Spatial Distribution Characteristics and Influencing Factors of the World Architectural Heritage

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Abstract: This research focusing on the world architectural heritage sites registered in the World Heritage List established by UNESCO aimed to analyze its spatial distribution characteristics and influencing factors at the world and regional level to provide a scientific basis for further architectural heritage conservation. Firstly, this study explored the spatial distribution characteristics of the world architectural heritage sites using the ArcGIS spatial analysis method. Then, we used the space–time statistical method to analyze their spatial and temporal distribution characteristics. The main findings are as follows: (1) world architectural heritage sites are distributed in clusters with imbalanced patterns and a strong degree of concentration: in Western Europe, Eastern Asia, and Northwestern Latin America, with clear country distribution, especially in Italy, China, and Mexico; (2) the time of construction can be divided into four stages: the ancient historic sites stage, the uniform and stable stage, the stage of growth in Asia and Europe, and the stage of growth in Europe, America, and Africa; (3) different types of heritage sites are unevenly distributed, and the type distribution differs significantly between regions, with regional uniqueness. The authors also analyzed the influencing factors of the spatial distribution characteristics and highlighted the important influence of the geographical environment, historical evolution, economic strength and discourse power, international heritage protection situation, and registration policy. This study may provide basis for specific guidance and directions for heritage protection for various countries and regions.

Keywords: architectural heritage; spatial distribution characteristics; spatial layout; spatial structure; influencing factors; UNESCO heritage; heritage protection

1. Introduction

The protection of cultural and natural heritage is now a cultural trend affecting the world and a cultural hotspot concerning governments, people, and various international and regional organizations [1,2]. Architectural heritage, which is subordinate to cultural heritage, is an important part of cultural heritage protection. In addition to the universal value and significance of cultural heritage, architectural heritage is more important because it is directly and closely related to the human living environment.

Architectural heritage is the carrier of human historical activities, the memory of the city, an indispensable and important part of human civilization. The term “architectural heritage” comes from the Venice Charter, which means historic monuments and sites [3]. The systemic protection of architectural heritage began in the Renaissance. The changes in the concept of heritage protection are mainly reflected in the international conservation documents and charters published in different periods [4]. With the passage of time and the deepening of academic understanding of heritage management, more and more protection regulations have been promulgated [5–7]. The Athens Charter, the Venice Charter, the World Heritage Convention, the Florence Charter, etc. represent the stage achievements of the formation of the concept of protecting cultural and natural heritage, which reflect...
the new thoughts of heritage protection in various periods. In recent years, under the circumstances of globalization, informatization, and climate change, protection of the architectural heritage has become more comprehensive, complex, and urgent.

Architectural heritage includes not only single buildings of superior quality and their surroundings, but also all towns or villages with historical and cultural significance [8]. It is an important carrier of local cultural identity [9], and its spatial distribution to some extent reflect the historical context and evolution process of civilization development and its internal relations in different geographical locations. At present, academic research on architectural heritage from the perspective of space mainly involves micro and medium aspects, as well as macro-level research on specific types of architectural heritage, such as industrial heritage, religious architectural heritage, etc. [10–12]. Studies on the spatial distribution characteristics of architectural heritage sites on the global level are scarce.

Regarding understanding of architectural heritage value, the academic community has experienced a corresponding development process [13]. Older research on the spatial distribution of architectural heritage was mainly concentrated on the field of architecture and geography. Due to the interdisciplinary nature of the concept of architectural heritage, it often intersects with archaeology, art humanities, tourism, and other fields [14–17]. In terms of research objects, studies on the spatial distribution of architectural heritage often overlap with related studies on specific heritage types, such as world heritage [18], endangered world heritage [19], industrial heritage [20], agricultural cultural heritage [21], mining heritage [22], cultural landscape heritage [23], religious architectural heritage [24], and settlement heritage [25]. On the spatial scale, studies have been conducted on the hemispheric, zonal, intercontinental, national scales, etc. However, the statistics of all the sites have not been sorted out and the research has not been carried out at the global level.

Therefore, from the perspective of spatial distribution, this study used the ArcGIS software (Geographic Information System Company, Environmental Systems Research Institute, West Redlands, CA, USA) spatial analysis and the geographical model method to study the general spatial distribution characteristics of the world architectural heritage sites registered in the World Heritage List. The influencing factors were further studied to reveal the spatial distribution patterns and provide a scientific basis for the research on the system and the method of architectural heritage protection.

