CLAIMS:

1. A fusion system for constructing tracks of a ground target from radar and optical detections, the fusion system comprising:

a radar channel including:

at least one Ground Moving Target Indicator (GMTI) radar providing GMTI detections in the form of GMTI plots;

a GMTI tracker arranged downstream of said at least one GMTI radar, and configured for constructing GMTI tracks of the ground target from the GMTI plots provided by said at least one GMTI radar; and

a Smooth Radar Plots (SRPs) generator arranged downstream of the GMTI tracker and configured for sequentially in time producing smooth radar plots in the form of locations of ground target on the GMTI tracks and corresponding location errors;

an optical channel including:

at least one electro optical (EO) sensor sequentially in time providing EO detections in the form of coordinates of the ground target; and

a combiner tracker configured for sequentially in time combining data streams of the radar channel generated by the SRPs generator with data streams of the optical channel provided by said at least one EO sensor, and producing fused tracks of the ground target.

2. The fusion system of claim 1, wherein the optical channel includes:

a plurality of electro optical (EO) sensors providing EO detections in the form of coordinates of the ground target; and

an EO detections buffer arranged downstream of said plurality of the EO-sensors, and configured for providing sorted in time EO detections to the combiner tracker.

3. The fusion system of claim 1, wherein the SRPs generator includes:

an assigning system configured for sequentially assigning the GMTI plots to corresponding GMTI tracks;

a filter configured for applying to the GMTI plots; and

a SRP calculator configured for sequentially calculating location of the ground target on the GMTI tracks.

4. The fusion system of claim 3, wherein the filter includes at least one of Covariance Intersection filters, Maximum Likelihood filters, or Kalman filters.

5. The fusion system of claim 1, wherein the combiner tracker includes:

a combiner tracker plot generator configured for sequentially receiving SRPs and EO detections, and combining them in one-state vectors, thereby generating ground target plots (GTPs);

a candidate track selection system coupled to the combiner tracker plot generator, said candidate track selection system configured for sequentially finding a plurality of candidate fused tracks that can be associated with a corresponding GTP obtained from said combiner tracker plot generator;

an associations system coupled to said combiner tracker plot generator; said associations system configured for sequentially computing a value of likelihood functions for association of the corresponding GTP with said plurality of candidate fused tracks to provide a score and update each fused track;

a geographical updates system coupled to said associations system, said geographical updates system configured for sequentially receiving updated fused tracks calculated by the associations system and calculating geo-updates;

a track update and exclusion ambiguities system coupled to said geographical updates system, said track update and exclusion ambiguities system configured for receiving the associations of the GTPs with the corresponding fused tracks generated by the associations system, and calculating ambiguities of such associations and exclusions of certain tracks;

a track situation picture generator coupled to said track update and exclusion ambiguities system; said track situation picture generator configured for periodically selecting best fusion tracks generated by said track update and exclusion ambiguities system, and generating ground fusion track pictures including best fused tracks which have the highest score; and

a combiner tracker database coupled to said combiner tracker plot generator, said candidate track selection system, said associations system, said geographical updates system, and to said track update and exclusion ambiguities system.

6. The fusion system of claim 5, wherein the associations system includes:

a prediction target state system configured for sequentially in time predicting the target coordinates and velocity for each candidate track from the plurality of the candidate tracks associated with the new GTP at the corresponding times; and

an optimized state and likelihood system configured for applying an assignment procedure for predicted fused tracks and the corresponding GTP for computing optimized target coordinates and velocity and a likelihood of the association of the GTP with the predicted tracks.

7. The fusion system of claim 6, wherein said optimized state and likelihood system includes a filter, wherein the filter includes at least one of Kalman filters, Covariance Intersection filters, or Maximum Likelihood filters.

