

INTELLIGENT IDENTIFICATION SYSTEM USING AN ELECTRONIC CHART AND
FOR BERTHING AND UNBERTHING A SHIP

BACKGROUND

Field of the Invention

5 [0001] The present invention relates to the technical field of identification security systems, and in particular to a system that utilizes ship electronic charts in combination with artificial intelligence for identification and recording.

Description of Related Art

[0002] In the bustling sea areas adjacent to ports, docks, and berths, the high volume
10 of ship traffic, coupled with the diverse berthing requirements and varying durations of each ship's stay, renders these areas prone to maritime accidents. In the event of a maritime accident involving a ship, it not only leads to losses in the shipping company's property, equipment, cargo, and potential casualties among the crew but also gives rise to associated issues such as delivery date delays and compensation claims. Moreover,
15 there is an increased risk of environmental pollution and harm to aquatic life. Consequently, ensuring the efficient and safe entry, exit, and berthing of ships in ports, docks, and along shores has long been a significant and widely-concerned issue.

[0003] The majority of accident-causing factors documented in maritime accident investigation reports are human errors. Hence, effective reduction of human errors can
20 serve as a preventive measure against maritime accidents. To this end, various industry operators have installed Closed-Circuit Television (CCTV), Voyage Data Recorders (VDR), and Electronic Chart Display and Information Systems (ECDIS) within the ship's cockpit. These systems are used to record the navigation trajectory, with the data being stored in cloud-based folders.

25 [0004] Owing to the limitations of satellite network bandwidth, the uploading of data related to the ship's berthing and departure navigation trajectories alone requires a full

day to complete. Subsequently, the management end must also download the data. Furthermore, at present, for the ship's navigation trajectory to be presented on an electronic chart, it necessitates translation and manual intervention before it can be accurately depicted and displayed on the screen. However, due to discrepancies in the scales between the recorded navigation trajectory and the electronic chart, the relationship between the ship and various environmental objects within the chart can only serve as a reference on the screen and cannot be precisely analyzed. As a result, for the post-event determination of whether a ship's berthing and departure operations comply with relevant regulations, an initial manual assessment is required. In the event of identified violations, video recordings are made and subsequently reviewed by department supervisors to confirm the details of the non-compliance. Evidently, the current process is time-consuming, and the excessive length of the videos results in a limited number of videos that can be inspected during each session. This leads to a low overall inspection rate and a reduced overall sampling ratio, thereby failing to guarantee that the majority of affiliated ships adhere to the berthing and departure regulations.

SUMMARY

[0005] The present invention provides an intelligent identification system using an electronic chart and for berthing and unberthing a ship, the main object of which is to provide a security system for identifying and managing ship's berthing and departure through artificial intelligence.

[0006] To achieve the above object, an intelligent identification system using an electronic chart and for berthing and unberthing a ship provided by the present invention includes:

[0007] an original data module including an original data;

[0008] a ship standard specification module information-connected to the original data module, wherein the ship standard specification module is used to receive the

original data and includes a ship detection unit, a berthing detection unit, a character identification unit, a comparison unit and a database, the ship detection unit, the berthing detection unit and the character identification unit are used to analyze the original data to obtain at least one data, the at least one data includes: a parallel data, a
5 safe-speed data and an offshore-distance data, the comparison unit is used to receive the parallel data, the safe-speed data and the offshore-distance data, at least one criterion is pre-stored in the comparison unit, and the at least one criteria include: a parallel criterion, a safe speed criterion and an offshore-distance criterion, the parallel criterion is used to compare the parallel data, the safe speed criterion is used to
10 compare the safe-speed data, and the offshore-distance criterion is used to compare the offshore-distance data, if any of the above data does not meet the criteria, at least one record information and at least one analysis information is formed, if any of the above data meets the criteria, the record information is formed, and the comparison unit transmits the record information and the analysis information to the database; and
15 [0009] a management module information-connected to the ship standard specification module, wherein the management module is information-connected to the comparison unit to receive the record information and the analysis information.
[0010] More specifically, the record information and the analysis information include short videos with a duration of less than one minute, screenshots, videos and text files.
20 [0011] More specifically, the at least one data and the at least one criteria further include a turn-around data and a turning criterion, and the turning criterion is used to compare the turn-around data.
[0012] More specifically, the original data includes images from satellites or texts, values displayed on the ship's system or texts, values or images pre-stored in the ship's
25 system.
[0013] More specifically, the parallel criterion includes that the ship is kept parallel to

a bank data, and being parallel means that an angle between the ship's body and the bank data is less than 5 degrees.