2. Research Materials and Methods

2.1. The Source of the World Architectural Heritage

The architectural heritage in this article refers to the architectural heritage sites that were examined and approved according to the standards and procedures stipulated in the World Heritage Convention issued by UNESCO (the United Nations Educational, Scientific and Cultural Organization) and then registered in the World Heritage List after being confirmed by the UNESCO World Heritage Committee. At present, in this list, there are 1154 world heritage sites in the world, including 897 world cultural heritage sites, 218 world natural heritage sites, and 39 world cultural and natural heritage sites. The UNESCO 1972 World Heritage Convention defines architectural heritage as cultural heritage monuments, groups of buildings and sites with the outstanding universal value from the point of view of history, art, or science [26]. Based on this convention, an architectural heritage site can be interpreted as an "artifact", where its elements are witnesses of the cultures, actors, and events that occurred during the life of the building [27].

The world architectural heritage sites listed in this article are based on the 2021 statistics. Referring to the standard description of the World Heritage Convention and the Operational Guidelines for the Implementation of the World Heritage Convention, the authors selected 877 architectural heritage sites as research objects distributed between five global politico-economic and cultural zones, 148 countries and regions, involving seven heritage types, including sites, monuments, group of buildings, cultural landscape,
heritage towns and town centers, heritage canals, and heritage routes (Table 1) [28,29]. All the tables and figures in this article were elaborated by the authors.

Table 1. Architectural heritage types and definitions.

<table>
<thead>
<tr>
<th>Types</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites</td>
<td>Works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, esthetic, ethnological, or anthropological point of view.</td>
</tr>
<tr>
<td>Monuments</td>
<td>Architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings, and combinations of features, which are of outstanding universal value from the point of view of history, art, or science.</td>
</tr>
<tr>
<td>Groups of buildings</td>
<td>Groups of separate or connected buildings which, because of their architecture, their homogeneity, or their place in the landscape, are of outstanding universal value from the point of view of history, art, or science.</td>
</tr>
<tr>
<td>Cultural landscapes</td>
<td>They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic, and cultural forces, both external and internal.</td>
</tr>
<tr>
<td>Heritage towns and town centers</td>
<td>(i) Towns which are no longer inhabited but which provide immutable archaeological evidence of a past; these generally satisfy the general criterion of authenticity and can be easily managed; (ii) historic towns which are still inhabited and which, by their very nature, have developed and will continue to develop under the influence of socioeconomic and cultural change, a situation that renders the assessment of their authenticity more difficult and any conservation policy more problematical; (iii) new towns of the twentieth century which paradoxically have something in common with both the aforementioned categories: while their urban organization is clearly recognizable and their authenticity is undeniable, their future is unclear because their development cannot be controlled.</td>
</tr>
<tr>
<td>Heritage canals</td>
<td>A canal is a human-engineered waterway. It may be of outstanding universal value from the point of view of history or technology, either intrinsically or as an exceptional example representative of this category of cultural property. The canal may be a monumental work, the defining feature of a linear cultural landscape, or an integral component of a complex cultural landscape.</td>
</tr>
<tr>
<td>Heritage routes</td>
<td>The concept of heritage routes is shown to be a rich and fertile one, offering a privileged framework in which mutual understanding, a plural approach to history, and a culture of peace can all operate.</td>
</tr>
</tbody>
</table>

2.2. World Architecture Heritage Coordinate Data

With the help of the Google Earth Map Coordinate picker, the spatial coordinates of the sites in the list that conform to the architectural heritage criteria were calibrated [30]. The spatial distribution map of the world architectural heritage was generated (Figure 1).
2.3. Analytical Methods

With the help of the correlation operation model in the ArcGIS software, using the spatial analysis method of the nearest neighbor analysis and kernel density, as well as the traditional geographical model method of the spatial Gini coefficient and the imbalance index, this study analyzed the distribution characteristics of architectural heritage in the worldwide geographic space [31].

