Research Article

Application Research of Manuscript Writing Robot Based upon Laser Sensor in News Dissemination Field

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Under the background of the information and data age, intelligent technology has had a large and profound impact on the production field of each industry, and the field of news dissemination has inevitably become one of them. With the rapid development of new media technologies, the traditional news production model has been impacted by the development of the times. Out of the needs of the transformation and upgrading of its own industry and the further development of laser sensor smart technology, a manuscript writing robot based on laser sensors came into being. Manuscript writing robot is the first time in the history of the development of news dissemination that the main body of news manuscripts has been changed from a natural person to a machine, realizing the transformation of the news production process from semifixed to completely relying on machine automation. This paper first briefly introduces the manuscript writing robot's working principle and work characteristics, analyzes its influence on other aspects, then models the machine hardware system, and finally conducts a quality comparison test between the manuscript writing robot and traditional artificial news production. Through the analysis of experimental data, the language organization ability of the manuscript writing robot is generally inferior to the traditional artificial language organization ability. However, the quality of manuscript writing robot data is 1.1 times that of traditional humans, and the speed of producing news is also 1.3 times faster than traditional humans. In terms of the depth and breadth of the scope of news, the overall average value of writing robots is 0.475 higher than that of traditional humans. Generally speaking, manuscript writing robots have clear advantages compared with traditional manual labor in news production and have a large room for development.

1. Introduction

In recent years, science and technology represented by artificial intelligence and information sensing technology have been developed rapidly, and many industries have realized the transformation and improvement of the times under the support of these intelligent technologies. The field of news communication has also profoundly changed its future development direction due to the development of the times, and the competition among news media has become increasingly fierce. Catering to the requirements of the times, seizing the opportunities of the times, and seizing development opportunities have become the necessary means for news media to win the battle for survival.

As a new type of measuring instrument, the laser sensor has the advantages of noncontact long-distance measurement, fast speed, high precision, large range, and strong

antilight and electrical interference. It is also often used in the field of robot manufacturing. Robots based on laser sensor technology can quickly process a large amount of information, make highly accurate judgments, and have extremely superior data and information processing capabilities.

At present, systems or robots developed based on laser sensing technology have received extensive attention from scholars. In his article, Daniel studied how to build a robot sensor control board and put it into practical use. He believes that the interpretation of sensor data can be achieved by using robot neural network algorithms, fuzzy logic algorithms, and artificial intelligence algorithms. This process is called sensor fusion or sensor interpretation in the field of artificial intelligence. Such algorithms can also be used for advanced signal processing in image processing, pattern recognition, MRI, ultrasound, and interpretation of sonar

and radar signals [1]. Villagrossi et al. have developed an intelligent system that uses a single-point laser displacement sensor and combines the robot sensor information to synchronize the handshake communication process. This system can use the robot as a measuring instrument, allowing the rapid reconstruction of extremely robust 3D images under difficult working conditions. They used a two-stage method to compare the reconstructed 3D point cloud with the nominal 3D point cloud and found that the system can automatically adjust the robot's deburring trajectory. This experiment proves the feasibility and effectiveness of the proposed solution [2]. Yanbiao and Xiangzhi proposed a hand-eye calibration method based on semidefinite programming (SDP) for arc welding robots and laser vision sensors. They established the conversion relationship between the pixel coordinate system and the laser plane coordinate system based on the mathematical model of the laser vision sensor's three-dimensional measurement. In addition, the conversion relationship between the arc welding robot coordinate system and the laser vision sensor measurement coordinate system was established based on the hand-eye calibration model. They used ordinary least squares (OLS) to calculate the rotation matrix and used SDP to identify the direction vector of the rotation matrix to ensure their orthogonality. In the feasibility appraisal, it is proved that this method can reduce the calibration error and ensure the orthogonality of the calibration results [3]. Liu and Tian researched a new method of robot welding path planning based on laser scanning for nonideal tube intersection curves. They used a laser displacement sensor to scan and identify the weld seam and analyzed the direction and posture of the spatial weld seam to give the laser sensor scan trajectory. After sampling and filtering the distance data obtained by the laser sensor, they proposed a new type of welding spot recognition algorithm suitable for the mentioned scanning trajectory. Finally, the ADAMS simulation experiment proves that the scheme can effectively avoid the adverse effects of up-and-down welding on the welding quality [4]. Ge et al. proposed and constructed a robot welding seam online grinding system based on a laser vision sensor. They developed welding seam tracking software and applied the online interaction method to grinding system data based on XML (Extensible Markup Language) files. They first established a hand-eye calibration model to convert the data into the robot coordinate system. Then, they extracted the weld contour information, stored it in the data buffer, and transmitted the coordinates of the robot grinding point through the self-developed weld grinding software. They integrated a vision system and a self-made grinding system at the end of the robot. Finally, the reliability and practicability of the system and the proposed online method of data interaction are verified through experiments [5]. Pachkawade V proposed a manufacturing method based on laser sensing technology to develop transducers based on micro-sized capacitive gaps suitable for various applications. He produced a low-cost prototype using fast and advanced laser micromilling technology. It achieved a parallel cut width (capacitor gap) of approximately 60 microns on a piece of aluminum and a piece of stainless steel, with

