Catalogue of representative scales to visualize different coverages in Google Earth

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Abstract. Representative scales were established, based on the zoom level of Google Maps, for generating a catalogue of indicators from the scale-image relationship, into the Google Earth visualization system. It was possible to analyze some functionalities of the visualization system proposed, such as the depth of detail from image resolution and the images return. Therefore, samples of four land use were analyzed. Furthermore, to associate the multilevel mechanism of the visualization in Google Earth, a digital ruler was used as a tool that measures the pixels per inch into the screen. In consequence, it is possible to analyze the changing behaviour from one screen to another. With this, it is feasible to associate a specific mechanism to improve the relationship between the handling of several images covering a limiting territory, and the scales that best represents the themes described. Finally, 893 samples were analyzed in 32 points of the territory, between the coordinates 14° to 33° N and 86° to 119° W. Finally, the error percentage, the variance, and the standard deviation were estimated for determining the variation between the values calculated in different samples.

1. Introduction
Nowadays, many users of spatial technologies have associated to integrate vectorial mapping with satellite imagery in universal server infrastructures, mainly in Google Earth, allowing research support in the knowledge of territory elements [1-3]. Before the virtual globe development (visual system development), web mapping showed significant alternatives for analysis and knowledge of the Earth. For this reason, different programs, such as MapQuest, Google Maps and Map24, were popular for some time [4]. On the other hand, Google Earth is an interactive visualization system that allows the analysis of different types of images through depth mechanisms in image resolution [5]. The image information is not related to a fixed scale so that we can find maps in several scales [6]. The interoperability of Google Earth [7, 8], that has allowed the unification of data from different sources, on several formats (.shp, .dwg, .fmw, among others), through its KML (Keyhole Markup Language) structure [9], has enabled to develop millions of mapping operations through the GIS use, handling...
data of various scales and integrate them to platform images [10]. Thus, we can get a better appreciation of the vectorial data described on each territory based on its relationship with satellite imagery [11]. Google Earth allows us to observe details due to the high resolution of its images [12]. However, it hasn’t been easy to measure certain inconsistencies of representation and description of the objects, from vectorial data integrated with the variety of images that represent the territory, which, have different resolutions and a multi-scale structure easy to handle but it has been complicated to associate geometrical and topological correspondences [13].

To observe and to analyze geographic objects, with a certain zoom level of the image, when combined with vectorial data, it is difficult to obtain accurate integration because the vectorial data come of a cartographic production to absolute scale [14]. In this way, the functionalities of Google Earth and its mechanism scalar associated of the objects by a determined zoom [15] motivated this work. It is interesting to study the relationship between elements or objects represented by different images and the possible scalar representation of their structure — so we analyze the corresponding part to Google Maps, as it has different views from ground level [16]. However, due that zooms are not only fixed but constant, they depend on the area and the image resolution [17]. Likewise, each zoom represents a scale, but its measure can have low precision depending on the resolution of the image showed by Google Earth [18]. The representation of the information is presented through the zoom, and this is associated with the increase or decrease of the objects focal distance [19]. The zooming into an image in a computer multiplies the number of pixels that integrates, presenting larger or smaller images on the screen despite the original object [20]. The scale, unlike the zoom, represents a proportion value, and this is generally associated with a metric representation of the ground with the graphical symmetry on a scale, a map, or a display system [21].

To analyze cartographic scale in satellite images, cannot dispense some essential factors in which the scientific community has worked hard, such that geometric accuracy and visual quality the image, and its relation to scale by different criteria and standards for planimetric accuracy [22]. Considering that different types of images from Google Earth that make Earth’s description are subject to a UTM projection system, these can be affected in their representation from latitude and longitude [23]. This situation also affects several changes in determining the scale of the image, which to exert a zoom degree in a specific area, generates a certain pixel increase in images that describe elements from the territory. When the image resolution is lower, the latitude and longitude adapt to a series of mechanisms of a little pixel representation. In such a way that it is possible to count through a specific quantity of views, analysing the capacity to deepen in the image resolution, and the opposite process of the zoom (go back). In this way, it is possible to associate the zoom levels with a determined scale.

Likewise, it's necessary to consider the resolution of the screen where the elements analyzed of the territory are observed, given that these screens are subject to specific pixel classifications, which are converted automatically and adapted when viewing images of Google Earth on a particular type of display. A mechanism developed [24], described in a patent (US 6,618,053 B1) "The asynchronous multilevel texture pipeline" a method that reports real processes in which Google Earth structure functionality is supported.