2.3.1. Nearest Neighbor Analysis

On the macroscale, architectural heritage is distributed as points on the world map. The spatial distribution patterns of point elements can be summarized into three types: clustered type, random type, and dispersed type. The nearest neighbor index can be used for the analysis of the proximity degree of point elements in the geographic space. We calculated the nearest neighbor index as follows [32]:

\[
R = \frac{\bar{d}}{d_E} = 2\sqrt{Dd}
\]

(1)

where \(\bar{d}\) represents the average of the distances between the nearest points, \(d_E\) refers to the theoretical nearest neighbor distance, and \(D\) is the point density; \(d_E\) in this formula can be calculated as follows [33]:

\[
d_E = \frac{1}{2\sqrt{n}} \sqrt{\frac{A}{\pi}} = \frac{1}{2\sqrt{D}}
\]

(2)

where \(A\) refers to the total area of the administrative district with architectural heritage sites and \(n\) is the amount of world architectural heritage sites.

2.3.2. Kernel Density Analysis

To further explore the aggregation areas of the world architectural heritage, the kernel density estimation model was used to evaluate the spatial aggregation degree of the architectural heritage. The kernel density estimate value was calculated as follows [34]:

\[
f_k(x) = \frac{1}{nh} \sum_{i=1}^{n} k \left( \frac{x - X_i}{h} \right)
\]

(3)
where \( n \) represents the world architecture heritage amount, \( k \) is the kernel function, \( x - X_i \) refers to the distance from the estimate point \( x \) to the sample \( X_i \), and \( h \) is the search radius.

2.3.3. Imbalance Index

The spatial structure difference of the world architectural heritage is reflected in the difference in the number of architectural heritage sites in different regions. The imbalance index was used to reflect the equilibrium index of the distribution of the architectural heritage in different regions. The calculation formula was as follows:

\[
S = \frac{\sum_{i=1}^{n} Y_i - 50(n+1)}{100n - 50(n+1)}
\]

where \( n \) refers to the number of regions, \( Y_i \) is the cumulative percentage of the number of architectural heritage sites to the total in the region \( i \). If \( S = 0 \), the world architectural heritage sites are evenly distributed in each region. If \( S = 1 \), they are concentrated in a certain region. The closer the \( S \) value is to 1, the more unevenly the world architectural heritage sites are distributed.

2.3.4. Gini Coefficient

The Gini coefficient was used to describe the distribution of spatial elements in discrete regions, and can be calculated as follows [35]:

\[
G = -\frac{\sum_{i=1}^{n} P_i \ln P_i}{\ln N}
\]

\[
C = 1 - G
\]

where \( N \) is the number of regions, \( P_i \) refers to the percentage of the number of architectural heritage sites to the total in the region \( i \), and \( C \) represents the uniformity of distribution. In theory, the Gini coefficient is between 0 and 1, and a higher Gini coefficient indicates a higher concentration.


3.1. The Characteristics of Spatial Distribution

3.1.1. Type of Distribution Structure

We used ArcGIS10.5 to conduct the nearest neighbor analysis of 877 world architectural heritage sites. The results show that the average observation distance \( \bar{d} \) is 180,428.4902 m, the expected average distance \( d_E \) is 304,183.9475 m, and the nearest neighbor ratio is 0.59, less than 1, which shows that the world architectural heritage sites are clustered in space.

3.1.2. Overall Distribution Pattern

The kernel density analysis in the ArcGIS10.5 spatial analysis tool was used to divide the spatial pattern of the world architectural heritage sites into four levels according to the density value, namely, core-density, high-density, medium-density, and low-density. Then, we generated the kernel density distribution map of the world architectural heritage (Figure 2).
Figure 2. Kernel density distribution map of the world architectural heritage. Note: The Antarctic plate is not shown in the picture because it does not feature any sites from the World Heritage List.

In Figure 2, we see that the world architectural heritage sites cluster and form a core-density zone in Western Europe and two high-density zones in Eastern Asia and Northwestern Latin America, which shows obvious agglomeration characteristics. The spatial agglomeration forms are mainly of two types: zonary and cluster distribution. They are banded in Northeast and South Asia, Western South America and Mexico in North America, and clustered in Midwestern Europe and the Eastern and Northern coastal areas of the Arab States.

3.1.3. Distribution Differences between Various Regions

The world architectural heritage sites are divided into five global politico-economic and cultural zones by UNESCO [36]. According to Formula (4), after calculation and analysis of the data of heritage amounts, proportions, and cumulative proportions in each zone in Table 2, it can be concluded that the imbalance index $S$ of the world architectural heritage is 0.53. It shows that the distribution of architectural heritage sites in the five zones of the world is imbalanced, and there are obvious differences in each region.

Table 2. Statistics on the distribution of the world architectural heritage in various regions.