thicknesses of 1 and 2 mm, respectively. This device has been shown to facilitate driving and sensing changes in capacitance on its electrodes through electrostatic means. He conducted experiments on aluminum structures and provided results, including analytical modeling, manufacturing, and electrical characteristics. It proved the applicability of the device as a two-degree-of-freedom resonant mode positioning sensor using weak electrostatic coupling. The sensor has sensitivity based on vibration amplitude to respond to relative changes in stiffness and can solve the order of least stiffness perturbation [6]. Laser sensor technology has been created and used in many fields, but its integration with the news dissemination field has not yet received widespread attention. Laser sensors with high accuracy, high processing efficiency, and large dynamic range can be integrated with high effect in the field of new production.

The manuscript writing robot based on laser sensor is the product of the fusion of the news communication industry and science and technology, and it has a strong contemporary character. Manuscript writing robots only began to enter people's sight after 2015. In an era when new media is prevalent, most scholars are studying the combination of the Internet and traditional news dissemination. Few scholars have combined news dissemination and smart sensor technology for research. However, with the rapid development of science and technology nowadays, the traditional news dissemination field can only achieve deeper development if it is combined with the characteristics of the times [7]. As a part of intelligent science and technology, manuscript writing robots play a very special and important role in improving the efficiency of news production and advancing the process of intelligent news dissemination. This paper studies the application of laser sensor-based manuscript writing robots in the field of news dissemination, which is of innovative significance for filling the current gaps in news dissemination research and promoting the continuous development of manuscript writing robot technology.

This paper conducts a study on the application of a laser sensor-based manuscript writing robot in the field of news communication. The working principle of the handwriting robot is introduced in detail, the impact on the news industry is analyzed, and a comparison experiment between the manuscript writing robot and the traditional manual handwriting is conducted. The paper is organized as follows:

Section 1 introduces the current status of research development in the field of news communication and laser sensor technology and provides a brief description of the current research results at home and abroad.

Section 2 mainly introduces the working principle, working characteristics of the manuscript robot, and its impact on the news communication industry.

Section 3 uses the manuscript writing robot hardware system for system modeling and probabilistic modeling of the selected LiDAR and compares and tests the manuscript writing robot news production model with the traditional manual news production model.

Section 4 analyzes the experimental results of this paper and concludes that the quality of news edited by the manuscript writing robot is inferior to that of traditional manual editing. However, in terms of news processing efficiency, the manuscript writing robot outperforms traditional humans.

Section 5 provides an overview of the paper, describing the main topics addressed in this paper and the future of manuscript writing robots.

2. Manuscript Writing Robot Based on Laser Sensor

2.1. The Working Principle of the Manuscript Robot. Manuscript bots are artificial intelligence software that can automatically generate manuscripts based on algorithms in the first place, instantly output analysis and research, and deliver important information and interpretations to users. The production method of manuscript robot news is slightly different from the traditional news production method. In traditional news writing, the formal completion of a news article needs to go through the following links: news information collection, news information collation, manuscript writing and editing, review and proofreading, and final issuance and push, as shown in Figure 1. The content of each link is a completely manual operation [8].

In the writing process of the manuscript robot, the entire news generation process needs to go through four links: information collection, information analysis and processing, news content generation according to preset semantic processing templates, and review push release, as shown in Table 1. The whole process is the result of the prewritten algorithm program and big data, the whole process can be automated, and the time from the news event to the final draft is very short [9].

The functional requirements of the robot usually involve four modules: information collection module, data processing module, signal input and output I/O module, and power management and electrical protection module. Each module needs to be implemented independently in terms of a function, and there are dependencies between the modules. According to the functional requirements of each module, the corresponding electrical components are selected, and the type and number of electrical components are determined based on the mechanical structure of the body and the control strategy of the software. Figure 2 shows the relationship between the four modules.