[0014] More specifically, the safe speed criterion includes that the ship's navigation speed is maintained at 2 knots.

5 [0015] More specifically, the offshore-distance criterion includes that a distance between the ship and the bank data is at least twice the ship's width.

[0016] More specifically, the turning criterion includes that there are no obstacles in water area with a radius of at least one ship's length centered on the ship.

[0017] The present invention judges whether the original data of different scales
10 complies with these criteria through artificial intelligence by pre-storing these criteria, so as to make the berthing and departure of the affiliated ships safer. Then, short videos with a duration of less than one minute, screenshots, videos and text files are derived through artificial intelligence to facilitate subsequent review and examination. Moreover, in combination with the fact that AI can conduct deep learning, manual operations are
15 saved and human errors are reduced, achieving the purposes of rapid and convenient recording and warning.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a framework schematic diagram of an intelligent identification system
20 using an electronic chart and for berthing and unberthing a ship in accordance with the present invention;

FIG. 2 is a system flowchart of the intelligent identification system using an electronic chart and for berthing and unberthing a ship of the present invention;

FIG. 3 is a schematic diagram of information transmission of the intelligent
25 identification system using an electronic chart and for berthing and unberthing a ship of the present invention; and

FIG. 4 is a schematic diagram of an embodiment of the intelligent identification system using an electronic chart and for berthing and unberthing a ship of the present invention.

DETAILED DESCRIPTION

5 [0019] Please refer to FIGS. 1-3, the present invention provides an intelligent identification system using an electronic chart and for berthing and unberthing a ship, which includes an original data module 10, a ship standard specification module 20, and a management module 30.

[0020] The original data module 10 includes a plurality of information-connected
10 devices 10A, which are installed on ships and include voyage data recorders (VDR), electronic chart display and information systems (ECDIS), and automatic identification system (AIS) for ships, but are not limited thereto. These devices 10A obtain an original data 11 through information transmission with nearby ships, towers, and satellites. The original data 11 includes a dynamic information, a static information, and a nautical
15 information. The dynamic information includes: ship position, navigation status, such as in motion or at rest, navigation direction, navigation trajectory, navigation speed, surrounding water objects, ship's angle, etc. The dynamic information can be derived from satellite images or text and values displayed on the ship's system. The static information includes: ship name, ship type, ship's length and width, chart information,
20 etc. These static information can be text, values, or images pre-stored in the ship's system. The nautical information includes: ship's draft depth, a predetermined berthing position P, a berthing position M, and arrival time. It should be noted that the predetermined berthing position P is the position where the ship is scheduled to finally dock, and the berthing position M is the ship's position before it is guided by a tugboat
25 to the predetermined berthing position P. Please refer to FIG. 4, since the characteristics of each port or dock are different, the captain will contact the tower and

confirm the time of entering and leaving the port before the ship enters the port. After entering the port, the ship will proceed to the pre-docking position (i.e., the predetermined berthing position P) according to the instructions of the tower. The ship will wait for a tugboat near the predetermined berthing position P (i.e., the berthing position M). Then, with the short-distance pushing and pulling of the tugboat, the ship can be accurately docked at or leave the predetermined berthing position P. The specification in the present invention is the specification for the ship to wait for the tugboat's assistance in berthing and departure at the berthing position M. That is, when the ship arrives at the berthing position M for identification, but it is not limited thereto. It can be changed according to different sea area conditions to meet the specifications of various operators. Additionally, it should be noted that the scales of the static information, the nautical information, and the dynamic information are not the same, resulting in different scales in the original data 11, such as for the navigation trajectory and chart information, and thus accurate comparison cannot be made. The conventional technology relies on manual confirmation and interpretation, and there are often human errors. In the present invention, the original data 11 with different scales is downloaded and then imported into the ship standard specification module 20 for intelligent judgment, thereby reducing human errors and manpower through intelligent judgment.

[0021] An artificial intelligence identification host 2 includes the ship standard specification module 20. The ship standard specification module 20 is information-connected with the original data module 10. The original data 11 is imported into the artificial intelligence identification host 2. The ship standard specification module 20 includes a ship detection unit 21, a berthing detection unit 22, a character identification unit 23, a comparison unit 24, and a database 25 which are information-connected with each other.