<table>
<thead>
<tr>
<th>Region</th>
<th>Heritage Amount</th>
<th>Proportion</th>
<th>Cumulative Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe and North America</td>
<td>457</td>
<td>51.99%</td>
<td>51.99%</td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>191</td>
<td>21.73%</td>
<td>73.72%</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>103</td>
<td>11.72%</td>
<td>85.44%</td>
</tr>
<tr>
<td>Arab States</td>
<td>81</td>
<td>9.22%</td>
<td>94.65%</td>
</tr>
<tr>
<td>Africa</td>
<td>47</td>
<td>5.35%</td>
<td>100.00%</td>
</tr>
<tr>
<td>Total</td>
<td>879</td>
<td>100.00%</td>
<td>405.80%</td>
</tr>
</tbody>
</table>

1 There is one architectural heritage site shared by Europe and North America, Asia and the Pacific, Latin America and the Caribbean.

The number of European and North American architectural heritage sites accounts for 51.99% of the global world architectural heritage, which is much higher than even distribution (20%). Asia and the Pacific account for 21.73%, and the other three regions are
all below the even distribution. Antarctica has no architectural heritage listed in the World
Heritage List (Table 2). With the results, we generated the world architectural heritage
distribution map in Figure 3.

![World Architectural Heritage Distribution Map](image)

**Figure 3.** World architectural heritage distribution map. Note: The Antarctic plate is not shown in the picture because it
does not feature any sites from the World Heritage List.

3.1.4. Analyses of Aggregation Areas

We calculated the Gini coefficient of the number of the world architectural heritage
sites distributed in the five geographical divisions of the world to judge the uniformity of
their distribution. We used Formulas (5) and (6) to calculate the Gini coefficient $G = 0.81$
and the distribution uniformity $C = 0.19$. The result shows that the concentration degree
of the world architectural heritage is strong and the distribution uniformity is low in the
five regions.

The 877 architectural heritage sites are distributed between 148 countries and regions,
accounting for 63.52% of the total number of 233 countries and regions of the world.
The results for each country within each region show the characteristics of imbalanced
distribution and strong concentration in Table 3.

<table>
<thead>
<tr>
<th>Region</th>
<th>Heritage Amount</th>
<th>Country and Area Amount</th>
<th>Inequality Index</th>
<th>Gini Coefficient</th>
<th>Uniformity Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe and North America</td>
<td>457</td>
<td>49</td>
<td>0.51</td>
<td>0.87</td>
<td>0.13</td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>191</td>
<td>32</td>
<td>0.62</td>
<td>0.80</td>
<td>0.20</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>103</td>
<td>24</td>
<td>0.58</td>
<td>0.82</td>
<td>0.18</td>
</tr>
<tr>
<td>Arab States</td>
<td>81</td>
<td>19</td>
<td>0.32</td>
<td>0.94</td>
<td>0.06</td>
</tr>
<tr>
<td>Africa</td>
<td>47</td>
<td>24</td>
<td>0.35</td>
<td>0.94</td>
<td>0.06</td>
</tr>
</tbody>
</table>
The specific distribution is as follows:

1. The largest concentration of the world architectural heritage is in Europe and North America. This region has 457 architectural heritage sites in 49 countries, with Italy (52), Germany (47), Spain (42), and France (40) leading the list.
2. For Asia and Pacific, there are 191 architectural heritage sites in 32 countries, mainly in Northeast and South Asia: China (36), India (32), Iran (the Islamic Republic of Iran) (24), Japan (19).
3. The world architectural heritage sites of Latin America and the Caribbean (103) are distributed between 24 countries, mainly in Mexico (27) and Brazil (16).
4. Most architectural heritage sites in the Arab States are in Morocco (9) and Tunisia (7). In Africa, Ethiopia (6), Senegal (5), Kenya (4), and Mali (4) have the largest concentration of architectural heritage sites.

3.2. The Characteristics of Time and Type Distribution
3.2.1. Distribution of the Registration Time

We used spatiotemporal statistical analysis methods to research the spatiotemporal distribution (Figure 4). It was found that the number of registered architectural heritage sites shows a trend of fluctuating growth during the last 44 years, from 1978 to 2021, and its development can be roughly divided into three periods. From 1978 to 1988, the number of registered architectural heritage sites maintained a steady growth. From 1989 to 2000, a period of rapid growth was observed, which reached a peak in 2000 when the number of registered architectural heritage sites reached 49. Since 2001, the number has been stable, and the annual number of registered architectural heritage sites has decreased slightly compared with the previous period.