The key to improving the response time of a writing robot lies in the robot's core component, the servo motor. The robot is driven by the servo motor to realize the multi-degree-of-freedom movement during operation. If high speed and accuracy are required for robot operation, the actual requirement is that the response speed and control accuracy of the servo motor should be high enough.

2.1.1. Information Collection. Information gathering is the first step for the writing robot to complete news editing work. The information collection of news writing here is

roughly the same as that of the reporter's previous news interviews. Through the sensory information processing technology, the effective mass data related to the report theme is captured from the database in cooperation with the media organization, as shown in Figure 3. Machine news writing is currently mainly used in the field of phenomenon reports. The distinguishing feature of this type of news report is that its content is mainly supported by data, and the complete news report can only be produced by machine news writing relying on the processing results of the target data. Therefore, the primary link of using machine news writing to produce news content is data capture. Therefore, some people call machine news writing "data porters." The rapid development of big data technology makes machine news writing present the advantages of wide information sources and accurate capture in the data capture stage [10].

2.1.2. Information Analysis and Processing. Information analysis and processing is the second step of the manuscript writing robot to complete the news editing work. Through the screening and analysis of the captured data, the process of selecting data that meets the news value is shown in Figure 4. In this process, the robot first excludes illegal data, such as sensitive words and clearly wrong data. Then, according to the present news point, select the data that coincides with the news value, and combine the news report model that has been set manually to measure the "news" in the data. This process is similar to the conception process of journalists in the traditional news production process: determining the theme, screening useful materials, arranging the structure of the article, and so on.

2.1.3. Generate News Content according to the Preset Semantic Processing Template. After collecting and analyzing the news information in the first two links, in the third step, the robot must match the most appropriate language template model based on the best news angle selected by the algorithm and the filtered data. Then, it fills the selected key data into the language template model to automatically generate the main body of the manuscript. First of all, the search system searches out all relevant news from the news database according to the user's intention and performs preprocessing, including word segmentation and sentence processing. Next, the importance of sentences is sorted based on a series of algorithms, among which are graph-based sorting and feature-based sorting algorithms [11]. The graph sorting algorithm will build a graph network model, as shown in Figure 5. Each sentence of the document is regarded as a node in the graph network. The similarity between sentences is used as the edge weight between the nodes. The calculation formula for the similarity between sentences is

$$\text{similarity}(s_i, s_j) = \frac{|\{w_k | w_k \in s_i \& w_k \in s_j\}|}{\log(|s_i|) + \log(|s_j|)}. \quad (1)$$

FIGURE 1: Schematic diagram of news production process.

TABLE 1: Main content of news production steps.

Procedure	Traditional news production	Robot news production method
News source	Journalists selectively compile and edit the content of mass communication	Data from massive databases on the Internet
News gathering	Manual information search, screening, or on-site interview	Computer program for automatic data collection
News production	Journalists participate in the work of collecting, writing, editing, arranging, and proofreading	Computers rely on “machines” to automatically write articles
Press releases	Man-manipulated works are mainly text	Released after manual review

FIGURE 2: Relationship diagram modules.

FIGURE 3: Principles of information collection by manuscript robots.

Using the principle to iteratively spread the weight to calculate the score of each sentence, as an important parameter for generating short summaries, the graph model formula is as follows [12]:

$$S(V_i) = (1 - d) + d * \sum_{j \in \text{In}(V_i)} \frac{1}{|\text{out}(V_j)|} S(V_j). \quad (2)$$

2.1.4. Review Push Release. The review push release is the last step of the manuscript writing robot to complete the news work. The difference from the previous three steps is that this step cannot be separated from the manual “review

FIGURE 4: Schematic diagram of data analysis by manuscript robot.

push,” that is, the manual review and release of the automatically generated news manuscript. After all, the manuscript robot algorithm system is just a program. Although its own algorithms can be used to improve the accuracy of news content in some fields of news production, the current algorithms have not yet reached the level of checking and judging the correctness of information like the human brain. It is still necessary for the media to modify the robot’s manuscript based on its own news positioning and other

FIGURE 5: Text generation processing.

factors. Manually review the manuscript and distribute it to various channels for push after confirming that it is correct [13]. With the improvement of the algorithm technology of manuscript robots, some media have begun to try to make manuscript robots realize the full automation of news production. In the future, with the development of this technology, the participation of manual editorial review in specific reporting areas is expected to gradually decrease.

2.2. Work Characteristics of Manuscript Robots. The manuscript writing robot based on laser sensor technology has overturned the traditional mode of news production and has unique working characteristics compared to the traditional news production mode. An American media once did an experiment in which a reporter from National Public Radio and a writing robot simultaneously edited a brief report of sports news, which was faster and more recognized than trying to write a report. The experimental results are shown in Table 2.