The aim of this study is to generate a catalogue of scalar indicators in Google Earth for determining the scale-image relationship that associates the characteristics that visually describe some elements of land use. Additionally, it will facilitate knowledge of the image-scale relationship, for those who need to determine distances, surfaces or volumes, and they take advantage of the resolution of the images and their temporality.

2. Method
2.1 Study Area
The analysis will be performed with images covering the Mexican territory, between the coordinates 14° to 33° N and 86° to 119° W. Those images come from different sources: CNES/Spot, Digital Globe, GeoEye, and NASA.
2.2 Description of The Methodology
First, for selecting the samples, it will be generated a list of natural resources represented in the Google Earth images. Then, a list of scales will be analyzed and determined in Google Maps, we will relate them to the Google Earth interface, to associate specific correlation of scale representation. Since the resolution of Google Earth images is defined by a factor known as pixels per inch (PPI). This measure indicates the number of pixels that are in a physical inch on the monitor, so this is the factor that causes a resized image from a screen to another due to the difference of PPI between both screens. For sample measurement on screen, it will use JrulerPro software, which is developed by Spadix Software Company. This tool is a digital ruler to measure any object on a screen. It's useful for graph measurement and webspace distribution. The ruler can be displayed in pixels, inches, picas, and centimeters. For this study, we used version 3.0 Pro. This ruler can be rotated, dragged, extended, and change its graduation automatically, in addition to modifying its transparency.

Initially, the procedure for determining relationships between scales and existing zoom levels in Google Maps will be as follows: The Jruler software will be installed and once placed on the screen, we enter into the zoom level to locate or focus on the country or city map of our choice, in this case, will be placed in San Luis Potosi City, Mexico. Next, the map view mode changes, so we will facilitate the measurement of do not have so many items on the screen. The zoom is fixed to the level that we want to measure, this time we used as an example the 18 -zoom level, to which we associate the ruler. Thus, we can determine the number of pixels that measures the line from end to end, and we obtain a measurement of about 90 pixels. As previously noted, the number of pixels from which an image is formed varies depending on the screen resolution where it is located.

By changing the Jruler adjustment in cm for measuring scale line again, it gives an approximate 2.5 cm scale line from end to end. Because Jruler automatically changes the number of pixels per inch, the measurement will not change, no matter the screen or the resolution is displayed, the line always will measure 2.5 cm. This line represents a 50 m measure or 5000 cm, but according to the ruler, it measures 2.5 cm. If we divide the measure, that represents the line (5000 cm), by what it measured (2.5cm), it will result in the centimeters proportion value of an estimated scale of 2000. The steps indicated were repeated with each of the 20 zoom levels in Google Maps, to determine the equivalence in centimeters between Jruler and zoom levels.

2.3 Experimentations with Sample Measurement in Google Earth
For associating the scales identified in Google Maps, we will proceed to establish a mechanism in Google Earth. Subsequently, on a specific area of the image, the baseline will be drawn, trying to mark the greater length in the element and then determined data are recorded in the ruler window. It should be noted that this procedure involves determining criteria for measuring water bodies in which it was intended to find a length and surface similarity between these elements represented in various images of Google Earth. We also set a mark to obtain the sample coordinates; subsequently, an auxiliary line is traced next to the object of analysis, to determine the scale.

Also, we need to represent a line of 200 meters in 2.5 cm on the screen, for adjusting the zoom view and reach the size measure of the auxiliary line. This procedure determines the scaling in the view, after setting the zoom to the size of the auxiliary line. The view will be on the indicated scale being able to be measured with Jruler. This procedure was repeated so many times over elements from the same site, taking account the adequacy of Google Earth zoom, concerning those scales which allowed to observe the sampling element, in the capacity for deepening in image resolution and its opposite process (go back) of each image resolution in which the item was located.

Then we will measure the indicated element, taking care not to change the zoom view, to measure a baseline using Jruler. This operation allows us to work in the image position. From this image, the zoom parameters are stated, and the length is obtained with the ruler at the determined view; thus, its value is in centimeters. This value is multiplied by the meters represented on the scale line. Likewise, the value of "height of the eye" is also taken, serving to determine the observed variations of each view at different zoom levels. Each item considered will be based on the scales established for
associating with those objects that could be measured, these being visible on screen as an established scale.

