Claims

1. An integrated monitoring system that obtains airport ramp surface operations information of the entire ramp area from multiple locations, meshes real time data produced by multiple sources at the multiple locations, and transmits artificial intelligence-processed meshed real time data to aircraft pilots and ramp control operations personnel to ensure safety, efficiency, and security of airport ramp and airside operations, comprising:

a. a ramp area at an airport with a plurality of parking locations for aircraft, passenger loading bridges, a plurality of aircraft moving within said ramp area into and out of said parking locations, at least some of said plurality of said aircraft driven by electric taxi drive systems, and a plurality of ground vehicles, and equipment;

b. multiple monitoring units positioned in multiple exterior locations on one or more of said plurality of passenger loading bridges, aircraft, and ground vehicles, and equipment operative to produce secure composite streams of real time data of views of said entire ramp area from said multiple monitoring units;

c. an artificial intelligence-based processing system comprising intelligent algorithms operative to process and mesh said secure composite streams of real time data and to communicate said processed meshed data in the form of secure visual displays of said entire ramp area and signals in real time to pilots of said plurality of aircraft and to ramp control operations personnel or to store said processed meshed data; and

d. a three-dimensional airside map of said entire ramp area in data transmission communication with said artificial intelligence-based processing system

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2. The system of claim 1, wherein each of said multiple monitoring units comprises a scanning LiDAR device, a camera, or proximity sensors or combinations of scanning LiDAR devices, cameras, and proximity sensors positioned to produce views of said entire ramp area.

3. The system of claim 1, wherein said system comprises controllable robotic ramp ground surface roving units functioning as ground personnel equipped with said multiple monitoring units positioned exteriorly on said roving robotic units to produce a view of said identified ramp area blind spots.

4. An integrated monitoring method that obtains airport ramp surface operations information of the entire ramp area from multiple locations, meshes real time data produced by multiple sources at the multiple locations, and transmits artificial intelligence-processed meshed real time data to aircraft pilots and ramp control operations personnel to ensure safety, efficiency, and security of airport ramp operations, comprising:

a. providing a plurality of parking locations at an airport ramp area for aircraft, passenger loading bridges at the plurality of parking locations, a plurality of aircraft moving within the ramp area into and out of the parking locations, at least some of the plurality of aircraft being driven by electric taxi drive systems, and a plurality of ground vehicles and equipment;

b. positioning multiple monitoring units in multiple exterior locations on one or more of the plurality of passenger loading bridges, aircraft, and ground vehicles and equipment, the monitoring units operating to produce secure composite streams of real time data of the entire ramp area from the multiple locations as the ground vehicles move within the ramp area and the aircraft are driven within the ramp area into and out of the parking locations;

c. providing an artificial intelligence-based processing system comprising intelligent algorithms, and receiving, processing, and meshing the secure composite streams of real time data of the entire ramp area from the multiple monitoring units, and then communicating the processed meshed data in the form of secure visual displays of the entire ramp area and

signals in real time to pilots of the plurality of aircraft and to ramp control operations personnel or storing said processed meshed data

; and

d. in response to the communicated secure visual displays of the entire ramp area, continuing to move the aircraft within the ramp area into and out of the parking locations or stopping movement of the aircraft, or continuing to move or stopping movement of the ground vehicles.

5. The method of claim 4, further comprising providing one or more roving robotic units functioning as ground personnel and positioning the monitoring units exteriorly on the roving robotic units functioning as ground personnel to produce secure composite streams of data as the roving robotic units move

on the ramp area ground surface, receiving, processing, and meshing the secure composite streams of real time data of views of ramp area locations, and communicating the processed meshed data in the form of real time secure visual displays to display devices located in aircraft cockpits, ground control locations, and air traffic control tower locations.