It can be seen from Table 2 that the superiority of the manuscript writing robot in terms of speed cannot be surpassed by human journalists, but the journalist outperforms the manuscript writing robot in terms of manuscript quality and reader acceptance. It can be seen from the experiment that the manuscript writing robot has the characteristics of fast speed and good at comprehensive information processing [14].

This paper summarizes and analyzes the characteristics of the news production of the manuscript robot from three aspects: the main body of the news production of the manuscript robot, the content of news production, and the cost of news production.

2.2.1. Intelligent Mechanization of the Main Body of News Production. The most essential difference between the news production of the manuscript robot and the news production under the traditional mode is that the main body of the news production in the traditional mode is humans, while the main body of the news production of the manuscript robot is the mechanical program. News production in the traditional mode is similar to the manual assembly line, with semiautomatic and semifixed nature. The news editor can only proceed after the reporter has conducted the actual investigation and interview. With the progress of the times,

computer-assisted news that has appeared only collects data and information through computers. Even if it later develops into data journalism, computers only play the role of supplementary information in the news, appearing as supplementary background material for news content. However, the manuscript writing robot is not just like an auxiliary role in data journalism; it has the feature of fully automating every program from the beginning to the end of news production [15]. In this respect, the use of manuscript writing robots has transformed the work of journalists from complex and boring information gathering to a more creative direction. This changing trend is both an opportunity and a challenge for those engaged in the news industry.

2.2.2. Personalized and Accurate News Production Content.

In the era of big data where new media is prevalent, users receive a large amount of information every day. How the media uses this information push channel to select the most interesting news information from the mass data stream has become the primary link in news production. It is impossible for such extremely complex tasks to be completed by humans alone, which has become the advantage of robot news production. The manuscript writing robot can produce news information that is most closely connected to the audience and users while ensuring that the news production meets the quantity requirements. Moreover, the manuscript writing robot can also use the powerful information acquisition and discrimination capabilities of its own system to reduce the probability of error to an extremely low level, thereby improving the accuracy of news articles. From the perspective of news sources, if it only relies on manual screening to obtain such complex news information, the probability of reporting errors will greatly increase. However, the manuscript writing robot directly uses the system information sensing technology to process the original data, which is much lower than the manual method to report the error, thus ensuring the accuracy of the news source [16].

2.2.3. Economical News Production Costs.

The impact of the Internet on the traditional news dissemination industry puts it under tremendous economic pressure. The adjustment of the internal structure of the industry, the external transformation and upgrading, the improvement of news production efficiency, and the reduction of production costs are inevitable measures for the sustainable development of the entire news dissemination industry. Although the manuscript writing robot needs to invest a lot of money in the initial use of the system, in the long run, the production cost of the manuscript robot is much lower than the production cost of news based on manual labor alone.

According to statistics, the cost of writing different types of news reports by writing robots used by the British news communication industry is much lower than the cost of manual production of news, as shown in Table 3. Although the application of manuscript writing robots has not yet reached a mature level, its cost-effectiveness in the field of news production in the future will become higher and higher [17].

TABLE 2: Experimental comparison results.

Reporter	VS	Manuscript robot
8 minutes	Writing time	3 minutes
9813 readers recognized	Manuscript quality	932 readers recognized
Deduction and association	Competitive advantages	Induction and synthesis
Depth and character theme	Areas of expertise	News manuscripts

TABLE 3: Different types of news writing costs.

News type	Labor cost (€)	Cost of writing robot (€)
Financial news	10	5
Sports news	12	5
Political news	16	6
Life news	9	4

2.3. Impact Analysis of Manuscript Robots. There are four main aspects to the impact of writing robots, including the impact on people engaged in the news industry, the impact on news consumers, the impact on the news media, and the impact on society as a whole. Dividing it into the coordinate axes of the four-quadrant graph, as shown in Figure 6. The horizontal axis is on the news-public basis, and the vertical axis is on the micro-macro basis. News media and society are at the macroend, and the news industry, personnel, and news audiences are at the microend. From another perspective, people in the news industry and news media have news attributes, while readers and society have public attributes. Journalists, news consumers, news media, and society are all closely related to the development of writing robots [18].