8. The fusion system of claim 5, wherein the combiner tracker database includes the following database pools:

a GTPs pool configured to store the GTPs generated by the combiner tracker plot generator; where an input of the GTPs pool is coupled to the combiner tracker plot generator, while an output of the output of the GTPs pool is coupled to the candidate track selection system;

a fused tracks pool configured to store the updated fused track that were calculated; where an input of the fused tracks pool is coupled to the track update and exclusion ambiguities system, while an output of the fused tracks pool is coupled to the candidate track selection system;

a geographical updates pool configured to store data related to location of the updated tracks on a real world map, where an input of the geographical updates pool is coupled to the geographical updates system, while an output of the geographical updates pool is coupled to the candidate track selection system;

an association pool configured to store associations between the fused tracks and the GTPs, where an input of the association pool is coupled to the track update and exclusion ambiguities system, while an output of the association pool is coupled to the candidate track selection system;

an ambiguities pool configured to store information on ambiguities along with a list of the corresponding tracks in which the ambiguities appear, where an input of the ambiguities pool is coupled to the track update and exclusion ambiguities system, while an output of the ambiguities pool is coupled to the candidate track selection system;

an exclusion pool configured for storing a list of excluded tracks, where an input of the exclusion pool is coupled to the track update and exclusion ambiguities system, while the output of the exclusion pool is coupled to the candidate track selection system;

a picture pool configured for storing pictures including fused tracks having the greatest score; where an input of the picture pool is coupled to the track update and exclusion ambiguities system, while an output is coupled to the candidate track selection system;

and a history pool configured to store information history on previous pictures; where an input history pool is coupled to the track update and exclusion ambiguities system, while the output is coupled to the maintenance system.

9. The fusion system of claim 8, wherein the combiner tracker further includes a maintenance system coupled to the history pool of said combiner tracker database, said maintenance system being configured for deleting obsolete tracks in the history pool.

10. A method for constructing tracks of a ground target from radar and optical detections, the method comprising:

sequentially in time providing Ground Moving Target Indicator (GMTI) detections from at least one GMTI radar in the form of GMTI plots, and electro optical (EO) detections in the form of coordinates of the ground target by at least one electro optical (EO) sensor;

sequentially in time constructing GMTI tracks of the ground target from the GMTI plots by a GMTI tracker arranged downstream of said at least one GMTI radar;

sequentially in time producing smooth Radar Plots (SRPs) in the form of locations of ground targets on the GMTI tracks and corresponding location errors by a Smooth Radar Plots (SRPs) generator arranged downstream of the GMTI tracker;

and combining data streams generated by the SRPs generator with data streams provided by the EO sensor, and producing fused tracks of the ground target.

11. The method of claim 10, further comprising:

sequentially in time providing EO detections in the form of coordinates of the ground target by a plurality of electro EO sensors; and

sorting the EO detections and providing sorted in time EO detections to the combiner tracker.

12. The method of claim 10, wherein producing SRPs includes:

sequentially assigning the GMTI plots to corresponding GMTI tracks;

applying a filter to the GMTI plots; and

sequentially calculating location of the ground target on the GMTI tracks.

13. The method of claim 10, wherein producing fused tracks of the ground target includes:

sequentially receiving SRPs and EO detections and combining them into one-state vector, thereby generating ground target plots (GTPs);

sequentially finding a plurality of candidate fused tracks that can be associated with a corresponding GTP;

sequentially computing a value of likelihood functions for association of the corresponding GTP with said plurality of candidate fused tracks, providing a corresponding score to each fused track, and generating updated fused tracks;

sequentially calculating geo-updates including data related to location of the updated fused tracks on a real world map;

sequentially receiving the associations of the GTPs with the corresponding updated fused tracks, and calculating ambiguities of such associations and exclusions of certain tracks; and

periodically selecting updated fusion tracks having the greatest score, and generating ground fusion track pictures including best fused tracks which have the highest score.

14. The method of claim 13, wherein a period for generating each new ground fusion track picture is in a range of 5 seconds to 10 seconds.

15. The method of claim 13, further comprising sequentially storing the GTPs; the updated fused track; data related to location of the updated fused tracks on a real world map; associations between the fused tracks and the GTPs; information on ambiguities along with a list of the corresponding tracks in which the ambiguities appear; information on exclusions including a list of excluded tracks; the ground fusion track pictures; and information history on previous pictures.

16. The method of claim 13, further comprising providing maintenance by deleting obsolete tracks in the information history.