Claims

1. A system for monitoring gaming activity in a gaming area comprising a gaming table, the system comprising:

at least one camera configured to capture images of the gaming area;

at least one processor configured to communicate with the at least one camera and a memory;

the memory storing instructions executable by the at least one processor to configure the at least one processor to:

determine presence of a first gaming object on the gaming table in a first image from a series of images of the gaming area captured by the at least one camera, the series of images comprising one or more images,

responsive to determining the presence of the first gaming object in the first image, process the first image to estimate postures of one or more players in the first image, and

based on the estimated postures, determine a first target player associated with the first gaming object among the one or more players.

2. The system of claim 1, wherein the instructions are executable to configure the at least one processor to determine in the series of images an image region of a face of the first target player associated with the first gaming object.

3. The system of claim 1 or claim 2, wherein processing the first image to estimate postures of one or more players in the first image comprises identifying one or more periphery indicator regions in the first image, each periphery indicator region corresponding to a distal hand periphery of one or more players.

4. The system of claim 3, wherein each of the one or more periphery indicator regions corresponds to a distal left hand periphery or a distal right hand periphery.

5. The system of any one of claims 1 to 4, wherein the instructions are executable to configure the at least one processor to determine the first target player associated with the first gaming object by:

estimating a distance of each periphery indicator region from the first gaming object in the first image;

identifying a closest periphery indicator region based on the estimated distance; and

determining the first target player associated with the first gaming object based on the identified closest periphery indicator region.

6. The system of claim 5, wherein processing the first image to estimate postures of one or more players in the first image comprises:

estimating a skeletal model of one or more players, and

determining the first target player associated with the first gaming object based on the estimated skeletal model of one or more players.

7. The system of claim 6, wherein estimating the skeletal model of one or more players comprises estimating key points in the first image associated with one or more of: wrists, elbows, shoulders, neck, nose, eyes or ears of the one or more players.

8. The system of any one of claim 1 to 7, wherein the instructions are executable to further configure the at least one processor:

determine presence of a second gaming object on the gaming table in a second image from the series of images;

responsive to determining the presence of the second gaming object in the second image, process the second image to estimate postures of players in the second image;

based on the estimated postures, determine a second target player associated with the second gaming object among the players.

9. The system of any one of claims 1 to 8, wherein the first gaming object comprises any one of: a game object, a token, a currency note or a coin.

10. The system of any one of claims 1 to 9, wherein the memory comprises one or more posture estimation machine learning models trained to estimate postures of one or more players in the series of images.

11. The system of claim 10, wherein the one or more posture estimation machine learning models comprise one or more deep learning artificial neural networks trained to estimate postures of one or more players in the captured images.

12. The system of claim 2 or any one of claims 3 to 11 when dependent on claim 2, wherein identifying a face of the first target player further comprises determining a vector representation of the image region of the face of the first target player using a face recognition machine learning model stored in the memory.

13. The system of any one of claims 1 to 12, wherein the instructions are executable to further configure the at least one processor to estimate a game object value associated with the first gaming object.

14. The system of any one of claims 1 to 13, wherein determining a presence of a first gaming object on the gaming table further comprises determining a position on the gaming table zone of the first gaming object.

15. The system of any one of claims 1 to 14, wherein the at least one processor is further configured to execute instructions stored in the memory to identify in the series

of images a plurality of face regions corresponding to a face of the first target player associated with the first gaming object.

16. The system of claim 15, wherein the instructions are executable to further configure the at least one processor to process the plurality of face regions to determine face orientation information of the first target player's face in each of the plurality of face regions.

17. The system of claim 16, wherein the instructions are executable to further configure the at least one processor to process the face orientation information of the first target player's face in each of the plurality of face regions to determine a most head-on face region corresponding to the target player.

18. A method for monitoring gaming activity in a gaming area comprising a gaming table, the method comprising:

providing at least one camera configured to capture images of the gaming area, at least one processor configured to communicate with the at least one camera and a memory storing instructions executable by the at least one processor;

determining by the at least one processor, a presence of a first gaming object on the gaming table in a first image from a series of images of the gaming area captured by the at least one camera, the series of images comprising one or more images;

responsive to determining the presence of the first gaming object in the first image, processing by the at least one processor the first image to estimate postures of one or more players;

based on the estimated postures, determining by the at least one processor a first target player associated with the first gaming object among the one or more players.