2.3.1. Impact on Personnel Engaged in the News Industry. The invention of the manuscript robot has realized a fundamental change in news production methods. Its emergence will replace part of the work of people in the news industry, which will cause changes in the structure of the news industry. Manuscript writing robots liberated some journalists from their pipeline-like work, but at the same time as the liberation, the development of the industry also posed more arduous challenges to them. In the follow-up news production process using manuscript robots, the focus of manual operation will soon focus more energy on improving the quality of news products so that the original more “informative” news will become more high-quality news. Some research scholars also emphasized that the main purpose of introducing machines (algorithms) is to weaken the labor of journalists so that they can extract more time and energy to get rid of the trouble of processing data and spend more time on making good news. In the future, human reporters will work together with robot news writers [19].

2.3.2. Impact on News Consumers. In the context of the era of big data, news consumers, that is, readers, have extremely high requirements for the quality of news content and the aesthetics of arrangement. The production level of news has a profound impact on news audiences. The quality of news produced by the manuscript robot is not inferior to the

FIGURE 6: The writing robot and the four actors related to it.

quality of the news produced by humans, and the manuscript robot can also judge the user’s preferences by analyzing user data to produce and deliver more personalized news to readers. In this regard, writing robots still have a relatively ideal development trend in terms of the breadth of user audiences in the future.

2.3.3. Impact on News Media. The decline of the traditional news dissemination industry forces the industry to adjust its internal structure by introducing new media technical talents and reducing the number of traditional journalists. However, news production is indispensable to the demand for labor, and the reduction of the number of personnel will cause the number of news productions to fail to meet the development requirements. The cost of new media technical personnel is relatively high, and the labor return time is long. For the entire industry facing a development crisis, this method cannot quickly solve the problem, but the writing robot can effectively alleviate this situation. Manuscript writing robots can produce news that meets the development requirements with relatively low production costs and fast and efficient information processing technology, speeding up the pace of industrial production of news [20].

2.3.4. Impact on Society. There is no doubt that the writing robot has the advantage of being able to use large-scale industrial production of news, and its development status in the news dissemination industry in the future will gradually increase. This development trend has met the increasing demand of modern people for news and information. However, because the information processing algorithm system of the manuscript robot is more willing to push news

content that matches the interests of users, the probability of user groups seeing news content that does not conform to their opinions will become less and less. This will put the user group in a highly homogeneous speech background, and it will also bring a certain degree of public opinion risk to the society.

3. Experimental Research on the Application of Manuscript Robots in the Field of News Communication

This paper firstly carries on the systematic modeling of the selected manuscript writing robot hardware system, carries on the probabilistic modeling of the chosen laser radar, then carries on the pinhole camera principle analysis of the chosen camera, and introduces its image alignment and calibration principle. Later, the manuscript writing robot news production mode and the traditional manual news production mode were compared and tested [21].

3.1. Laser Modeling. The two-dimensional LiDAR emits laser pulses through its transmitter. When the laser touches the object, part of the laser light is reflected back to the laser receiver, the time difference between the transmission and reception is settled, and the ranging function can be realized. The performance parameters of the laser rangefinder used in this paper are shown in Table 4.

When the laser radar establishes its mathematical model, it mainly establishes the Bayesian observation model $p(A_t | B_t, m)$ of its scan data. The standard established by the observation model is that $p(A_t | B_t, m)$ has a smooth corresponding relationship with the pose B_t of the manuscript writing robot. That is, the change of the pose B_t is small, and the change of the observation model $p(A_t | B_t, m)$ is correspondingly small.

A single frame of scan data contains data after one week of LiDAR opening angle scanning. At this time, assuming that there is a total of scan data, the scan data A_t can be expressed as

$$A_t = \{A_t^1, A_t^2, \dots, A_t^n\}. \quad (3)$$

Use A_t^k to represent the k observation value in the observation data at t time (A_t^k represents a specific value). It is assumed that the scan data in the laser scan data of a single frame are all independent. At this time, the value of $p(A_t | B_t, m)$ can be expressed as the product of n scan data:

$$p(A_t | B_t, m) = \prod_{k=1}^n p(A_t^k | B_t, m). \quad (4)$$

When the laser scanning data is used in practice, the independent assumption performs well, so this Bayesian observation model can be used as the laser radar mathematical model.

The camera used in this paper uses TOF (time of flight) technology. It can perform depth imaging, and the imaging efficiency is higher. Table 5 shows the main parameters of the camera.

TABLE 4: LiDAR main parameters.

The main parameters	Performance
Opening angle	260°
Scanning frequency	18°/HZ
Angle resolution	1°
Work area	0.04 m–10°m
Power consumption	4°W

TABLE 5: The main parameters of the camera.