[0022] The ship detection unit 21 uses image recognition technology to identify whether the ship position in the original data 11 is located at the berthing position M. The above-mentioned identification result is a position information 211. The ship detection unit 21 uses image recognition technology to identify the length and width of the ship and the ship's angle in the original data 11. The above-mentioned identification result is a ship information 212.

[0023] The berthing detection unit 22 uses image recognition technology to identify the predetermined berthing position P, a bank data P2, a turning position and surrounding water area in the original data 11. The bank data P2 is the bank type corresponding to the predetermined berthing position P, for example, the angle of bank extension as shown in FIG. 4. The above-mentioned identification result is a berthing information 221.

[0024] The character identification unit 23 uses image recognition technology to recognize the text of the dynamic information, the static information, and the nautical information in the original data 11 to obtain a numerical information 231. The numerical information 231 includes navigation speed, navigation distance, and navigation time.

[0025] In one embodiment, according to the position information 211, it is first confirmed whether the ship's position is located at the berthing position M. If the ship is at the berthing position M, the width of the ship is obtained according to the ship information 212, and then the bank data P2 is obtained according to the berthing information 221. The berthing position M, the bank data P2, and the width of the ship are compared to obtain an offshore-distance data 203. The offshore-distance data 203 is the distance between the ship and the bank data P2 when the ship is at the berthing position M, as shown in FIG. 4.

[0026] In one embodiment, according to the position information 211, first confirm whether the ship's position is located at the berthing position M. If the ship is at the

berthing position M, obtain the ship's angle according to the ship information 212, and then obtain the bank data P2 according to the berthing information 221. Compare the berthing position M, the bank data P2, and the ship's angle to obtain a parallel data 201. The parallel data 201 is the angle between the extension of the ship's body at the
5 berthing position M and the bank extension in the bank data P2.

[0027] In one embodiment, according to the position information 211, first confirm whether the ship's position is located at the berthing position M. If the ship is at the berthing position M, obtain the navigation speed according to the numerical information 231. Compare the berthing position M and the navigation speed to obtain a safe-speed
10 data 202. The safe-speed data 202 is the navigation speed of the ship when it is at the berthing position M.

[0028] The offshore-distance data 203, the parallel data 201, and the safe-speed data 202 are imported into the comparison unit 24. Please refer to FIGS. 2 and 3, a parallel criterion 241, a safe speed criterion 242, and an offshore-distance criterion 243 are
15 pre-stored in the comparison unit 24. Users can set a single criterion to compare with a single data or cross-compare the conditions formed by the union of multiple criteria with these data according to actual needs. In this embodiment, it is a comparison of a single criterion with a single data (which will be described in detail later). That is, the parallel criterion 241 is compared with the parallel data 201, the safe speed criterion 242 is
20 compared with the safe-speed data 202, and the offshore-distance criterion 243 is compared with the offshore-distance data 203. After the comparison unit 24 makes one-by-one comparisons, if any data does not meet the criterion standard, a record information 245 and an analysis information 246 are formed. If any data meets the criterion standard, the record information 245 is formed, and the record information 245
25 and the analysis information 246 are transmitted to the database 25 and the management module 30. The database 25 stores the record information 245 and the

analysis information 246.

[0029] Please refer to FIGS. 2 and 3, in this embodiment, it is a comparison of a single criterion with a single data. That is, the parallel criterion 241 is compared with the parallel data 201. The parallel criterion 241 requires that the ship and the bank data P2 must be parallel. To be parallel, the angle between the ship's body and the bank data P2 is less than 5 degrees. If it meets the requirement, the comparison unit 24 issues the record information 245. If it does not meet the requirement, the comparison unit 24 issues the analysis information 246 and the record information 245. The safe speed criterion 242 is compared with the safe-speed data 202. The safe speed criterion 242 requires that the ship's navigation speed at the berthing position M be maintained at 2 knots. If it meets the requirement, the comparison unit 24 issues the record information 245. If it does not meet the requirement, the comparison unit 24 issues the analysis information 246 and the record information 245. The offshore-distance criterion 243 is compared with the offshore-distance data 203. The offshore-distance criterion 243 requires that the distance between the ship at the berthing position M and the bank data P2 be at least twice the ship's width. If it meets the requirement, the comparison unit 24 issues the record information 245. If it does not meet the requirement, the comparison unit 24 issues the analysis information 246 and the record information 245. The comparison unit 24 transmits the record information 245 and the analysis information 246 to the database 25 and the management module 30. The database 25 stores the record information 245 and the analysis information 246 for future query of the relevant number of violations to achieve a warning function.