2.4 Sample Analysis of The Image-Scale Relationship
It will be obtained a representative scale set to handle the different Google Earth images. These scales will be generated from the sample analysis, regarding the zoom functionality, within process deepening back to each analyzed image resolution in various soil coverages. At this step, is associated that for each selected topic exists a scales variety that is representative for handling the various images covering the analysis sector in this work. However, there are full, considered implications in the use of such scales determined for each subject, analysing procedures based on the description of error ranges, depending on the analysis variety of each sample.

To perform a comparison of the sample lengths obtained by measuring on each scale with Jruler will be calculated the percentage error. This standardization will be made so that handle an error range, so that, for each sample, it will be obtained the difference based on calculated length measurement on the screen and the determined measure with the Jruler, which describes the error. The error is multiplied by 100 and divided by sample length (measured with Jruler), giving an error percentage in the determined scale.

2.5 Variation of Error in Each Scale
Once the percentage of error between the length of the sample in the Google Earth interface has been shown, what is obtained with the ruler, as well as their respective calculations, right away the variations between the errors in each scale will be described (including the percentage of error). In this case, both variables support to find a scale where there is greater variation among the errors, that is, where the errors of the measurements are more likely to suffer more significant alterations. To analyze such variations, we apply the following formula of variance ($\sigma^2$) to measure the mean of the differences between the set of error values in the different scales analyzed. Similarly, knowing how much data are separated from percentages, the standard deviation was determined ($\sigma$) to measure dispersion in the average of the distances between the error percentages determined.

\[
\sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1} \quad (1)
\]

\[
\sigma = \sqrt{\sigma^2} \quad (2)
\]

Where: $\sigma^2$ = Variance; $x_i$ = Observed value; $\bar{x}$ = Average of observations; $n$ = The sample elements

3. Result and Discussions
3.1 Sample Selection
Initially, water, soil, agriculture, livestock, coastlines, flora, and fauna, infrastructure, communication routes, urban and rural areas were selected. Then, the criterion of being able to capture in the images the sharpness of the object and the shape of its typical characteristics was established to be able to measure it to select the final coverages. Finally, the four covers selected were agriculture, bodies of water, infrastructure, and forest. Likewise, a sample was chosen of each coverage in for each state of the country, and which in turn was representative. States in which the selected coverages were not observed were omitted. This procedure allowed us to establish the following scale catalogue at different zoom levels (Table 1).
Table 1. Scales Associated with Google Maps According to Different Zoom Level

| Zoom | Linear meters represented | Centimeters measured with Jruler | Proportion of centimeters in estimated scale |
|------|---------------------------|---------------------------------|---------------------------------------------|
| 0    | 10,000,000                | 2                               | 1:500000000                                 |
| 1    | 5,000,000                 | 2                               | 1:250000000                                 |
| 2    | 2,000,000                 | 2                               | 1:100000000                                 |
| 3    | 2,000,000                 | 3.2                             | 1:625000000                                 |
| 4    | 1,000,000                 | 3.2                             | 1:312500000                                 |
| 5    | 500,000                   | 3.2                             | 1:156250000                                 |
| 6    | 200,000                   | 2.5                             | 1:8000000                                   |
| 7    | 100,000                   | 2.5                             | 1:4000000                                   |
| 8    | 50,000                    | 2.5                             | 1:2000000                                   |
| 9    | 20,000                    | 2                               | 1:1000000                                   |
| 10   | 10,000                    | 2                               | 1:500000                                    |
| 11   | 5,000                     | 2                               | 1:250000                                    |
| 12   | 2,000                     | 1.6                             | 1:125000                                    |
| 13   | 2,000                     | 3                               | 1:66666                                    |
| 14   | 1,000                     | 3                               | 1:33333                                    |
| 15   | 500                       | 3                               | 1:16666                                    |
| 16   | 200                       | 2.5                             | 1:8000                                     |
| 17   | 100                       | 2.5                             | 1:4000                                     |
| 18   | 50                        | 2.5                             | 1:2000                                     |
| 19   | 20                        | 2                               | 1:1000                                     |

(Source: Data Measuring, 2020)

3.2 Experimentations with Sample Measurement in Google Earth

To associate the scales identified in Google Maps, we located the sample area according to the item or object, representing a land use. In this case, as an example, we take a water body sample in Lake Miramar (Figure 1) in the state of Chiapas. Next, we draw a line based on a specific area of the image, marking the largest length of the element (Figure 2) and saving the obtained data in the ruler window. It should be noted that this procedure involves determining criteria for measuring water bodies in which it was intended to find a length and surface similarity between these elements represented in the various images of Google Earth. In the following example (Figure 3), was fitted the view at 1:8000, under the relation of scales defined in Table 1. Here, we drew a line of 200 meters with the Google Earth ruler, which must correspond to the 2.5 cm measurement on Jruler.