The main parameters	Performance
Color camera resolution	2120 × 960 30FPS
Depth camera resolution	515 × 424
Infrared resolution	515 × 424
Depth distance	0.4 m–4.8 m
Horizontal field of view	80°
Vertical field of view	60°

The difference between the depth camera and the ordinary monocular camera is that it is equipped with two cameras. The color camera and the depth camera obtain color RGB images and depth images, respectively. For this paper, the pinhole camera model is adopted, as shown in Figure 7.

It can be seen from Figure 6 that there are three coordinate systems X_d, Y_d , and Z_d in the camera imaging process of the pinhole model, which are represented as the camera coordinate system, the physical plane coordinate system, and the pixel coordinate system. Among them, the geometric correspondence between the point $P(X_d, Y_d, Z_d)^t$ of the camera coordinate system and the point $[X_p, Y_p, F]^t$ of XOY on the physical plane under the pinhole camera model can be expressed as [22]

$$\begin{cases} X_p = F \frac{X_d}{Z_d}, \\ Y_p = F \frac{Y_d}{Z_d}. \end{cases} \quad (5)$$

The relationship between the imaging point $[X_p, Y_p, F]^t$ and the pixel coordinate $[u, v]^t$ on the physical plane XOY is

$$\begin{cases} u = \alpha X_p + d_x, \\ v = \beta Y_p + d_y. \end{cases} \quad (6)$$

Through the joint transformation of the three coordinate system transformation formulas (5) and (6), the relationship between the pixel coordinates and the points of the camera coordinate system can be obtained, expressed as

$$\begin{cases} u = F \frac{X_d}{Z_d} + d_x, \\ v = F \frac{Y_d}{Z_d} + d_y. \end{cases} \quad (7)$$

FIGURE 7: Pinhole model camera points are expressed in each coordinate system.

Among them,

$$\begin{aligned} F_x &= \alpha F, \\ F_y &= \beta. \end{aligned} \quad (8)$$

At the same time, formula (6) can be expressed as [23]

$$Z_d \begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} F_x & 0 & d_x \\ 0 & F_y & d_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_d \\ Y_d \\ Z_d \end{bmatrix}, \quad (9)$$

where $K = \begin{bmatrix} F_x & 0 & d_x \\ 0 & F_y & d_y \\ 0 & 0 & 1 \end{bmatrix}$ is the internal parameter matrix of the camera.

The vision camera must be calibrated before use to calibrate its internal camera parameters to get the best effect. The camera used in this paper needs to calibrate the internal parameters of its two cameras, namely, calibrate the color camera and the depth camera. Depth cameras are different from ordinary cameras in that they can directly obtain depth information while observing without additional calculations. The key point to realize this feature is that each pixel of the color image has the gray value of the depth image; that is, the depth information corresponds to it. Therefore, in the process of calibrating the two cameras, it is necessary to align the color image and the depth image while obtaining the camera internal parameters. This paper mainly analyzes the principle of color and depth image alignment of the RGB-D camera.

The internal parameter matrix obtained by the internal parameter K_{rgb} of the color camera after calibration is shown in formula (9). At this time, according to the camera pinhole

model, the mapping relationship between the homogeneous coordinate $P = [u, v, 1]^t$ of the pixel point in the imaging plane and the three-dimensional space coordinate ($P = [X, Y, Z, 1]^t$) of the point in the camera coordinate system is shown in formulas (10) and (11) [24]:

$$K_{rgb} = \begin{bmatrix} F_{x,rgb} & 0 & d_{x,rgb} \\ 0 & F_{y,rgb} & d_{y,rgb} \\ 0 & 0 & 1 \end{bmatrix}, \quad (10)$$

$$Z_{rgb} P_{rgb} = K_{rgb} [I|0] P_{rgb}. \quad (11)$$

Expand formulas (10) and (11) to get

$$Z_{rgb} \begin{bmatrix} u_{rgb} \\ v_{rgb} \\ 1 \end{bmatrix} = \begin{bmatrix} F_{x,rgb} X_{rgb} + d_{x,rgb} Z_{rgb} \\ F_{y,rgb} Y_{rgb} + d_{y,rgb} Z_{rgb} \\ Z_{rgb} \end{bmatrix}, \quad (12)$$

$$Z_{rgb} \begin{bmatrix} u_{rgb} \\ v_{rgb} \\ 1 \end{bmatrix} = \begin{bmatrix} F_{x,rgb} & 0 & d_{x,rgb} & 0 \\ 0 & F_{y,rgb} & d_{y,rgb} & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_{rgb} \\ Y_{rgb} \\ Z_{rgb} \\ 1 \end{bmatrix}. \quad (13)$$