6. The method of claim 4, further comprising wherein multiple ones of the plurality of aircraft are driven in the ramp area by the electric taxi drive systems, transmitting the composite streams of real time data from the monitoring units on each of the multiple aircraft to the artificial intelligence-based processing system, processing, and meshing the secure composite streams of real time data from the multiple ones of the electric taxi drive system-driven aircraft, and then communicating the processed meshed data in the form of secure visual displays and signals in real time to pilots of said plurality of aircraft and to ramp control operations personnel or storing said processed meshed data for further analysis and use at a later time if the processed data does not identify a safety or collision hazard.

7. The method of claim 5, further comprising positioning at least one of the roving robotic units in a ramp area location with an identified blind spot, monitoring the identified blind spot as an aircraft is driven with the electric taxi drive system to maneuver near or into the blind spot, producing the secure composite streams of data, receiving, processing, and meshing the secure composite streams of real time data of views of the identified blind spot as the one of the roving robotic units moves in the ramp area near the identified blind spot, transmitting the meshed real time data representing the optimal views of the blind spot to the artificial intelligence-based processing system, and communicating the processed meshed data in the form of real time secure visual displays from the one of the roving robotic units to at least a display device located in a cockpit of the aircraft.

8. The system of claim 1, wherein said three-dimensional airside map identifies at least ramp area blind spots and structures that present obstacles to safe aircraft ramp movement of at least said plurality of aircraft within said entire ramp area.

9. The system of claim 3, wherein said system comprises a plurality of said roving robotic units and said multiple monitoring units are positioned in said exterior locations on said plurality of roving robotic units.

10. The system of claim 9, wherein said multiple monitoring units are positioned only in said exterior locations on said roving robotic units.

11. The method of claim 4, further comprising positioning monitoring units comprising single or multiple scanning LiDAR devices, cameras, and proximity sensors or combinations of said single or multiple scanning LiDAR devices, cameras, and proximity sensors in the multiple locations, producing secure composite streams of real time data comprising views of the entire ramp area, processing the real time data and producing meshed secure composite streams of real time data, communicating the secure processed meshed data in the form of real time views of the entire ramp area to the aircraft pilots and to the ramp control operations personnel, and continuing to move or stopping movement of the aircraft.

12. The method of claim 11, wherein one of the plurality of aircraft is driven by electric taxi drive systems and the monitoring units are positioned exteriorly on the roving robotic units, further comprising positioning one or more of the roving robotic units in a ramp area location with identified blind spots or corners, monitoring a ramp area space adjacent to an identified blind spot or an identified corner with the roving robotic unit as the aircraft is driven and maneuvered with the electric taxi drive systems near or into the blind spots or corners, producing secure composite streams of data, receiving, processing, and meshing the secure composite streams of real time data of views of the identified blind spot or corner, and communicating the processed meshed data in the form of real time secure visual displays to at least a display devices located in the aircraft cockpit.

13. The method of claim 12, further comprising receiving, processing, and meshing the secure composite streams of real time data from the multiple monitoring units on the passenger loading bridges, and then communicating the processed meshed data in the form of

secure visual displays and signals in real time to display devices located in aircraft cockpits, ground control locations, and air traffic control tower locations.

14. The method of claim 12, further comprising receiving, processing, and meshing the secure composite streams of real time data from the multiple monitoring units on the ground vehicles and equipment, and then communicating the processed meshed data in the form of secure visual displays and signals in real time to display devices located in aircraft cockpits, ground control locations, and air traffic control tower locations.

15. The method of claim 12, further comprising receiving, processing, and meshing the secure composite streams of real time data from the multiple monitoring units on the aircraft driven with electric taxi drive systems, and then communicating the processed meshed data in the form of secure visual displays and signals in real time to display devices located in aircraft cockpits, ground control locations, and air traffic control tower locations.

16. The method of claim 4, further comprising, wherein others of the plurality of aircraft are driven without the electric taxi drive systems, transmitting the composite streams of real time data from the monitoring units on each of the aircraft driven without electric taxi drive systems to the artificial intelligence-based processing system, processing, and meshing the secure composite streams of real time data from each of the aircraft driven without the electric taxi drive systems, and then communicating the processed meshed data in the form of secure visual displays and signals in real time to display devices located in aircraft cockpits, ground control locations, and air traffic control tower locations.