Analysis of the registration time of architectural heritage sites in the five regions (Figure 5) found that Europe and North America, as the region with the largest concentration of the world architectural heritage, has a dynamic trend similar to the overall trend of the world architectural heritage. In the 10 years from 1979 to 1988, the Arab States registered the largest number of heritage sites, accounting for 49.38% of the total number in the region. Asia and the Pacific have maintained sustained growth.
3.2.2. Distribution of the Construction Time

As for the construction time of architectural heritage sites, some sites have been rebuilt several times, and in some cases the construction process covered one or several long periods. To control the consistency of time variables, this study adopted the initial construction year uniformly. This allowed us to elaborate the construction time distribution map of architectural heritage sites of the world and each region in Figures 6 and 7.

Figure 5. Statistics on the registration time of architectural heritage sites in various regions.

Figure 6. Statistics on the construction time of the world architectural heritage. Note: The construction times of five heritage sites cannot be determined: one is in Africa, and the other four are in Europe and North America.
Analyzing the construction time of the architectural heritage of the whole world and of each region, we found that the heritage construction time can be divided into four stages. The first stage is the ancient historic site stage before the 20th century BCE. Architectural heritage sites built during this period are mainly distributed in Europe and North America (25), Asia and the Pacific (18), and the Arab States (17). The second stage is the uniform and stable stage from the 20th century to the 6th century BCE. The number of heritage sites built during this period was small and remained stable. The third stage is the Asian and European growth from the 6th century BCE to the 6th century CE. The architectural heritage of Asia and the Pacific and Europe and North America began to grow significantly during this period. Compared with the previous period, the number of heritage sites in this period increased and maintained a stable trend. The fourth stage, from the 6th century to the present times, is the growth stage for Europe, America, and Africa. The number of heritage sites grew rapidly, reaching its peak in the 15th and 16th centuries.

3.2.3. Distribution of Architectural Heritage Types

Referring to the UNESCO version of the modern heritage classification standards [37] combined with archaeology, sociology, natural geography, architecture, urban planning, and other disciplines and classification systems [38], we formulated the following classification standards for architectural heritage. There are five major categories and 15 subcategories (Table 4).

The statistical results show that residential (428) and public architecture (308) are the main types, which account for 83.92% of the total number of architectural heritage sites. Among the residential architecture, cities and urban agglomerations have the largest number of sites (289), accounting for 67.52% of this category. Religious architecture (167) has the largest amount public architecture sites, with a proportion of 54.22% (Figure 8).
Table 4. Classification and number of the world architectural heritage sites.

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Subcategory</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Residential architecture</td>
<td>428</td>
<td>1.1 Cities and urban agglomerations</td>
<td>289</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2 Towns and villages</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3 Groups of building</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4 Single buildings</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1 Commercial facilities</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2 Cultural and educational facilities</td>
<td>14</td>
</tr>
<tr>
<td>2. Public architecture</td>
<td>308</td>
<td>2.3 Transportation facilities</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.4 Civil affairs facilities</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.5 Religious architecture</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.6 Landscape architecture</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.7 Memorial buildings</td>
<td>48</td>
</tr>
<tr>
<td>3. Industrial architecture</td>
<td>67</td>
<td>3.1 Civil industry</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2 Military industry</td>
<td>34</td>
</tr>
<tr>
<td>4. Agricultural architecture</td>
<td>30</td>
<td>4. Agricultural architecture</td>
<td>30</td>
</tr>
<tr>
<td>5. Royal architecture</td>
<td>44</td>
<td>5. Royal architecture</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>877</strong></td>
<td><strong>Total</strong></td>
<td><strong>877</strong></td>
</tr>
</tbody>
</table>

The statistical results show that residential (428) and public architecture (308) are the main types, which account for 83.92% of the total number of architectural heritage sites. Among the residential architecture, cities and urban agglomerations have the largest number of sites (289), accounting for 67.52% of this category. Religious architecture (167) has the largest amount public architecture sites, with a proportion of 54.22% (Figure 8).

Figure 8. (a) Statistics on the categories of the world architectural heritage. (b) Statistics on the subcategories of the world architectural heritage.

