Evolution of dissolved total solids in groundwater based on high resolution image processing and evaluation of urban English translation

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Abstract
In recent years, learning based super-high resolution image reconstruction technology has been rapidly applied. It also has good development and application effect in related fields. So in this paper, by combining the characteristics of SAR image, the learning based super-high resolution image reconstruction technology is added to the field of super-high resolution image reconstruction, and has been applied in reality. Image classification and ultra-high resolution technology are closely integrated. However, because the hardware facilities of some equipment are relatively expensive, and will inevitably be affected by other factors in the imaging process, in order to better study the influence of the increase of dissolved total solids in groundwater on the water level in the core of the funnel in the plain area, and the main components of the increase of dissolved total solids in groundwater. Every country in the world is carrying on a kind of propaganda to its national image, which is also a main manifestation of the overall level of the country. This paper studies the process of City English translation, makes corresponding analysis and preparation before city English translation, and pays attention to relevant reply and report after city English translation. This paper focuses on the construction system of City English translation and the improvement of the ways and methods of using English to publicize the city. Through the construction of City English translation system, this paper expounds the influence of Public English translation in City publicity construction, and changes the corresponding strategies for high-resolution image processing, so as to make English translation more accurate for the change process of total dissolved solids in groundwater, and improve the ability and level of City English translation.

Keywords High resolution image processing - Groundwater - Total dissolved solids - City English translation

Introduction
This paper mainly uses a single image for super-resolution reconstruction, and the main purpose of image super-resolution reconstruction is to transform some low resolution images into high resolution images by adding some image information and content. In theory, super-resolution image reconstruction mainly includes three processes. One is the initial image super-resolution through the difference algorithm. Second, image super-resolution is achieved by reconstruction algorithm (Rai et al. 2014). Thirdly, image super-resolution is achieved by learning algorithm. At present, the learning algorithm based on the third algorithm is the most widely used and scientific algorithm for image super-resolution (Raja et al. 2017; Saha et al. 2005). At the same time, the image super-resolution reconstruction by learning algorithm also includes two different algorithms: using the original machine learning algorithm and through the deep learning algorithm (Gill and Malamud 2017). By learning the super-resolution algorithm, the original technology can be fused in the image super-resolution reconstruction, and good results can be achieved. This is also the biggest advantage of image super-resolution by learning algorithm (Rasyid et al. 2016). In the following research, most of them are based on the learning algorithm to study the image super-resolution. On the basis of...
collecting the data information of many low resolution images, the high-frequency and low-frequency parts of these images are processed separately by learning algorithm (Guri and Patel 2015). At the same time, high resolution image region and low resolution image region are created to form a mapping relationship between them. Through the use of mathematical physics, geography and other related statistical analysis methods and time series methods, as well as GIS spatial analysis methods, the changes of groundwater level and the components of water soluble total solids in the target area are analyzed. Groundwater usually refers to the water existing in the land or rock below the ground. After the groundwater is polluted, it is difficult to control (Mahdadi et al. 2018). This is because the pollution sources will not only spread in the groundwater, but also adhere to the underground soil and rock, making the underground environment more complicated (Hong et al. 2016; Pradhan et al. 2012). Therefore, the control of groundwater pollution is difficult, the investment cost is high, the treatment time is long, and the treatment effect is remarkable, very slow and so on. With the rapid development of China’s economy, the comprehensive influence of China’s national economy and culture is more and more extensive in the world. In this case, city English translation plays a very important role in the external publicity of the city and the country (Mahmood et al. 2015). It not only publicizes the national image, but also reflects the comprehensive development level of the country as a kind of national soft power. Based on the investigation of the translation of City English in public places of a city in China, this paper collects some samples and data for specific research and analysis, so as to make public English translation more accurate and normative (Kaur et al. 2019). In order to help the experts and scholars to do better research. Through the study of this paper, the translation of City English can be improved. Personnel can pay more attention to other aspects of the city’s English translation, make the city English translation more standardized and rigorous, and constantly improve the ability and level of City English translation, which also reflects the comprehensive strength of the city to a certain extent (Kamp et al. 2008).