The homogeneous coordinates $P_{rgb} = [X_{rgb}, Y_{rgb}, Z_{rgb}, 1]$ in the formula are expressed as $P_{rgb} = [X_{rgb}, Y_{rgb}, Z_{rgb}]$ with nonhomogeneous coordinates. At this time, formula (12) can be transformed into formula (14). The coordinate change of the internal reference K_{ir} of the depth camera can be expressed in the same way as formula (15):

$$Z_{rgb} P_{rgb} = K_{rgb} \overline{P_{rgb}}, \quad (14)$$

$$Z_{ir} P_{ir} = K_{ir} \overline{P_{ir}}. \quad (15)$$

Since the transformation relationship of the entire camera is considered, the relative relationship R_{rgb}, T_{rgb} of the color camera and the relative relationship R_{ir}, T_{ir} of the depth camera need to be subjected to rigid body transformation. The transformation process is shown in formula (16) and formula (17) [25]:

$$R_{ir2rgb} = R_{rgb} R_{ir}^{-1}, \quad (16)$$

$$T_{ir2rgb} = T_{rgb} - R_{ir2rgb} T_{ir}. \quad (17)$$

The consideration is the relative transformation relationship between the cameras. At the same time, it is necessary to establish the relationship between the inhomogeneous three-dimensional space coordinates P_{rgb} and $\overline{P_{rgb}}$ of the two cameras in their respective coordinate systems, as shown in formula (18). At this time, substituting the two transformation formulas into it, it can get formula (19):

$$\overline{P_{rgb}} = R_{ir2rgb} \overline{P_{ir}} + T_{ir2rgb}, \quad (18)$$

$$Z_{rgb} P_{rgb} = K_{rgb} R_{ir2rgb} K_{ir}^{-1} Z_{ir} P_{ir} + K_{rgb} T_{ir2rgb}. \quad (19)$$

At this time, P_{rgb} and P_{ir} in the imaging planes of the two cameras can be connected so that $R = K_{rgb} R_{ir2rgb} K_{ir}^{-1}$ and $T = K_{rgb} T_{ir2rgb}$ in formula (17) can be simplified formula (20), where R and T are the external camera parameters in camera calibration.

$$Z_{rgb} P_{rgb} = R Z_{ir} P_{ir} + T. \quad (20)$$

3.2. Evaluation Method of Manuscript Quality. The method of assessing the quality of the manuscript can be done using metaheuristic algorithms. The metaheuristic algorithm is a modification of the heuristic algorithm, which is the product of combining a stochastic algorithm with a local search algorithm. It is proposed relative to an optimization algorithm, which can find the optimal solution of a problem, while a metaheuristic algorithm is an intuitively or empirically constructed algorithm that can give a feasible solution to a problem at an acceptable expense (mean computational time and space), and the degree of deviation of that feasible solution from the optimal solution is not necessarily predictable in advance.

This paper first modeled the hardware of the manuscript robot system, introduced the selected LiDAR parameters and its probability model, analyzed the principle of the pinhole model of the camera used in this paper, and introduced its calibration method at the same time, and the method of assessing the quality of manuscripts is introduced. It laid the foundation for the follow-up comparison experiment between the manuscript writing robot and the traditional artificial news production.

3.3. Comparative Experiment. In this controlled experiment, four major news articles on sports, finance and economics, politics, and entertainment were selected as samples. It mainly compares the pros and cons of manuscript writing robots with traditional humans from these four aspects. They are the comparison of news production language (readability and vividness), data comparison (objectivity and credibility), publication time comparison (publishing speed), and coverage comparison (depth and breadth).

3.3.1. News Language Comparison. To evaluate whether the news language of a news article has its distinctive personality and is different from literature or other professional languages, it mainly depends on its readability and vividness of language organization. The experiment selects the mentioned four categories of topics to analyze the manuscript writing robots and traditional artificially produced news language samples. The experimental data is shown in Figure 8.

As shown in Figure 8, the average readability of the manuscript-written robot news language is 7.95, and the vividness of the language organization is 7.425; the average

readability of the traditional artificial news language is 8.65, and the vividness of the language organization is 8.325.

3.3.2. News Data Comparison. News data refers to data capture, statistics, analysis, and visualization based on news content. Nowadays, news of any subject matter will quote the data, and the quotation of data can promote the determination of news topics and show news points through the characteristics of the data. It plays an essential role in the reporting stage of news. The objectivity and credibility of data as a whole also determine the objectivity and credibility of news. The experiment selects four types of topics to analyze the new data samples of writing robots and traditional manual production. The experimental data is shown in Figure 9.

