

The Continuous Cadastral Mapping Plan the Computerized Digital File of Cadastral Map in Korea

- Focusing on the Accurative Continuous Cadastral Map -

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SUMMARY

A computerization project was completed in Korea to computerize the paper cadastral maps in sheet and tile format in 2003. There were errors, which had not been found during the computerization project, as a part of efforts to implement the cadastral database. The drawing mismatching is one of those errors, which has caused inconvenience to surveyors in providing the survey results in the cadastral survey.

This study suggested the plan for the preparation of the continuous cadastral map based on the computerized digital file, eliminating the drawing mismatching, which may cause inconvenience to surveyors during the field surveying.

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1. INTRODUCTION

The purpose of the computerization project of the cadastral map is to facilitate the maintenance and management of the original cadastral map, which allows the flexible upsizing and downsizing; build a highly accurate database available for the cadastral survey; and integrate a land ledger with a cadastral map to create a basic drawing as an infrastructure that may commonly be utilized by the related organizations in the national geographic information projects.

The computerized digital files compiled in 2003, which have retained the analog properties of the paper cadastral maps, mismatched with the cadastral maps that were drawn up in various scales based on the different control points and the variant boundaries of the administrative districts. The drawing mismatching is a combination of different drawing borders, scales, administrative districts, and control points.

This study identified the type of the continuous cadastral maps prepared by each administrative organization, rather than classified and analyzed the type of the drawing matching. The study also analyzed each guideline and regulation, and established the criteria to match drawings without a field survey. In addition, the study presented the cases in which the scanned images and the field survey were used to match boundaries between ground and drawing.

The study indicated the mapping plan for the Accurate Continuous Cadastral Map (ACCM) by introducing the cases to which new matching methodologies were applied, and redefining the matching principles.

2. TYPE OF THE CONTINUOUS CADASRAL MAP

A continuous cadastral map is a continuous drawing on which the parcel boundaries are matched between the computerized cadastral drawings prepared by correcting the computerized digital files in a regular drawing border. The diagram database of the Parcel Based Land Information System (PBLIS) in the Ministry of Government Affairs and Home Affairs shall be used for the preparation of the continuous cadastral maps. There are two continuous cadastral maps: one prepared by the Ministry of Government Affairs and Home Affairs to be used for the cadastral administration and survey, the other prepared by the Ministry of Construction and Transportation to provide the policy information.

The ACCM is prepared by integrating the computerized sheets of cadastral (forestry) map prepared by the Ministry of Government Affairs and Home Affairs with the data from the canceled map and the survey result drawings for land mutation, reflecting the virtual changes immediately after installing the Korea Land Information System (KLIS), and inspecting the parcels with more than 0.3 mm disparity in a field survey. Although the Ministry of Government Affairs and Home Affairs has instructed the preparation of approximately 759,000 accurate continuous cadastral maps, each local autonomous entity has yet to pursue the mapping plan due to the budget gap.

The purpose of the continuous cadastral map prepared by the Ministry of Construction and Transportation is to be used as a basic drawing in the Land Management Information System (LMIS) that has been developed to computerize the operations related to the land policies, land management and land administration in both central and local governments. The computerized sheets of cadastral (forestry) map prepared by the Ministry of Government Affairs and Home Affairs cannot be used in a survey, including the cadastral, civil and design surveys, because the maps are forcedly matched on the drawing without a field survey.

3. ACCURATE CONTINUOUS CADASTRAL MAPPING

3.1 Case Study : Utilization the Images

This case suggested the utilization of images, a database that had been built by each competent authority in the closed drawings, the survey result drawings and the survey status drawings, for the drawing matching. The continuous cadastral mapping program was used for the drawing matching, while the ACCM for the cadastral survey.

If a parcel boundary had an influence on a cadastral record, a highly matched parcel boundary was determined on a computerized digital file overlapped with a survey result drawing (an image data) in the continuous cadastral mapping program.

Fig. 1 shows a computerized digital file overlapped with a survey status drawing in the same 1/1200 scale, and Fig. 2 shows a computerized digital file overlapped with the survey result drawings for land mutation in the map scale of 1/6000 and 1/1200, respectively.