Materials and methods

Data source

The research data of this paper is mainly based on the data of some authoritative monitoring websites. According to the Research Report and survey data issued by relevant authorities, the groundwater level in a city is monitored and analyzed (Martha et al. 2013).

Model design of high resolution image processing

Because of the influence of physical imaging system and surrounding factors, it is difficult to obtain high-quality images in the process of image collection. Image usually has some deterioration process, which will directly affect the quality of the image. The generation process of ground resolution image is: activity, sampling, blur processing, and noise influence.

\[ y = DBMx + n \]  

Here, \( X \) is a high-resolution image in which motion deformation \( m \), opaque deformation process \( B \) and downward test operation \( D \) are carried out in sequence, and additional noise \( n \) is inevitable. Finally, the low resolution image \( y \) is observed.

SSIM image quality measurement is very similar to human eye image quality evaluation. It plays an important role in image evaluation index.

\[ SSIM(x, y) = [l(x, y)]^\alpha \cdot [s(x, y)]^\beta \cdot [c(x, y)]^\gamma \]  

For the initial image and the image area to be tested, \( l(x, y) \) represents the brightness comparison degree, \( s(x, y) \) represents the structure information comparison degree, and \( c(x, y) \) represents the comparison degree. These three indexes are used to adjust the proportion of each part of SSIM.

EPI is used to evaluate the storage of information, such as the edge and texture of two images. The larger the EPI index, the larger the storage of information. The higher the image boundary and texture. EPI is usually used for coherent spectrum suppression in SAR images.

\[ EPI = \frac{\sum_{i=1}^{M} |X_1(i) - X_2(i)|}{\sum_{i=1}^{M} |Y_1(i) - Y_2(i)|} \]  

Here, \( M \) is the total number of pixels in the selected area:

On this basis, the new index used to measure SAR image edge index is more stable, namely epd-roa:

\[ EPD-ROA = \frac{\sum_{i=1}^{M} \left| \frac{X_2(i)}{X_2(i)} \right|}{\sum_{i=1}^{M} \left| \frac{Y_1(i)}{Y_2(i)} \right|} \]

The results show that the biggest difference of EPI is that EPI calculates the difference between two adjacent pixels, while epd-roa calculates the ratio of two adjacent pixels.

Study on reaction kinetics

The pseudo two-step kinetic model of warehouse is used to adjust the kinetics of reaction process:

\[ \frac{t}{q_d} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \]  

(5)
In the equation, the dynamic adsorption rate of K2 is almost constant, QE is the stationary adsorption capacity (mg/g), and QT is the minimum adsorption capacity (mg/g) for t.

**Results**

**Variation law of aquifer hydrochemical parameters**

In the restoration and remediation activities of nano iron, it has a great influence on the oxygen content in groundwater, and its change may indicate the restoration process of the reaction zone. This experiment continues to monitor the dissolved oxygen in the medium regularly, as shown in Fig. 1.

O2 is the best natural oxidant used by cmc-s-nzvi in groundwater system. Therefore, do concentration can directly explain the change of remediation situation in the reaction zone, and is the main index of restoration reaction zone. The original cmc-s-nzvi Fig. 1 shows the change of oxygen concentration in groundwater polluted by Cr (VI). Before the injection of cmc-s-nzvi inhibitor, the DO concentration along the channel decreased slightly. It is estimated that there are Cr (VI)—resistant aerobic microorganisms in the river sand in the do consumption area. After injecting cmc-s-nzvi inhibitor, the DO concentration near the injection site decreases rapidly, and then the DO concentration decreases slowly.