Then, we conducted statistical analysis of the quantity distribution of various types of architectural heritage in various regions (shown in Table 5) and found that various regions are significantly different and have regional uniqueness:

1. Cities and urban agglomerations occupy the largest proportion of heritage sites in all the regions.
2. Religious architecture is mainly distributed in two regions, namely Europe and North America (60.48%) and Asia and the Pacific (28.74%).
3. In Africa, memorial architecture (7) is second only to the cities and urban agglomerations (17) and groups of buildings (8), accounting for 31.82% of the total number of all heritage sites.
4. In the region of Asia and the Pacific, royal architecture (17), towns and villages (11), and memorial buildings (11) occupy a considerable proportion.

Table 5. The subcategories and the numbers of the world architectural heritage sites in each region.

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>Africa</th>
<th>Arab States</th>
<th>Asia and the Pacific</th>
<th>Europe and North America</th>
<th>Latin America and the Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>4</td>
<td>4</td>
<td>17</td>
<td>128</td>
<td>49</td>
</tr>
<tr>
<td>1.2</td>
<td>4</td>
<td>9</td>
<td>11</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>1.3</td>
<td>8</td>
<td>9</td>
<td>13</td>
<td>44</td>
<td>8</td>
</tr>
<tr>
<td>1.4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>1</td>
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<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2.2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>2.3</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>2.4</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>2.5</td>
<td>4</td>
<td>5</td>
<td>48</td>
<td>101</td>
<td>9</td>
</tr>
<tr>
<td>2.6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>2.7</td>
<td>7</td>
<td>2</td>
<td>11</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>3.1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>3.2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2</td>
<td>17</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>81</td>
<td>191</td>
<td>457</td>
<td>103</td>
</tr>
</tbody>
</table>

1 There is one architectural heritage site shared by Europe and North America, Asia and the Pacific, Latin America and the Caribbean.

4. Influencing Factors in the Spatial Distribution of the World Architectural Heritage

4.1. Influencing Factors of the Geographical Environment

The spatial distribution of the world architectural heritage is affected by climate, topography, and altitude.

In terms of geographical location, architectural heritage sites are concentrated in the land areas of middle and low latitudes, especially in the offshore land area near 30 degrees North latitude. Most of the architectural heritage sites are distributed in the lower altitude areas with relatively gentle terrain, where the climate is more suitable for human life and production activities and the intensity of human transformation of nature is greater, resulting in a large number of glorious heritage sites [39]. The architectural heritage of Europe, for example, is clustered in the temperate marine and the Mediterranean climate zones and other temperate plains of Western Europe. Asia’s architectural heritage is concentrated in the southeastern coastal areas of the temperate monsoon and temperate continental climate zones at lower elevations. Architectural heritage sites of Africa are mostly distributed in the humid tropical rainforest and savanna climate zones and tend to be in the eastern and western coastal areas south of the Sahara Desert [40].

4.2. Influencing Factors of the Historical Development

Important nodes in the historical process often exert great influence on urban civilization and the built environment which interacts with human activities.

Historically, the fertile rivers and plains of the Middle East, India, China, and Europe gave birth to the greatest civilizations in history [41], including the Nile and Mesopotamia in the Middle East and the Iranian Plateau, the Yellow River valley in China, and the Northern Mediterranean region of Europe (including North Africa) [42]. Ancient humans established the earliest settlements and urban civilizations in these areas and gradually created a mature cultural form [43]. As a result, Europe and America, Asia and the Pacific, and the Arab States have a large number of prehistoric architectural heritage sites. Eurasia
has become an important historical center of the world, and the architectural heritage in Europe, America, and Asia and the Pacific accounts for 73.72% of the total number of the world architectural heritage sites. Meanwhile, residential and memorial buildings came to be the main architectural heritage types in Africa.

From 600 to 800 CE, China was in the prosperous period of the Tang Dynasty. During this period, China enjoyed high social development and unprecedented social and economic prosperity [44]. At the same time, China had frequent exchanges with the East and the West and active cultural exchanges with Japan, India, and other countries.

In the 14th century, with the rise of capitalism in Europe, the Renaissance movement and the opening of new navigation routes brought the development of architecture in Europe, North America, and Latin America to a glorious age [45]. This was the peak of the rapid growth of architectural heritage sites in Europe and Latin America. Then, the development of the workshop and handicraft industry promoted the industrial revolution in the 18th century [46]. With the great development of industry, cities grew, and the urban civilization reached a new height, giving birth to a series of new architectural types such as industrial, municipal, and cultural buildings, including commercial facilities, cultural and educational facilities, transportation facilities, civil industrial and agricultural architecture.

