at least part of the contextual data is stored in a corresponding profile of the user of the client device.

10. The system of claim 8, wherein the LBS engine is further configured to record in memory a time duration of interaction between the user and at least one virtual object for use in determining interests of the user or a degree of interest of the user for accordingly generating the location-based services.

11. A method comprising:

obtaining, by a location-based services (LBS) engine from a processing device via a network, processed or semi-processed spatial data associated with a client device, wherein the obtained spatial data includes 6 degrees of freedom (DOF) positional and orientational data computed using data fusion algorithms by the processing device;

receiving, by the LBS engine, positional and orientational data from a virtual world system;

assessing the spatial data to determine a spatial relationship between a user of the client device and at least one target interaction object stored in the virtual world system;

in response to determining that the spatial relationship matches a predetermined threshold, generating one or more location-based services for the client device based on contextual data associated with the client device; and

sending the location-based services to the client device via the network.

12. The method of claim 11, wherein the processing device is a hardwired chip comprising at least one processing core installed in the client device.

13. The method of claim 12, wherein at least one processing core of the hardwired chip

is a spatial core configured to:

obtain first positioning data from a global navigation satellite system (GNSS); and

compute, through one or more hardwired algorithms, an initial position and orientation of the client device;

wherein computing the spatial data using the data fusion algorithms includes: augmenting the initial position and orientation based on second positioning data received from a cellular positioning system via at least one hardware interface, based on third positioning data received from one or more short range communication systems, and based on orientational data received from one or more gyroscopes; and

performing virtual world system computations from data obtained from the virtual world system to obtain a refined 6 DOF position and orientation.

14. The method of claim 13, wherein the spatial core is further configured to further augment the initial position and orientation based on optical data obtained from optical sensors on one or more client devices, wherein the optical sensors utilize at least one of multi-user photogrammetry, crowd-sourced LIDAR, and photographic scanning.

15. The method of claim 11, wherein the location-based services comprise at least one of collision detections, collision warnings, delay warnings, and spatial operations.

16. The method of claim 15, wherein the spatial operations comprise running a spatial operation authentication process based on the spatial relationship.

17. The method of claim 11, further comprising embedding the spatial data in captured video data to generate a positional video trajectory enabling a reconstruction of objects in a scene.

18. The method of claim 11, wherein generating the one or more location-based services based on the contextual data associated with the client device comprises:

assessing one or more contextual relationships between the client device and the at least one target interaction object, wherein the one or more location-based services are adjusted based on the contextual relationship.

19. The method of claim 18, wherein the contextual data includes one or more of interest data, demographics data, service data, priority data, security data, and relationship data; and

wherein at least part of the contextual data is stored in a corresponding profile of the user of the client device.

20. The method of claim 18, further comprising recording in memory, by the LBS engine, a time duration of interaction between the user and at least one virtual object for use in determining interests of the user or a degree of interest of the user for accordingly generating the location-based services.

21. One or more non-transitory computer-readable media having stored thereon instructions configured to cause a server computer system comprising memory and at least one processor to perform a method comprising the steps of:

obtaining, by a location-based services (LBS) engine from a processing device via a network, processed or semi-processed spatial data associated with a client device, wherein the obtained spatial data includes 6 degrees of freedom (DOF) positional and orientational data computed using data fusion algorithms by the processing device;

receiving, by the LBS engine, positional and orientational data from a virtual world system;

assessing the spatial data to determine a spatial relationship between a user of the client device and at least one target interaction object stored in the virtual world system;

in response to determining that the spatial relationship matches a predetermined threshold, generating one or more location-based services for the client device based on contextual data associated with the client device; and

sending the location-based services to the client device via the network.