Figure 2 shows the change of redox concentration during the cmc-s-nzvi simulation test at the contaminated Cr (VI) purification site. Before the cmc-s-nzvi inhibitor was injected, the redox potential was stable. The redox potential decreases rapidly after injection. At this point, the number of redox options in each part of the simulator tank is reduced to a certain extent. After 48 h of operation, the redox potential at the downstream of the injection hole decreased significantly, which was consistent with the changes of Cr (VI) and do concentrations. The redox potential of cmc-s-nzvi increases near the injection site after 72 h, which indicates that cmc-s-nzvi has almost no reduction ability here.

Figure 3 shows the change of pH in the simulated tank. Figure 3 shows that the pH of the system is between 7.6 and 7.8 before injection into the cmc-s-nzvi terminal. On the one hand, because the pH value of the terminal itself is higher than 8.0, on the other hand, because the reduction of Cr (VI) is a process of producing H+ and OH+, the value increases rapidly. After one hour operation, the maximum pH value at the lower sampling point near the injection hole was 8.99, and then the pH value decreased slowly. The pH value of cmc-s-nzvi accumulation zone was between 8.1 and 8.7. The distribution of cmc-s-nzvi was consistent with the change of Cr (VI), and the pH value of other areas decreased gradually near the injected water.

Figure 4 shows the variation of SO4^2- concentration when cmc-s-nzvi simulation test was carried out to purify the polluted groundwater on Cr (VI) in the groundwater pipeline.

During the continuous reaction, the concentration of SO4^2- gradually decreased and gradually stabilized, but it was still higher than that in liquid water, mainly because S2 still carried out the reaction of SO4^2- formation in cmc-s-nzvi.

**Characteristic analysis of total dissolved solids in groundwater**

The initial TDS of groundwater in the test area is 343 to 998 mg/L, and the TDS of groundwater production in part I is 472 to 998 mg/L, as shown in Fig. 5(a), and its distribution characteristics are abnormally high. The medium-term TDS of groundwater in the test area is 463 to 1354 mg/L, which indicates that part II is the source area where the TDS of groundwater in part I tends to increase. As shown in Fig. 5(b), the maximum TDS of area I and area II has increased sharply, as shown in Fig. 5(c).

Table 1 shows that the maximum, minimum, and average values of TDS in part I and part II do not change much during the initial funnel formation stage, but they are significantly higher than those in area III.

Table 2 shows that in the middle stage of funnel formation, the average, minimum and maximum values of TDS in part I are smaller than those in part II, but still higher than those in part III.

Table 3 shows the different changes of the maximum, minimum, and average values of TDS in part I and parts II and III at the end of funnel formation stage.

It can be seen that in part I, under the same conditions, the average increase of TDS in the early, middle and late stages gradually decreases. This also shows that the anti-pollution ability of groundwater is gradually strengthened in part I.

**Influencing factors of total dissolved solids in groundwater**

Figure 6 shows the average increase of total dissolved solids in groundwater at the core of the funnel.

Figure 7 shows the average annual growth of TDS in the middle of the funnel core.

Figure 8 shows the average annual growth of TDS at the end of the core of the funnel.

Obviously, in line with the decline of annual average water level, with the continuous rise of water level in part I, the annual increase of TDS in the initial, middle, and final stages of groundwater decreases.

In the initial stage, the increase of TDS in part I groundwater is significantly correlated with the contents of Cu2+ and Mg2+, but not with the contents of Na+ and Cl, as shown in Table 4.
In the medium term, the increase of TDS in part I groundwater is still significantly correlated with the contents of Ca\(^{2+}\) and Mg\(^{2+}\), as shown in Table 4.

In the final stage, there is a significant correlation between the increase of TDS and Ca\(^{2+}\) in part I groundwater. Compared with the intermediate stage, the correlation
between the increase of TDS and Na in groundwater is decreased, but the correlation between the increase of TDS and Cl in groundwater is still relatively large, and the correlation and content with $SO_4^{2-}$ and $HCO_3^-$ continue to weaken, as shown in Table 4.