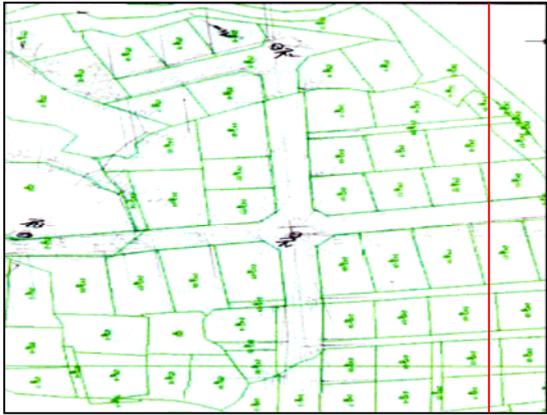


Fig. 1: Overlapped with a Survey Status Drawing

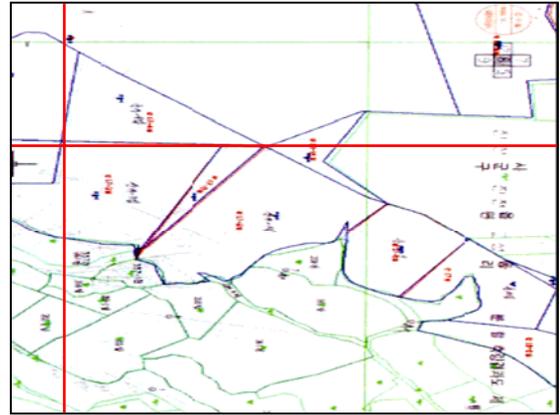


Fig. 2: Overlapped with a Survey Result Drawing

Fig. 3 and 4 show a drawing before and after implementing the ACCM, and Fig. 4 also indicates that the white blanks around the parcels were remarkably decreased.

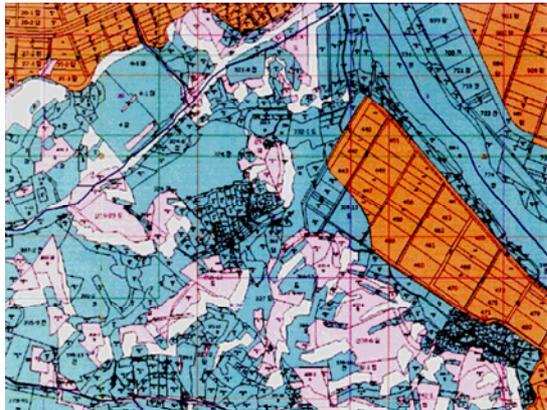


Fig. 3: Before Implementing the ACCM

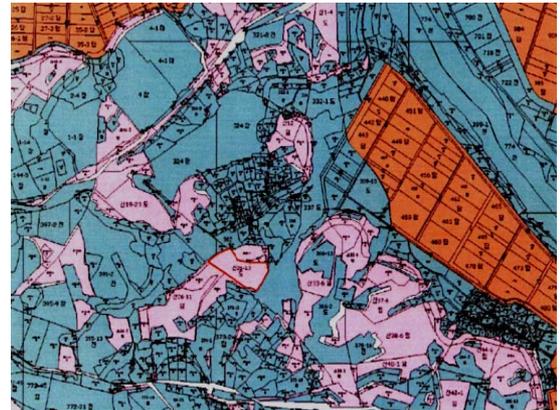


Fig. 4: After Implementing the ACCM

3.2 Case Study : Field Survey

We coordinated with a staff of the competent authority to determine whether the survey would be necessary for each field. The drawing matching was applied to the fields where the survey wouldn't be necessary, while the field survey was carried out for the fields where the survey would be necessary. After completing the field survey, the drawing matching was conducted through the discussion with a staff of the competent authority. We used the KCSC dedicated software, namely Total Survey System, for all field surveys, and changed the computerized digital files after matching boundaries obtained between ground and drawing for each block.

Each block was practically set based on roads and ditches. The same criteria was applied to all locations, regardless of the drawing matching or the field survey. We set the drawing border as a fixed point, and conducted the drawing matching on a block basis.

Fig. 5 and 6 show the drawing border matching in the same 1/1200 scale. The targeting area was a private vacant lot with an average of 1 m wide regular mismatching. The field survey indicated that the block should be adjusted by $\Delta x = -1.15$ m and $\Delta y = +0.45$ m based on the southern road to retain the area of each parcel, and eliminate the mismatching.

In addition Fig. 5 shows the computerized digital file overlapped with the survey result drawing prepared after the field survey, and Fig. 6 shows that the boundaries were adjusted with the survey results and matched between drawings.