19. The method of claim 18, further comprising identifying by the at least one processor in the series of images an image region of a face of the first target player associated with the first gaming object.

20. The method of claim 18 or claim 19, wherein estimating postures of one or more players in the first image comprises identifying one or more periphery indicator regions in the first image, each periphery indicator region corresponding to a distal hand periphery of one or more players.

21. The method of claim 20, wherein each of the one or more periphery indicator regions corresponds to a distal left hand periphery or a distal right hand periphery.

22. The method of any one of claims 18 to 21, further comprising determining by the at least one processor the first target player associated with the first gaming object by:

estimating a distance of each periphery indicator region from the first gaming object in the first image;

identifying a closest periphery indicator region based on the estimated distance; and

determining the first target player associated with the first gaming object based on the identified closest periphery indicator region.

23. The method of claim 22, wherein processing by the at least one processor the first image to estimate postures comprises estimating a skeletal model of one or more player, and wherein determining the first target player associated with the first gaming object is based on the estimated skeletal model of one or more player.

24. The method of claim 23, wherein estimating the skeletal model of one or more player comprises estimating key points in the first image associated with one or more of: wrists, elbows, shoulders, neck, nose, eyes or ears of the one or more players.

25. The method of any one of claim 18 to 24, further comprising:

determining by the at least one processor, a presence of a second gaming object on the gaming table in a second image from the series of images;

responsive to determining the presence of the second gaming object in the second image, process by the at least one processor the second image to estimate postures of one or more players;

based on the estimated postures, determine by the at least one processor, a second target player associated with the second gaming object among the one or more players.

26. The method of any one of claims 18 to 25, wherein the first gaming object comprises any one of: a game object, a token, a currency note or a coin.

27. The method of any one of claims 18 to 26, wherein the memory comprises one or more posture estimation machine learning models trained to estimate postures of one or more players in the series of images.

28. The method of claim 27, wherein the one or more posture estimation machine learning models comprise one or more deep learning artificial neural networks trained to estimate postures of one or more players in the captured images.

29. The method of claim 19 or any one of claims 20 to 28 when dependent on claim 19, wherein identifying by the at least one processor an image region of a face of the first target player comprises extracting a vector representation of the face of the first target player using a face recognition machine learning model stored in the memory.

30. The method of any one of claims 18 to 29, further comprising estimating by the at least one processor a game object value associated with the first gaming object.

31. The method of any one of claims 18 to 30, wherein determining presence of a first gaming object on the gaming table further comprises determining a gaming table zone associated with the first gaming object.

32. The method of any one of claims 18 to 31, further comprising identifying in the series of images a plurality of face regions corresponding to a face of the first target player associated with the first gaming object.

33. The method of claim 32, further comprising processing the plurality of face regions to determine face orientation information of the first target player's face in each of the plurality of face regions.

34. The method of claim 33, further comprising processing the face orientation information of the first target player's face in each of the plurality of face regions to determine a most head-on face region corresponding to the target player.

~~35. A system for monitoring gaming activity in a gaming area comprising a gaming table, the system comprising:~~

~~at least one camera configured to capture images of the gaming area;~~

~~an edge gaming monitoring computing device provided in proximity of the gaming table, the edge gaming monitoring computing device comprising a memory and at least one processor having access to the memory and configured to communicate with the at least one camera;~~

~~the memory storing instructions executable by the at least one processor to configure the at least one processor to:~~

~~determine a presence of a first gaming object on the gaming table in a first image from a series of images of the gaming area captured by the at least one camera;~~

responsive to determining the presence of the first gaming object in the first image, track the first gaming object in a plurality of images within the series of images;

determine object detection event data, the object detection event data comprising image data extracted from a plurality of images and metadata corresponding to the first gaming object; and

transmit the object detection event data to a gaming monitoring server.

36. The system of claim 35, wherein the object detection event data is determined in response to tracking of the first gaming object in at least two or more of the plurality of images within the series of images.

37. The system of claim 35 or claim 36, wherein the at least one processor is further configured to determine a presence of one or more players in the series of images of the gaming area.

38. The system of claim 37, wherein the image data extracted from the plurality of images comprises: image data corresponding to the one or more players and image data corresponding to the first game object.