During the first increase of TDS in part I groundwater, the Ca$^2+$ content of cation component increased the most. In the middle stage, TDS increased and Ca$^2+$ content of cation component increased the most, but lower than the initial proportion. Na$^+$ showed a significant increase. Considering the
presence of Mg$^{2+}$, the ratio of Mg$^{2+}$ to Mg$^{2+}$ decreases. Among the anionic components, CL shows an increasing characteristic, as shown in Table 5. By increasing the TDS of part I groundwater, the Ca$^{2+}$ content of cation component increased the most, but in the medium term, it showed a decreasing trend.

From the initial stage, the intermediate stage to the final stage, the ratio of Na$^{+}$ content and TDS increase shows an upward trend. It is obvious that the increase of Na$^{+}$ content and groundwater content are the main driving forces. It can be seen from Table 5 that the groundwater in part I is increasing continuously. With the continuous increase of nitrate content in groundwater, the increase of TDS plays a crucial role.

**Discussion**

**Problems in City English translation**

Mistranslation of stylized public signs still exists

Stylized public signs are widely used in real life and exist for a long time. The sentence patterns of this kind of stylized public signs are generally short and have fixed patterns, which have been collected by different translation software and systems. When using these software and system for translation, we can give some reference and help. Therefore, there are a lot of stylized public signs in the society. However, the objective
reality is that the stylized public signs in these translation software and platforms cannot be translated accurately. Even some stylized public signs have completely different meanings in different environments and situations. So there will be very obvious differences after translation (Achour et al. 2017). When using formulaic public signs in translation,
Translators must distinguish them carefully and use them correctly.

The Mistranslation of non-stylized public signs is common

Comparatively speaking, many nonstylized public signs have long sentence patterns. And the amount of information contained in the sentence is relatively large. In these nonstylized public signs, the historical and cultural background of the city and the characteristics of traditional culture are often included, so the information carrying capacity of these nonstylized public signs is relatively large, and the differences between different contents are relatively large. Therefore, there is no fixed template and format for these nonstylized public signs. When translating, it can not be applied according to the mode of stylized public signs. If the translator’s English ability and level is relatively poor, personal quality is not high, or can only rely on the system or translation software to translate, but only make relatively small changes, the whole sentence will not be coherent, and even appear reversed and contradictory phenomenon, so that the original meaning cannot be fully expressed. It is difficult to guarantee the presentation of the meaning and content of the original text correctly, and even make the viewer not know the specific meaning of all the expressions. This phenomenon can be found in many scenic spots.

Cultural misreading and grammatical errors are particularly prominent in mistranslation

Among all kinds of translation errors, cultural misreading and grammatical misuse are the most obvious. It accounts for nearly half of the total mistranslation. Moreover, in terms of cultural misreading and grammatical errors, the use of stylized public signs in translation is particularly striking in a relatively long space. In English translation, the requirements for the structure between paragraphs and the cohesion between sentences are relatively high. Therefore, in the translation of formulaic public signs in a relatively long space, the cultural background, and historical and traditional characteristics of the city should be comprehensively used, which greatly increases the difficulty of understanding and translation of the original text. At this time, if the translator’s own translation ability and level is not high, and the supervision of the relevant authorities is not enough, it is easy to cause cultural misreading of the original text, as well as grammatical errors (Aditian et al. 2018).

There are significant differences in the translation quality of public signs set in different batches

According to the design image of public signs and the characteristics of display boards, we can judge whether public signs belong to the same batch in a public place. Using this

| Table 1 TDS evolution characteristics of groundwater at the initial stage of funnel formation in the study area |
| --- |
| Funnel formation stage | Groundwater TDS and the characteristic value of average annual increase | Zone I TDS | Zone II TDS | Zone III TDS |
| | | TDS | Ratio to zone I | TDS | Ratio to zone I |
| Initial period (1978–1985) | TDS/(mg·L−1) | Minimum 472 | 635 | 0.75 | 343 | 1.39 |
| | Max 998 | 955 | 1.06 | 614 | 1.64 |
| | Average value 737 | 738 | 1.01 | 519 | 1.43 |
| Average annual increase/(mg·L−1) | Minimum 26.54 | 24.59 | 1.09 | 5.08 | 5.22 |
| | Max 49.52 | 47.87 | 1.04 | 30.68 | 1.62 |
| | Average value 36.05 | 35.01 | 104 | 23.35 | 1.55 |