Figure 1. Example of a water body sample in the state of Chiapas
Figure 2. Baseline definition
Figure 3. Auxiliary line definition
In the 1:8000 scale case, we need to represent a line of 200 meters in 2.5 cm on the screen, to adjust the zoom view and reach the size measure of the auxiliary line. The view will be on the indicated scale being able to be measured with Jruler. This procedure was repeated so many times over elements from the same site, taking account the adequacy of Google Earth zoom, concerning those scales (Table 1) which allowed to observe the sampling element, in the capacity for deepening in image resolution and its opposite process (go back) of each image resolution in which the item was located.

Then we measure the indicated element, taking care not to change the zoom view, to measure a baseline using Jruler (Figure 4).

In this example, it corresponds to 200 meters on a 1:8000 scale (shown in the column named "Proportion in centimeters in estimated scale" in Table 1). The 200 meters multiplied are divided between 2.5 centimeters, determined by the view adjustment and its correspondence in the Jruler tool. Then, the operation calculated in this example is recorded along with the values of all samples (Table 2); being represented as follows: 84.4 (cm in ruler) * 200 (m represented at line scale) / 2.5 (cm on the scale line measured with Jruler) = 6752.0 (calculated length). Likewise, the value of "height of the eye" is also taken, serving to determine the observed variations of each view at different zoom levels.

![Figure 4. Sample line measurement](image)

Each item considered (agricultural ground, water, infrastructure, and forests), was based on the scales of Table 1, so the scale determination from the example in Table 2, were associated with those objects that could be measured, these being visible on screen as an established scale. We determined a total of 893 samples divided as follows: 256 samples for soil in 32 states (8 scales analyzed), 217 samples for water bodies in 31 states (7 scales analyzed), 224 samples for infrastructure in 32 states (7 scales analyzed), and 196 samples for forest in 28 states (7 scales analyzed).

| Table 2. Registration Tables Descriptions and Measurements at Each Scale Used |
|--------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| State                        | Sample description | Length (m) | E                | N                | Date             | Source                        |
| Chiapas                      | Water bodies      | 6, 493      | 686,041          | 1’814,635        | 13/08/2006       | Digital Globe-CNES/SpotImage-GeoEye |

| Scale | Meters represented in scale line | Cm measured in scale line on the screen (Jruler) | Cm in ruler | Altitude (km) | Calculated length (m) |
|-------|---------------------------------|-----------------------------------------------|-------------|---------------|-----------------------|
| 1:1000000 | 20,000                          | 2                                             | 0.7         | 225.85        | 7000.0                |
| 1:5000000 | 10,000                          | 2                                             | 1.4         | 113.94        | 7000.0                |
| 1:2500000 | 5,000                           | 2                                             | 2.8         | 57.83         | 7000.0                |
| 1:6666666 | 2,000                           | 3                                             | 10.6        | 15.39         | 7066.7                |
| 1:3333333 | 1,000                           | 3                                             | 20.7        | 8.02          | 6900.0                |
| 1:1666666 | 500                             | 3                                             | 41.8        | 4.07          | 6966.7                |
| 1:8000    | 200                             | 2.5                                           | 84.4        | 2.16          | 6752.0                |
3.3. Results of Sample Analysis of The Image-Scale Relationship

There were obtained a representative scale set to handle the different Google Earth images. These scales were generated from the sample analysis, regarding the zoom functionality, within process deepen going back to each analyzed image resolution in various soil coverages (Table 3). The sample analyzed varied in their lengths. The ranges have length dispersion as follows: 1) Agricultural land (93 – 665 m); 2) Infrastructure (178 – 1601 m; 3) Waterbodies (1417 – 21219 m); 4) Forest (14651 – 263999 m).