39. A system for monitoring gaming activity in a gaming area, the system comprising:

a gaming monitoring server comprising at least one processor configured to communicate with a memory;

the memory storing instructions executable by the at least one processor to configure the at least one processor to:

receive object detection event data from a table gaming monitoring computing device, the object detection event data comprising image data corresponding to the plurality of images and metadata corresponding to the first gaming object;

process the image data corresponding to the plurality of images to estimate postures of one or more players;

based on the estimated postures, determine a first target player associated with the first gaming object among the one or more players.

40. The system of claim 39, wherein the instructions are executable to configure the at least one processor to identify in the plurality of images a plurality of face regions of the first target player associated with the first gaming object.

41. The system of claim 40, wherein the instructions are executable to configure the at least one processor to process the plurality of face regions of the first target player to determine face orientation information of a first target player's face in each of the plurality of face regions.

42. The system of claim 41, wherein the instructions are executable to configure the at least one processor to process the face orientation information of the first target player's face in each of the plurality of face regions to determine a most head-on face region corresponding to the target player.

43. The system of claim 42, wherein the most head-on face region corresponding to the target player relates to a face region that is a most information-rich face region for face recognition operations.

44. A method for monitoring gaming activity in a gaming area comprising a gaming table, the method comprising:

providing at least one camera configured to capture images of the gaming area, at least one processor configured to communicate with the at least one camera and a memory storing instructions executable by the at least one processor;

determining a presence of a first gaming object on the gaming table in a first image from a series of images of the gaming area captured by the at least one camera;

responsive to determining the presence of the first gaming object in the first image, tracking the first gaming object in a plurality of images within the series of images;

determining object detection event data, the object detection event data comprising image data extracted from a plurality of images and metadata corresponding to the first gaming object; and

transmitting the object detection event data to a gaming monitoring server.

45. The method of claim 44, wherein the object detection event data is determined in response to tracking of the first gaming object in at least two or more of the plurality of images within the series of images.

46. The method of claim 44 or claim 45, further comprising determining a presence of one or more players in the series of images of the gaming area.

47. The method of claim 46, wherein the image data extracted from the plurality of images comprises: image data corresponding to the one or more players and image data corresponding to the first game object.

48. A method for monitoring gaming activity in a gaming area, the method comprising:

receiving at a gaming monitoring server object detection event data from a gaming monitoring computing device, the object detection event data comprising image data corresponding to a plurality of images and metadata corresponding to a first gaming object;

processing the image data by the gaming monitoring server to estimate postures of one or more players in the plurality of images;

based on the estimated postures, determining by the gaming monitoring server a first target player associated with the first gaming object among the one or more players.

49. The method of claim 48, further comprising identifying in the plurality of images a plurality of face regions of the first target player associated with the first gaming object.

50. The method of claim 49, further comprising processing the plurality of face regions of the first target player to determine face orientation information of a first target player's face in each of the plurality of face regions.

51. The method of claim 50, further comprising processing the face orientation information of the first target player's face in each of the plurality of face regions to determine a most head-on face region corresponding to the target player.

52. The method of claim 51, wherein the most head-on face region corresponding to the target player relates to a face region that is a most information-rich face region for face recognition operations.

53. The method of any one of claims 44 to 52, wherein the gaming monitoring server comprises a gaming monitoring server located in a gaming premises or a gaming monitoring server located remote to the gaming premises.

~~54. The system of any one of claims 35 to 43, wherein the gaming monitoring server comprises a gaming monitoring server located in a gaming premises or a gaming monitoring server located remote to the gaming premises.~~

~~55. The system of any one of claims 35 to 43 and 54, wherein the gaming monitoring server comprises a secure data storage component for the object detection event data and the determined target player information.~~

~~56. The system of any one of claims 35 to 38, wherein the at least one camera and the edge gaming monitoring computing device are part of a smartphone.~~

~~57. The system of any one of claims 35 to 38 and 57, wherein the captured images comprise depth of field images; and~~

~~determination of a presence of a first gaming object on the gaming table is based on the depth of field images.~~

~~58.~~35 The method of any one of claims 18 to 34, wherein the captured images comprise depth of field images; and

determination of a presence of a first gaming object on the gaming table is based on the depth of field images.

~~59~~36. Non-transient computer readable storage media storing program code, the program code executable by at least one processor to configure the at least one processor to perform the method of any one of claims 18 to 3~~4, 44 to 53 and 58~~.