| Table 2 TDS evolution characteristics of groundwater in the middle stage of funnel formation in the study area |
| --- |
| Funnel formation stage | Groundwater TDS and the characteristic value of average annual increase | Zone I TDS | Zone II TDS | Zone III TDS |
| | | TDS | Ratio to zone I | TDS | Ratio to zone I |
| Mid-term (1978–1985) | TDS/(mg·L−1) | Minimum 626 | 712 | 0.89 | 463 | 1.36 |
| | Max 1232 | 1354 | 0.92 | 739 | 1.68 |
| | Average value 914 | 934 | 0.99 | 627 | 1.47 |
| Average annual increase/(mg·L−1) | Minimum 2.51 | 3.88 | 0.66 | 2.65 | 0.96 |
| | Max 18.34 | 19.98 | 0.93 | 7.83 | 2.35 |
| | Average value 8.89 | 9.82 | 0.92 | 5.41 | 1.65 |
method to translate the formulaic public signs of different batches of formulas and display boards in cities with the same departments or in similar places, the quality of translation will be uneven. This kind of situation will appear in the stylized translation of public signs in many public places. From this situation, it can be seen that for the same place, different batches are set up and different personnel are responsible for it (Afungang et al. 2017). Due to the different ability level and work attitude of translators and responsible personnel, the translation quality will be very different.

**Causes of problems in City English translation**

**The translation of public signs is not coordinated by the competent department**

In many cities, there is no relevant competent department and corresponding translation criteria or regulations for formula language translation (Freeman et al. 2004). According to incomplete statistics, only railways, highways and bridges in our country have unified and specific national names and translations, and there are no unified and standardized English translation standards and guidelines for various slogans in other public places, which are completely decided by the organizers according to their own situations. Therefore, it will also appear in the process of translation, without the unified deployment and supervision of the relevant competent departments.

**There is no relevant standard for the translation of public signs**

The translation of public signs in cities should be supervised by the relevant competent departments, and the national or local governments should issue unified translation norms and standards to guide and regulate the translation of public signs. However, at present, there is no corresponding standard for the translation of city signs, and there are no relevant laws.
and regulations to regulate and guide the translation, so the translation of city signs is very arbitrary and abusive. The management and supervision of the administrative authorities are even more out of the question (Bahrami et al. 2019).

Design of constructive hierarchical reconstruction system for urban English translation

Discourse reconstruction mechanism

In the process of English translation of City publicity, the hierarchical structure of discourse is the most important content of discourse reconstruction (Banshtu et al. 2020). Generally speaking, the basic requirement for a text is to have a coherent discourse to form the whole text. From this point of view, not only the whole discourse semantics should be very smooth and coherent, but also the logical structure of the whole discourse should be reasonable and perfect between contexts, which can fully meet the requirements of English grammar. Semantics and grammar reflect certain cultural tradition and cultural background, so the meaning and characteristics of culture should be hidden in semantics and discourse. In this way, there will be some differences in the content of translation under different cultural backgrounds (Bui et al. 2011).

In terms of discourse reconstruction, cultural context is very important. If the cultural background is different, then the translated cultural context will be very different. Generally speaking, cultural context includes single cultural context and complex cultural context. In a single cultural context, it is mainly to use simple language and words to express clearly (Chauhan et al. 2010). The single cultural context mainly expresses some short and clear contents. The complex cultural context is more complex and complicated, so in the process of City English translation, we should distinguish and distinguish the two contexts, so as to make scientific and reasonable use of the two contexts.

