CLAIMS

1. A computer-implemented method for mobile node tracking, comprising executing on one or more processors of a server the steps of:

predicting node positions of a plurality of mobile nodes;

receiving ultra-wideband (UWB) ranging data and instantaneous inertial measurement unit (IMU) data from each of the mobile nodes, wherein the UWB ranging data is obtained by each of the mobile nodes through UWB ranging with other of the mobile nodes and stationary or dynamically placed anchor nodes;

updating the predicted node positions of the mobile nodes using the UWB ranging data and the instantaneous IMU data; and

broadcasting the updated node positions of the mobile nodes from the server to the mobile nodes.

2. The computer-implemented method for mobile node tracking according to claim 1, further comprising identifying ranging losses in the mobile nodes before updating the predicted node positions of the mobile nodes.

3. The computer-implemented method for mobile node tracking according to claim 2, wherein the step of identifying ranging losses in the mobile nodes comprises:

determining a number of non-zero inter-nodal UWB ranging values in the UWB ranging data for each of the mobile nodes.

4. The computer-implemented method for mobile node tracking according to claim 3, wherein the step of identifying ranging losses in the mobile nodes further comprises:

making a determination of ranging loss in respect of each of the mobile nodes having less than a predetermined number of non-zero inter-nodal UWB ranging values in the UWB ranging data.

5. The computer-implemented method for mobile node tracking according to claim 4, wherein the predetermined number of non-zero inter-nodal UWB ranging values in the UWB ranging data is three (3).

6. The computer-implemented method for mobile node tracking according to any one of claims 2 to 5, further comprising performing a whitening procedure on each of the mobile nodes identified as having ranging losses.

7. The computer-implemented method for mobile node tracking according to claim 6, wherein the step of performing the whitening procedure comprises:

removing inter-nodal UWB ranging data of the mobile nodes identified as having ranging losses from the UWB ranging data before updating the predicted node positions of the mobile nodes.

8. The computer-implemented method for mobile node tracking according to claim 7, wherein the step of removing the inter-nodal UWB ranging data of the mobile nodes comprises:

removing each row of the inter-nodal UWB ranging data corresponding to respective ones of the mobile nodes identified as having ranging losses from a matrix of the inter-nodal UWB ranging data forming the UWB ranging data provided to the server.

9. The computer-implemented method for mobile node tracking according to any one of claims 6 to 8, wherein the whitening procedure is performed on each of the mobile nodes identified as having ranging losses for a predetermined time period.

10. The computer-implemented method for mobile node tracking according to claim 9, wherein the predetermined time period corresponds to a predetermined number of iterations of the step of updating the predicted node positions of the mobile nodes.

11. A device for mobile node tracking, comprising:

one or more processors; and

a non-transitory computer-readable memory storing computer program instructions executable by the one or more processors to perform operations for mobile node tracking, the operations comprising:

predicting node positions of a plurality of mobile nodes;

receiving ultra-wideband (UWB) ranging data and instantaneous inertial measurement unit (IMU) data from each of the mobile nodes, wherein the UWB

ranging data is obtained by each of the mobile nodes through UWB ranging with other of the mobile nodes and stationary or dynamically placed anchor nodes;

updating the predicted node positions of the mobile nodes using the UWB ranging data and the instantaneous IMU data; and

broadcasting the updated node positions of the mobile nodes to the mobile nodes.

12. The device for mobile node tracking according to claim 11, wherein the operations further comprise identifying ranging losses in the mobile nodes before updating the predicted node positions of the mobile nodes.

13. The device for mobile node tracking according to claim 12, wherein the operation of identifying ranging losses in the mobile nodes comprises:

determining a number of non-zero inter-nodal UWB ranging values in the UWB ranging data for each of the mobile nodes.

14. The device for mobile node tracking according to claim 13, wherein the operation of identifying ranging losses in the mobile nodes further comprises:

making a determination of ranging loss in respect of each of the mobile nodes having less than a predetermined number of non-zero inter-nodal UWB ranging values in the UWB ranging data.

15. The device for mobile node tracking according to claim 14, wherein the predetermined number of non-zero inter-nodal UWB ranging values in the UWB ranging data is three (3).

16. The device for mobile node tracking according to any one of claims 12 to 15, wherein the operations further comprise performing a whitening procedure on each of the mobile nodes identified as having ranging losses.

17. The device for mobile node tracking according to claim 16, wherein the operation of performing the whitening procedure comprises:

removing inter-nodal UWB ranging data of the mobile nodes identified as having ranging losses from the UWB ranging data before updating the predicted node positions of the mobile nodes.

18. The device for mobile node tracking according to claim 17, wherein the operation of removing the inter-nodal UWB ranging data of the mobile nodes comprises:

removing each row of the inter-nodal UWB ranging data corresponding to respective ones of the mobile nodes identified as having ranging losses from a matrix of the inter-nodal UWB ranging data forming the UWB ranging data provided to the server.

19. The device for mobile node tracking according to any one of claims 16 to 18, wherein the whitening procedure is performed on each of the mobile nodes identified as having ranging losses for a predetermined time period.

20. The device for mobile node tracking according to claim 19, wherein the predetermined time period corresponds to a predetermined number of iterations of the step of updating the predicted node positions of the mobile nodes.