[0030] The management module 30 is information-connected with the ship standard specification module 20. The management module 30 is used to receive the record information 245 and the analysis information 246 for review. In this embodiment, the record information 245 and the analysis information 246 include short videos with a

duration of less than one minute, screenshots, videos, and text files, etc. The record information 245 and the analysis information 246 can be permanently saved or exported by the management module 30 in the form of reports to improve work efficiency. Through the record information 245 and the analysis information 246, the management module 30 can quickly know whether the affiliated ships comply with the specifications, improve the overall inspection rate, and strengthen navigation safety, eliminating the time-consuming processes of uploading, manual preliminary judgment, editing, and reviewing of lengthy videos.

[0031] It should be noted that after the comparison unit 24 makes comparison, if there is a mismatch, the comparison unit 24 will form the analysis information 246 in the form of short videos with a duration of less than one minute, screenshots, videos, and text files for the non-compliant parts in the parallel data 201, the safe-speed data 202, and the offshore-distance data 203. The analysis information 246 will be stored in the database 25 for future warning use. At the same time, the analysis information 246 and the record information 245 will be transmitted to the management module 30 for review and viewing. Through short videos and screenshots with a duration of less than one minute, the need to watch lengthy videos can be eliminated, and the inspection rate can be improved. If the short videos with a duration of less than one minute are not sufficient to confirm whether the ship complies with the specifications, the video can be watched again to confirm whether the ship complies with the specifications. The ship standard specification module 20 and the comparison unit 24 can automatically and preliminarily identify whether the ship complies with the specifications through the artificial intelligence identification host 2, reducing human errors and also omitting procedures such as manual work and editing.

[0032] Considering that a ship needs to change direction or change course when docking or leaving a dock, or when entering or leaving a port, and has a need to turn

around, a ship turning around is an extremely complex operation, and the surrounding water area needs to be as free of danger as possible, that is, there should be no objects in the surrounding water area. Therefore, in this embodiment, the comparison unit 24 also includes a turning criterion 244. The turning criterion 244 is compared with the turn-around data 204. The turn-around data 204 is used to first confirm that the ship position is located at the turning position according to the position information 211. The turning position can be the berthing position M, but is not limited thereto. According to the ship information 212, the length of the ship is obtained. Then, according to the berthing information 221, the surrounding water area and the surrounding water objects at the turning position are identified. The above-mentioned surrounding water area is the surrounding water area with the turning position as the center and the length of the ship as the radius, so as to obtain an surrounding water object of the ship. Compare the turning position, the length of the ship, and the surrounding water object of the ship to obtain the turn-around data 204. The surrounding water object of the ship at the turning position of the above-mentioned ship is the turn-around data 204. The turn-around data 204 is imported into the comparison unit 24 for comparison with the turning criterion 244. The turning criterion 244 is that there are no obstacles (i.e., no objects) in the surrounding water area with a radius of at least one time of the ship length at the turning position of the ship. If it meets the requirement, the turning criterion 244 issues the record information 245. If it does not meet the requirement, the comparison unit 24 issues the analysis information 246 and the record information 245.

[0033] In the present invention, the original data 11 is analyzed by the ship detection unit 21, the berthing detection unit 22, and the character identification unit 23 to obtain the position information 211, the ship information 212, the berthing information 221, and the numerical information 231. The above-mentioned information is cross-compared and combined to obtain the parallel data 201, the safe-speed data 202, the

offshore-distance data 203, and the turn-around data 204 and import them into the comparison unit 24. The parallel criterion 241, the safe speed criterion 242, the offshore-distance criterion 243, and the turning criterion 244 are pre-stored in the comparison unit 24. These criteria can be changed according to different sea area

5 conditions to meet the specifications of various operators. After the artificial intelligence identification host 2 makes one-by-one comparisons of the parallel data 201, the safe-speed data 202, the offshore-distance data 203, and the turn-around data 204, if they meet the criteria, the record information 245 is obtained. If they do not meet the criteria, the analysis information 246 and the record information 245 are obtained.