For English translation, the ability and level of translators is very important, especially in the process of City English translation, translators are required not only to have solid translation ability and translation tools, but also to carry out different targeted analysis according to the specific situation (Francioni et al. 2019). According to different scenes and different contexts in different situations, we can translate objectively and practically (Chen et al. 2016). In the process of English translation, we should also consider the ability and level of the foreign audience to perceive the translation content, and whether there is a certain interest in the publicity content, so as to make the city better promote and carry forward the city (Chen et al. 2017). The translated articles should be logical, coherent and clear. At the same time, according to the audience’s cognitive ability and level to carry out targeted translation, so as to make the translation effect better, make the translated articles more easily absorbed and loved by the audience.

In the process of text reconstruction, there are many translation methods

1) Compensation translation is to make up for some shortcomings or loopholes of the original meaning.
2) Compression. Compressed translation is to translate the content of the original text by using short and concise language.
3) Opening and closing. Separation and combination translation is to reasonably separate or combine the contents of the original text, so as to make the translated text more readable.
4) Imitation. Imitation translation is to compare the content of the original text or set some scenes to set off the context.
5) Adjust the sequence. Debugging translation is to adjust the semantic order of the original text according to the characteristics and forms of the translation, so as to make the translation more in line with the language characteristics and habits of the translation (Corominas et al. 2014).

| Main chemical components | Correlation coefficient with TDS (R²) |
|--------------------------|-------------------------------------|
| Na⁺ | Early 0.21 | Mid-term 0.38 | End 0.17 |
| Ca²⁺ | 0.64 | 0.73 | 0.69 |
| Mg²⁺ | 0.57 | 0.56 | 0.39 |
| Cl⁻ | 0.23 | 0.38 | 0.38 |
| SO₄²⁻ | 0.17 | 0.24 | 0.05 |
| HCO₃⁻ | 0.21 | 0.19 | 0.18 |
Sentence group reconstruction mechanism

It is more difficult to reconstruct the sentence group. There are mainly the following ways.

1) Increase or decrease

Increase or decrease is to make the translation more readable and easier to be understood by readers. Therefore, when translating, we should consider the needs of different language and cultural background, and simplify some content accordingly (Dunning et al. 2007). And some of the content should be given additional description, so as to make the translation of the whole language more smooth and reasonable, which is also conducive to people with different cultural backgrounds in reading and understanding, more able to understand and familiar with their own cultural background or language habits (Dikshit et al. 2020).

2) Reorganization

Reorganization is to recombine according to the different grammatical and semantic structures of English and Chinese, so as to make English translation more clear and accurate.

3) Translation

Translation is to change the content of the original text to make the translation more clear and accurate. Translation needs to reconstruct the structure and style of the text by translating the target text to make it more perfect.

Sentence reconstruction mechanism

The reconstruction of sentences mainly includes the reconstruction of simple sentences and the reconstruction of complex sentences. The specific way includes three parts. The first is the increase and decrease, the second is the separation and combination. Because the national cultural traditions of Chinese and English are obviously different, the separation and combination in the translation of sentences can be more convenient to clarify the reader’s thinking, so that the reader can have a more accurate understanding of the content of the article. Finally, translation plays an important role in improving the semantics of sentences, modifying certain grammar, and reducing readers’ misunderstanding.

Word reconstruction mechanism

Word reconstruction is also an important aspect of text reconstruction, including adding or deleting the content of the original text to a certain extent according to the cultural background of the original text and the target text; According to the differences of grammar and semantics between English and Chinese, some sentences should be separated and combined to make the translated text more ornamental; In order to make the city English translation more clear and accurate, we should translate and write the sentences after adding, deleting, and combining.

Conclusion

In this paper, the image is processed with super-high resolution based on learning algorithm. Through the use of two different high-resolution image processing methods and methods, from the reality, the two methods are studied, and achieved good results. Because people in different countries have great differences in historical tradition and cultural background. Therefore, there are great differences in language expression, especially in public signs. Through the research and analysis of city public signs, we can further improve the problems and shortcomings of formula language translation in cities, strengthen the reconstruction mechanism construction of words, sentences, and grammar, make city English translation more accurate, and strengthen the city’s external publicity.

Declarations

Competing interests  The authors declare no competing interests.
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