| Scale      | Agricultural | Water bodies | Infrastructure | Forest |
|------------|--------------|--------------|----------------|--------|
| 1:4,000,000| 3.0%         |              |                |        |
| 1:2,000,000|              | 2.9%         |                |        |
| 1:1,000,000| 5.3%         |              | 2.2%           |        |
| 1:500,000  | 4.9%         |              | 1.9%           |        |
| 1:250,000  | 15.2%        | 2.4%         | 1.4%           |        |
| 1:100,000  | 5.1%         | 1.5%         | 10.5%          | 1.9%   |
| 1:33,333   | 3.4%         | 1.6%         | 3.9%           | 1.8%   |
| 1:16,666   | 1.9%         | 1.8%         | 2.1%           |        |
| 1:8,000    | 1.1%         | 2.9%         | 2.0%           |        |
| 1:4,000    | 1.2%         |              | 1.6%           |        |
| 1:2,000    | 3.9%         |              | 3.9%           |        |
| 1:1,000    | 1.9%         |              | 2.8%           |        |

(Source: Data Calculation, 2020)

Regarding this variation, an average for each subject was defined to effectuate a statistical sampling to verify their dispersion. In this case, for agricultural soil an average of 284 m was found; water bodies with 6928.7 m; infrastructure with 475 m and forest 48320.9 m (Table 4). Likewise, other statistical values were determined by the same lengths.

| N  | Agricultural | Water bodies | Infrastructure | Forest |
|----|--------------|--------------|----------------|--------|
| 32 | 284.4        | 6928.7       | 475.0          | 48320.9 |
| Maximum (m) | 665.0        | 21219.0      | 1601.0         | 263999.0 |
| Minimum (m)  | 93.0         | 1417.0       | 178.0          | 14651.0 |
| Variance     | 18057.9      | 18282865.7   | 122497.0       | 2334635704.3 |
| Standard deviation | 134.4        | 4275.8       | 350.0          | 48318.1 |

(Source: Data Calculation, 2020)

To compare the sample lengths obtained by measuring on each scale with Jruler was estimated a percentage error. This standardization was made to handle an error range, so that, for each sample, it was obtained the difference based on calculated length measurement on the screen and the determined measure with the Jruler, which describes the error. For example, to get the percentage error in agricultural land subject to scale 1:250 000, a procedure was performed for each state of Mexico that initially is calculated as follows: In agriculture case, it was obtained 375 m (long calculated) – 200 m (measuring the sample length with Jruler) = 175 m of difference, then the 175 * 100/200 = 87.5% error. The percentages for each sample taken at the same scale are summed and averaged, hence arose the 15.2% for 1:250,000 scales in the agricultural land subject. Being given that was calculated the same procedure for all 32 states, the result of each in other scales likewise is added and is determined.
average percentage error. Figure 5 shows the behavior from the average error percentage determined in each sample analyzed of the four coverages. In these graphs describe similar patterns, showing that the error is large in small scales, so that as scale increases until it exceeds half of the scale, it reaches the smallest error, then, increased slightly.

By concentrating previous graphics into one shows the similarity between errors of four topics discussed, which describes the following: By integrating scales to compare results in each of the thematic percentages, shows that in the fifth level of each topic, the lowest value was found in the error percentage, except water bodies, where the minimum is at the fourth scale (Figure 6).

![Figure 5](image)

**Figure 5.** Average percentage error of samples of a) agricultural land, b) waterbody, c) infrastructure, and, d) forest. *(Source: Data Processing, 2020)*

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![Figure 6](image)

**Figure 6.** Comparative of average errors between agricultural land, water bodies, infrastructure, and forest *(Source: Data Processing, 2020)*

In the first scale of each coverage (Agricultural land 1:250,000 - Waterbodies 1:1,000,000 - Infrastructure 1:66,666 - Forest 1:4,000,000), the sample is perceived very small, from mm to a few cm. In third and fourth scale (Agricultural land 1:33,333 and 1:16,666 - Waterbodies 1:250,000 and
1:66,666 - Infrastructure 1:16,666 and 1:8000 - Forest 1:1,000,000 and 1:500,000), the sample is observed moderate and can be measured on the screen. In the fifth scale (Agricultural land 1:8,000 - Water Bodies 1:33,333 - Infrastructure 1:4,000 - Forest 1:250,000), the sample is fully viewed on the screen, which facilitates direct measurement with the ruler. From the sixth scale (Agricultural land 1:4,000 - Waterbodies 1:16,666 - Infrastructure 1:2,000 - Forest 1:66,666), the sample exceeds the screen, so must be measured several times with the ruler. Changes made to move the ruler, or the sample causes the increase of the errors.