By the middle of the 19th century, Britain, France, Italy, and other European countries began gradually establishing a protection system with the national government as the main body. Subsequently, the discussion on the protection of the architectural heritage at the national level gradually extended to the whole world with Europe as the core. Therefore, a considerable part of the recent architectural heritage, especially since the Renaissance, has been well and timely preserved.

Subsequently, the two World Wars in the 20th century almost halted the global economic and social development and caused devastating damage to some historical buildings and cities, leading to a decline in the number of the world architectural heritage sites during this period [47]. However, with post-war reconstruction came some new modern architectural heritage and the diversity of building types.

4.3. Economic Strength and Discourse Power

The spatial distribution difference of the world architectural heritage is closely related to the development of regional social economy in history. Countries with a higher level of economic development tend to have a relatively stable domestic social environment and have the ability to provide greater support for heritage protection and attach more importance to the declaration and protection of the world heritage. Most of Europe is made up of developed countries with advanced concepts and technologies of heritage protection, as well as national attention and protection efforts, resulting in a high degree of architectural heritage aggregation.

On the other hand, countries or regions with weak economic strength and state power pay limited attention to architectural heritage protection. According to the statistics of the number of endangered architectural heritage sites in each region, it can be found that such a number in the Arab States is the largest, while that in Europe and America is the lowest (Table 6). According to the statistics, armed conflicts, poor management, and engineering construction are the biggest problems facing cultural heritage sites, including architectural heritage sites. In addition, the pressure of urban development and inappropriate protection and reconstruction also pose a threat to the protection of architectural heritage sites [48,49].
Table 6. The number of endangered architectural heritage sites in each region and the proportion of endangered architectural heritage in each region.

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
<th>In Danger</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arab States</td>
<td>81</td>
<td>21</td>
<td>25.93%</td>
</tr>
<tr>
<td>Africa</td>
<td>47</td>
<td>4</td>
<td>8.51%</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>103</td>
<td>4</td>
<td>3.88%</td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>191</td>
<td>4</td>
<td>2.09%</td>
</tr>
<tr>
<td>Europe and North America</td>
<td>457</td>
<td>4</td>
<td>0.88%</td>
</tr>
<tr>
<td>Total</td>
<td>879</td>
<td>37</td>
<td>4.21%</td>
</tr>
</tbody>
</table>

1 There is one architectural heritage shared by Europe and North America, Asia and the Pacific, Latin America and the Caribbean.

At the same time, the potential influence of national discourse power on the concept and value cognition of heritage often hides behind the economic development. The discourse power of developed countries affects the cognition and behavior of international organizations on heritage, making international organizations tend to conform to the will of developed countries in the formulation of heritage protection laws and practices. The World Heritage Convention adopted in Paris in 1972 reflects the basic concept of the world heritage, which is the embodiment of the European recognition of the universal significance of historical heritage sites for international protection [4].

4.4. International Heritage Protection Situation and Registration Policy

The heritage registration policy and system driven by the international heritage conservation background plays a decisive role in the number of the world architectural heritage sites.

On the one hand, since the establishment of the World Heritage List in 1976, UNESCO successively established and regulated the World Heritage Center and other international authorities, constantly adjusted the requirements and standards of the heritage registration system according to the changes in the global heritage protection concept, and promoted the world heritage registration system to be more authoritative, rigorous, comprehensive, and up-to-date to the direction of continuous optimization. For example, since the first batch of the world heritage sites was registered in 1978, various types of heritage sites have been added in succession: from historical towns to cultural landscapes, from heritage canals to cultural routes, and more recently, industrial heritage, modern architectural heritage, and holy mountains. The abovementioned types of architectural heritage sites have been listed, valued, and protected [50].

On the other hand, although the criteria for inclusion in the World Heritage List formulated by the World Heritage Committee are objective and reliable, the distribution of the world heritage sites is often unreasonable due to the great differences between different countries in the value and protection of heritage and their enthusiasm for participating in international actions. The spatial distribution of heritage sites in developed and developing countries is extremely imbalanced. However, to alleviate this situation, since around 1994, UNESCO has developed specific programs to correct the imbalance concerning the 19th and 20th century heritage. These actions led to the publication of a special issue in 2003 of the World Heritage Papers, under the title ‘Identification and Documentation of Modern Heritage’. With the deepening of the theme of peace and development, the strengthening of the international cooperation, and the introduction of the various relevant documents to balance the types and global distribution of the world heritage sites, the gap in the number of the world heritage sites between the contracting parties will tend to narrow [14].