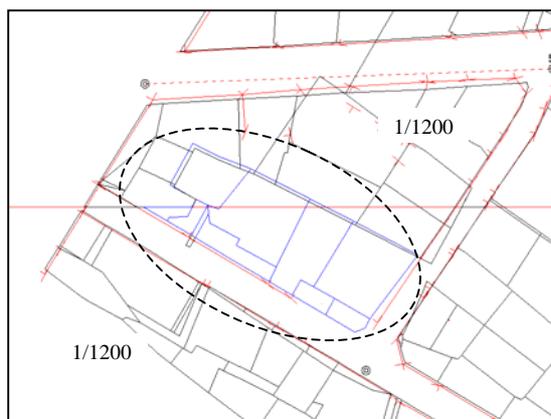


Fig. 5: Field Survey

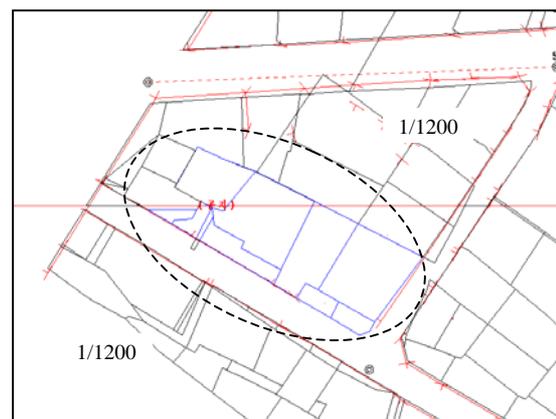


Fig. 6: Matching with the Survey Results

4. GUIDELINES FOR MAPPING THE ACCM

4.1 Criteria for Drawing Matching

The criteria is needed to determine whether to the necessary when matching drawings with the same or different scale. The criteria is set on the basis of the effective range of the survey results, which is calculated for the adjacent small scale. Table 1 shows the criteria for drawing matching without survey under the Para. 4, Article 54 (The Determination of the Survey Results) of the Enforcement Decree of the Cadastral Act. Those were based on the registered paper cadastral map that had been drawn by the plan table survey during the Land Survey Project.

If the survey result falls within the range of $0.3 \times M$ mm (where $M = \text{Scale Denominator}$), for example, 36 cm and below for the small scale 1/1200 when you match the drawing in 1/600 scale with the drawing in 1/1200 scale, the figure indicates that you can conduct the drawing matching without a survey.

Table 1: The Criteria for Drawing Matching

(Unit: cm)

Scale	1/500	1/600	1/1000	1/1200	1/2400	1/3000	1/6000
1/500	10	18	30	36	72	90	180
1/600	-	18	30	36	72	90	180
1/1000	-	-	30	36	72	90	180
1/1200	-	-	-	36	72	90	180
1/2400	-	-	-	-	72	90	180
1/3000	-	-	-	-	-	90	180
1/6000	-	-	-	-	-	-	180

4.2 Matching Principles

The Guidelines for the Computerization of the Cadastral (Forestry) Map, which had been prepared by the Ministry of Government Affairs and Home Affairs, and the Operational Regulations for the Continuous Cadastral Maps, which had been prepared by the Ministry of Construction and Transportation, were redefined to establish the matching principles, including the basic principles and general principles. The basic principles covered the administrative procedures, together with the criteria for the drawing matching, while the general principles covered the procedures for each matching type, including the drawing border matching, the scale matching, and the administrative district matching.

Basic Principles

- Set the drawing border as a fixed point to match the drawings based on the criteria for applying the survey.
- Minimize the change in shape and area of the parcel after the drawing matching.
- If the parcel boundaries require the field survey, conduct the drawing matching based on the survey results, including the survey result drawing and the geometric traces.
- For the complicated matching, input and review the information of the cadastral boundary mismatching for each parcel, an error in the properties, and the repeated or omitted lot numbers and parcels, and consult with a staff on the matter prior to the drawing matching. If the matching is improper, maintain the data in a separate file.
- If you believe that a specific land shall be corrected in the registration, follows the provisions on the Article 24 (The Correction of Registration) of the Cadastral Act

General Principles

- Give the priority on the parcel boundary of a private land.
- Give the priority on the parcel boundary of a small area.
- Give the priority on the parcel in a cadastral (forestry) map over the parcel in a land ledger.
- Give the priority on the parcel boundary of the district where the land or field readjustment project has been implemented.
- Give the priority on the boundaries of the closed polygonal parcels near the border lines.

- Maintain the linear elements, including roads, ditches, rivers and city projected line.

Border Matching

- If one parcel forms a closed polygonal parcel in many drawings, change the parcel boundary based on the survey result before matching.
- If one parcel is extended over many drawings, and does not form a closed polygonal parcel, survey around the parcel to establish the boundaries before matching.
- If there is overlapping or separation for the drawing border in the land or field readjustment map, use the survey result or the geometric traces.

Scale Matching

- Match the drawings based on the parcel boundaries in a large scale. If the parcel area exceeds the legal tolerance in a small scale, maintain the data in a separate file.
- Use the survey result to match the cadastral map with the forestry map.

Administrative District Matching

- Apply the drawing border or scale to match the parcel boundaries between the administrative districts.
- The relevant competent authority shall get involved in a drawing matching for each administrative district.

5. CONCLUSION

The study redefined the matching principles, and demonstrated the mapping plan for the ACCM in two cases that utilized the images and the field survey respectively.

- Set the drawing border as a fixed point for all drawing matching.
- Determine whether the survey will be necessary for each field based on the criteria for drawing matching without survey.
- Apply the drawing matching to the fields where the survey won't be necessary.
- If the image is available for the field where the survey will be necessary, overlap the image with the survey result drawing or the survey status drawing. If there is no image available, carry out the field survey.
- Choose the highly matched boundaries in the image overlapping.
- Match the boundaries between ground and drawing on a block basis (roads, ditches and rivers).

The Korea Cadastral Survey Corporation has retained 5,600,000 survey result drawings from 1994 through 2005. Utilizing those drawings as an image data may contribute to an early completion of the ACCM by diminishing the need to carry out the field survey.

The ACCM can eliminate the drawing mismatching that may cause inconvenience to surveyors during the field survey, and provide the better quality survey results.

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