3.4 Variation of Error in Each Scale
In this case, both variables support to find a scale where there is greater variation among the errors, that is, where the errors of the measurements are more likely to suffer more significant alterations. Table 5 shows the variance and standard deviation obtained for each coverage. In this case, it can be perceived as a similar pattern to the average error percentage.

Table 5. Variance and Standard Deviation for Damples of a) Agricultural Land, b) Waterbody, c) Infrastructure, and, d) Forest

| SCALE | $\sigma^2$ | $\sigma$ |
|-------|-----------|---------|
| 1:250,000 | 54.93 | 7.40 |
| 1:66,666 | 49.34 | 4.76 |
| 1:33,333 | 12.05 | 3.47 |
| 1:16,666 | 12.66 | 3.59 |
| 1:5,000 | 0.91 | 0.91 |
| 1:2,000 | 1.39 | 1.18 |
| 1:1,000 | 2.03 | 1.42 |
| 1:500 | 2.04 | 1.43 |
| 1:250 | 2.05 | 1.43 |

Figure 7 shows the graphics of the standard deviation. In these graphics is perceived that on a smaller scale occurs more variation between the values calculated in samples. There is also a point after the center where exists less dispersion, which shows after other increases.

Figure 7. Standard deviation for error percentage in a) agricultural, b) waterbodies, c) infrastructure, and, d) forest.
Making a comparison between the results for the error percentage calculation and those results determined based on the standard deviation calculation, are described in Table 6 and 7.

| Land use   | Minimum error/Scale | Maximum error/Scale |
|------------|---------------------|---------------------|
| Agricultural | 1.1% (1:8,000) | 15.2% (1:250,000) |
| Water bodies | 1.5% (1:66,666) | 5.3% (1:1,000,000) |
| Infrastructure | 1.6% (1:4,000) | 10.5% (1:66,666) |
| Forest      | 1.4% (1:250,000) | 3% (1:4,000,000) |

| Land use   | Minimum error/Scale | Maximum error/Scale |
|------------|---------------------|---------------------|
| Agricultural | 1.02% (1:4,000) | 18.69% (1:250,000) |
| Water bodies | 1.22% (133.333) | 7.02% (1:500,000) |
| Infrastructure | 1.21% (1:4,000) | 18.39% (1:66,666) |
| Forest      | 1.08% (1:250,000) | 2.46% (1:2,000,000) |

According to Table 7, the obtained scales are recommended for associating the analyzed coverages with Google Earth images. Such scales will allow getting a lower error and higher quality in the various applications to be made with the image-scale relationship. The scales based on the average of the error percentages determine the actual ranges between generated errors for each of the scales, while scales determined based on the variation between errors, allow to find the scale where the error percentage dispersion with respect its average is less. In the last decade, analyzes using tools such as Google Earth have increased [25]. Accuracy is important in estimating natural resources and infrastructure. For example, in China the Google Earth platform was used to calculate the extent of bodies of water [26]; regarding infrastructure, terrain elevation data was obtained using Google Earth to develop transportation applications [27]; furthermore, this platform was used to estimate changes in land use [28], and, similarly, Google Earth is used to analyze the dynamics of agriculture [29]. High precision was obtained in the four cases mentioned.

4. Conclusion
The present analysis confirmed the dependence between display scale and the associated error in the interpretation of the soil coverages analyzed. As a result of this work, a catalogue of the scale-image relationship was generated to facilitate the use of the Google Earth display system. This catalogue affords to standardize the scale in Google Earth for certain purposes, besides defining the geographic elements describing natural resources that can be used with a scale for endless studies and analyzes carried out on the display system. The relation image-scale has been analyzed directly to associate the real element represented in the images on a specific scale. The goal of this is to analyze the differences between the measurement of vectorial data and their relationship with the images, since, according to their resolution, inconsistencies are presented. As the scales increase, it is notable in any moment that the observed object in the image is more significant and exceeds the screen size. This fact is due to the zoom increment to adapt the view to the scale. It is worth mentioning that there are places on the planet where the coverage of the image with good detail allows an increase in the image’s depth with more zoom levels, of which there are more scales in those areas. Conversely, in other places with low image resolution originate fewer zoom levels. Google Earth and other new technologies for spatial data visualization and the applications developed of those systems, such that API's, development of spatial data infrastructures and new research lines on Digital Earth, will have to answer in its time to the quality representation needs of all geographic objects on the different territories.
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