5. Discussion

In this article, we showed that the world architectural heritage sites are clustered with the imbalanced distribution. The number, registration time, construction time, and type distribution of heritage sites in each geographical division are different, which is related to
the geographical environment, historical process, economic strength, international heritage protection situation, and registration policy.

Our research reveals that there are great differences in the protection of architectural heritage in different regions of the world and at the same time reflects the unfairness of the international heritage registration system. We hope to establish a more scientific registration and protection system of the architectural heritage internationally, build a balanced international architectural heritage protection environment, guide specific directions of heritage protection for all countries and regions, and provide timely and appropriate protection and preservation for more endangered heritage sites.

The problems of architectural heritage protection mainly exist in three aspects: inadequate protection, excessive development, and isolation:

1. When we counted up the architectural heritage list, we found that although some heritage sites were listed, the actual situation was that they were not well-used and faced the risk of destruction. In particular, the endangered heritage needs the attention of all the countries and regions.

2. Some of the properties have been overdeveloped. The most immediate example is the delistment of Liverpool—Maritime Mercantile City in 2021, an architectural heritage site in the UK registered in 2004. Liverpool’s planning of large-scale development of the historic dockyard area north of the city center will threaten the harmonious relationship between the site and its surrounding environment. Heritage and its environment should be the focus of protection and conservation, and any development and construction should be carefully decided. Otherwise, the lack of protection or noncompliance with laws and protection plans would cause the loss of a world heritage site or put it at risk.

3. World heritage protection generally lacks regional linkage and cooperation. Based on independent protection, each country should form not only horizontal coordination of regional heritage protection, but also a vertical linkage of various levels to build an organic and integrated regional heritage protection system.

In addition, considering that the registration of the world heritage is a strong driving force for local employment and sustainable economic development, to alleviate the imbalanced distribution of the world heritage, the registration system should be more inclined towards less developed areas.

Although there are important discoveries revealed by this study, there are also limitations. First, the coordinates of the architectural heritage sites are not precise enough. Some transboundary architectural heritage sites like heritage routes and ancient city walls have more than one coordinate, but we only chose the core coordinates, which affects the visualization of the spatial distribution of heritage points to some extent. Second, the selection of the research methods is limited. The spatial analysis methods used in this paper are one-dimensional. In further research, we will consider the inclusion of the time dimension with the factors of population and regional area, adopt the multiple regression analysis and other methods to conduct a comprehensive analysis, and further explore the two-dimensional succession law of time and space. Third, the discussion on the influencing factors is relatively superficial. In the future, a mathematical–statistical analysis should be conducted to further verify the coupling between the influencing factors and the spatial distribution characteristics and enhance the persuasiveness of the explanations.

6. Conclusions

At the spatial distribution level, the spatial analysis method was used to reveal the cluster form in space and show the areas of different densities. Then, we used the statistic analysis to verify the conclusions with actual data, and more accurate and clear results were obtained.

At the temporal and type distribution level, we divided the registration time and the construction time into various stages according to the changes and trends of the number of heritage sites. The type distribution shows a peculiarly imbalanced pattern in each region.
We further explored the influencing factors of the spatial and temporal distribution characteristics of architectural heritage sites. We analyzed the geographical environment, historical development, economic level, discourse power, international heritage protection situation, and registration policy and drew the following conclusions:

1. The spatiotemporal distribution of the world architectural heritage is affected by climate, topography, and altitude, which are related to the suitability of settlement.

2. Important nodes in the historical process have a great impact on the human civilization, and the built environment is often the epitome of historical development. Therefore, historical development leads to the construction of the built environment and also directly affects the spatiotemporal distribution of architecture types.

3. The spatial distribution difference of the world architectural heritage is closely related to the development of regional society and economy in history and is always influenced by the national discourse power. Countries with stronger economic strength tend to have a greater say in the international platform of architectural heritage conservation.

4. The heritage registration policy and system driven by the international heritage conservation situation play a decisive role in the number of the world architectural heritage sites. The diversity of heritage categories and the balance of heritage distribution will be the main guidance for the world architectural heritage protection organizations or institutions to establish the requirements for heritage registration and standardize the criteria for heritage selection.

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Conflicts of Interest: The authors declare no conflict of interest.

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