It can be seen from Figure 9 that the average objectivity of the news data of the manuscript writing robot is 9.275, and the credibility of the news data is 9.1; the average objectivity of the traditional artificial news data is 8.45, and the credibility of the news data is 8.2.

3.3.3. Comparison of News Release Time. The most important thing for news articles is to highlight the timeliness, which is one of the important criteria for evaluating the value of a news article. The experiment selects the manuscript writing robot and traditional manual production to compare the speed (min/piece) and release speed (min/piece) of the four types of news topics. The experimental data is shown in Figure 9.

It can be seen from Figure 10 that the average news acquisition speed of the manuscript writing robot is 5.55 min/piece, and the news release speed is 10.575 min/piece; the average traditional manual news acquisition speed is 7.875 min/piece, and the news release speed is 13.45 min/piece.

3.3.4. Comparison of News Coverage. The scope of a news report is the combination of all report objects, including the depth and breadth of the report. It stipulates which people and events are to be reported and how large the coverage is. It is the most basic part of the news reporting process. In this paper, test experiments are carried out on the depth and breadth of the four types of reports. The results are shown in Figure 11.

It can be seen from Figure 11 that the average depth of the range of news writing robots is 8.675, and the breadth of the news range is 8.65; the average depth of the range of traditional artificial news is 8.575, and the range of traditional artificial news is 8.275.

4. Discussion

By comparing the experimental data, the following conclusions can be drawn:

- (1) The average readability of news produced under the traditional manual mode is 0.7 higher than that produced under the news production mode of the

FIGURE 8: Comparison of the readability and vividness of news language. (a) The readability and vividness of the new language of the manuscript robot. (b) The readability and vividness of traditional artificial news language.

FIGURE 9: Comparison of objectivity and credibility of news data. (a) The objectivity and credibility of the news data of the writing robot. (b) The objectivity and credibility of traditional artificial news data.

manuscript robot. The average vividness of the news language organization produced under the traditional manual mode is 0.9 higher than the vividness of the news language organization produced under the news writing robot news production mode.

- (2) The average value of objectivity of manuscript-written robot news data is 0.825 higher than that of traditional artificial news data, and the average value of credibility of manuscript writing robot news data is 0.9 higher than that of traditional artificial news data.
- (3) The average speed of manuscript writing robot news is 2.325 min/piece faster than that of traditional manual news, and the speed of manuscript writing

robot news release is 2.875 min/piece faster than that of traditional manual news.

- (4) The average depth of the coverage of the news coverage of the manuscript robot is 0.1 greater than that of the traditional manual news coverage, and the coverage of the news coverage of the manuscript robot is 0.375 larger than the coverage of the traditional manual news.

The entire comparative data shows that, in terms of news language, the news quality of manuscript writing robot editors is not as good as that of traditional manual editors. However, in terms of news data, news acquisition, publishing speed, and news coverage, manuscript writing robots are superior to traditional humans.

FIGURE 10: Comparison of news acquisition and publication time. (a) The time when the manuscript robot news is obtained and released. (b) The acquisition and release time of traditional artificial news.

FIGURE 11: News coverage comparison. (a) The depth and breadth of the scope of the manuscript robot news. (b) The depth and breadth of the scope of traditional artificial news.

5. Conclusion

Due to the limited level of technological development, this is related to the sensors that create the robotic system, and manuscript writing robots are currently only used in news production by a few media. And after comparing and analyzing the news articles produced by manuscript writing robots and those edited by human reporters, it is found that machine news writing lacks the readability and vividness of language organization. In the era of big data, it may also cause data security problems. However, even so, it is the general trend that the news dissemination industry caters to the development of the times. The application of the laser sensor-based manuscript writing robot to the field of news communication is by no means a flash in the pan; it is a product with strong characteristics of the times. As the level of information technology continues to improve, the news production capacity of writing robots will be further

improved. And the sensors are secure and cannot fully represent the writing of the manuscript but are only able to capture snapshots of the writing. Robotic writing is a more complex concept that also has temporal characteristics, for example. Moreover, the selected sensors are only able to represent some features of the conceptual dimension of writing. The quality of the currently weak language organization will be further improved with the development of technology. Writing robots and journalism will undergo a more comprehensive and in-depth integration. The applicable fields of robot production news will become more extensive. The news articles produced by it will appear in front of the audience in large numbers. Its significance to the field of news dissemination is not only to innovate news production methods but also to promote the transformation and upgrading of the entire industry. Therefore, the manuscript writing robot still has a very ideal development prospect.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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