10 Through the analysis information 246 including short videos with a duration of less than one minute, screenshots, videos, and text files, they are transmitted to the management module 30 and the database 25, the database 25 is used to collect the analysis information 246 and the record information 245 for future query and use, and the management module 30 is used to quickly review whether the affiliated ships comply

15 with the specifications, improve the overall inspection rate, and strengthen navigation safety, eliminating the time-consuming processes of uploading, manual preliminary judgment, editing, and reviewing of lengthy videos.

[0034] Symbol explanation

2...artificial intelligence identification host

20 10...original data module

10A...devices

11...original data

20...artificial intelligence identification host

201...parallel data

25 202...safe-speed data

203...offshore-distance data

	204...turn-around data
	21...ship detection unit
	211...position information
	212...ship information
5	22...berthing detection unit
	221...berthing information
	23...character identification unit
	231...numerical information
	24...comparison unit
10	241...parallel criterion
	242...safe speed criterion
	243...offshore-distance
	244...criterion turning criterion
	245...record information
15	246...analysis information
	25...database
	30...management module
	P...predetermined berthing position
	P2...bank data
20	M...berthing position

Claims

【Claim 1】 An intelligent identification system using an electronic chart and for berthing and unberthing a ship, comprising:

an original data module including an original data;

a ship standard specification module information-connected to the original data module, wherein the ship standard specification module is used to receive the original data and includes a ship detection unit, a berthing detection unit, a character identification unit, a comparison unit and a database, the ship detection unit, the berthing detection unit and the character identification unit are used to analyze the original data to obtain at least one data, the at least one data includes: a parallel data, a safe-speed data and an offshore-distance data, the comparison unit is used to receive the parallel data, the safe-speed data and the offshore-distance data, at least one criterion is pre-stored in the comparison unit, and the at least one criteria include: a parallel criterion, a safe speed criterion and an offshore-distance criterion, the parallel criterion is used to compare the parallel data, the safe speed criterion is used to compare the safe-speed data, and the offshore-distance criterion is used to compare the offshore-distance data, if any of the above data does not meet the criteria, at least one record information and at least one analysis information is formed, if any of the above data meets the criteria, the record information is formed, and the comparison unit transmits the record information and the analysis information to the database; and

a management module information-connected to the ship standard specification module, wherein the management module is information-connected to the comparison unit to receive the record information and the analysis information;

wherein the record information and the analysis information include short videos with a duration of less than one minute, screenshots, videos and text files;

the ship detection unit uses image recognition technology to identify the

original data to obtain a position information and a ship information, the position information is an identification result of whether the ship's position is at a berthing position, and the ship information is an identification result of the ship's width, the ship's length and the ship's body angle;

the berthing detection unit uses image recognition technology to identify the original data to obtain a berthing information, wherein the berthing information is identification of a predetermined berthing position, a bank data, a turning position and surrounding water area in the original data, and the bank data is the bank type corresponding to the predetermined berthing position;

the character identification unit uses image recognition technology to identify a dynamic information, a static information and a nautical information of the original data to obtain a numerical information, and the numerical information includes navigation speed, navigation distance and navigation time;

the parallel data is the result of comparing the berthing position, the bank data and the ship's body angle, the safe-speed data is the navigation speed when the ship is at the berthing position, and the offshore-distance data is the result of comparing the berthing position, the bank data and the ship's width.

【Claim 2】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 1, the at least one data and the at least one criteria further include a turn-around data and a turning criterion, and the turning criterion is used to compare the turn-around data.

【Claim 3】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 1, the original data includes images from satellites or texts, values displayed on the ship's system or texts, values or images pre-stored in the ship's system.

【Claim 4】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 1, the parallel criterion includes that the ship is kept parallel to a bank data, and being parallel means that an angle between the ship's body and the bank data is less than 5 degrees.

【Claim 5】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 1, the safe speed criterion includes that the ship's navigation speed is maintained at 2 knots.

【Claim 6】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 1, the offshore-distance criterion includes that a distance between the ship and the bank data is at least twice the ship's width.

【Claim 7】 The intelligent identification system using an electronic chart and for berthing and unberthing a ship as claimed in claim 2, the turning criterion includes that there are no obstacles in water area with a radius of at least one ship's length centered on the ship.