PHOTOGRAMMETRIC STUDIES ON STOA
IN ANCIENT CITY OF KNIDOS (DATCA-MUGLA)

Ferruh YILDIZ[a], Hakan KARABÖRK[a],Murat YAKAR[a], Lütfiye ALP[a],H.Murat YILMAZ[b]

[a] University Selcuk, Enginering Faculty, Dept. Of Geodesy and Photogrammetry, Kampus, Konya,Turkey –(fyildiz, karabork, yakar, lutfiye)@selcuk.edu.tr

[b] University Nigde, Aksaray Enginering Faculty, Dept. Of Geodesy and Photogrammetry, Kampus, Aksaray, Turkey - hmyilmaz@nigde.edu.tr

Keyword : Digital Photogrammetry, Close-Range Photogrammetry, Archaeology, Culturel   Heritage, History

ABSTRACT

The history of Knidos ancient city, which is located in Datca (Mugla) Province, is known since B.C. 700. 5*3.8 m^2 dimensioned small rooms, called as Stoa, were built in front of the terrace walls of Knidos ancient city. Stoa, thougt as an complex structure, is a group of rooms in which commercial products were kept and sold. Terrain and office works are done for photogrammetric restitution. Drawing and restitution of Stoa which is taken out by surface excavation up to July 2002 are determined. Gorund control points are measured by Topcon GTS 701 Total Station. Front photographs of Stoa are taken with Leica R5 (50 mm objective) optic camera. Films are scanned with HP Photo Smart Scanner in 2400 dpi optical resolution and transferred into Pictran software. Images of interior walls of Stoa are taken with Nikon Coolpix 950 digital camera and,images transferred into Pictran software. Root mean square of the ground control points are computed as $m_x = \pm 2cm$, $m_z = \pm 1cm$, $m_y = \pm 3cm$.

1. INTRODUCTION

Knidos is located the most point of peninsula called "Datca Peninsula". This peninsula covers the border between Aegean sea at North and Mediterranean Sea at South. Today, this area which is belong to Muğla Province had taken part in border of Karia area on Ancient period.

The stoas in which commercial goods both bought and sold were a important part of historical structure in Konidos Ancient City. Each sota has a dimension of 5 m*3.8m. All stoas-door open to South (Fig.1). Since century stoas have been destructed due to meteoroligical condition and other reasons. The aim of this study is to obtain photogrammetric rolove in order to realize restoration process of stoa in Knidos Ancient City as similar to its original. Excavation in Knidos Ancient city has been carried out by Prof. Dr. Ramazan OZGAN in cooperation with the Ministry of Culture and Tourism in Turkey, since 1987.

2. MATERIAL and METHOD

In this sudy, firstly plan of stoa was obtained by geodetic method (Fig.2). For this, new ground control points were established in Knidos Ancient City with the use of triangulation point and polygon which were established previously. Coordinate of new ground control points were calculated. Photogrammetric rolove of stoas were obtained from east, west and south sight of stoas. In order to use in the photogrammetric restitution, ground control points for which disturibution were convenient were marked on Stoas and measured by Topcon GTS 701 Total Station in
National Coordinate System(UTM). Distance precision measured by Topcon GTS 701 Total
Station is $m_s=\pm(2 \text{ mm}+2 \text{ ppm.D})$ and precison of angle is $\pm 1^{cc}$ as dictated by user manuel. All photographs were taken with two different cameras (Leica R5 optic camera and Nikon Coolpix 950 digital camera). The photographs taken with Leica R5 optic camera were transformed from analog form to digital form by HP Photo Smart Scanner. The calibrated parametres of Leica R5_50 camera are
- a- image coordinates of principal point
  $x_o= 0.013$ mm ; $y_o=0.065$ mm
- b- focal lenght

c=-50.696 mm.
The calibrated parametres of Nikon Coolfix 950 camera are
- a- image coordinates of principal point
  $x_o= -0.0113$ mm ; $y_o=-0.00605$ mm
- b- focal lenght
  c=7.06014mm.

Root mean square of the ground control points are computed as
$$m_x = \pm 2cm, \quad m_z = \pm 1cm, \quad m_y = \pm 3cm.$$

In this study, PICTRAN softwre developed by Technet Gmbh (Germany) was used.

Figure.1 Knidos Peninsula and A View of Stoa

Figure.2 Plan of Stoas

3. APPLICATION

Photogrammetric restitution for south front of stoas was evaluated by PICTRAN software. The photographs taken with Leica R5 optic camera were used at photogrammetric restitution of south front. A Total 21 overlapped photographs were used in this study. These photographs were divided to two phases. In order to get link between two phases, three photographs from each phases were shared in two phases. Photogrammetric restitution was obtained by Pictran software and drawing of stoa were transferred into Autocad. East front and west front of each stoa were separately evaluated by Picran software . For this process, photographs taken with Nikon 950 digital camera were used and drawings were transferred into Autocad(Fig.5).
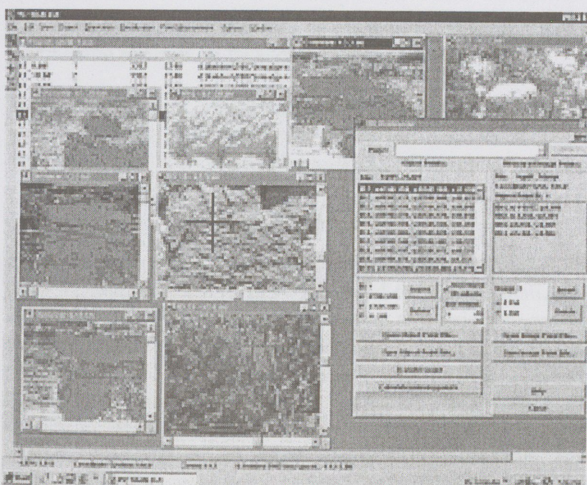

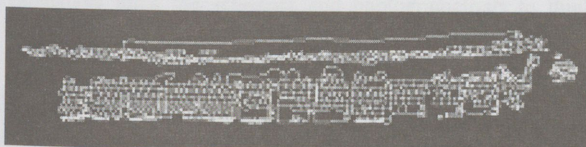Figure.3 A View From Photogrammetric Restitution in PICTRAN
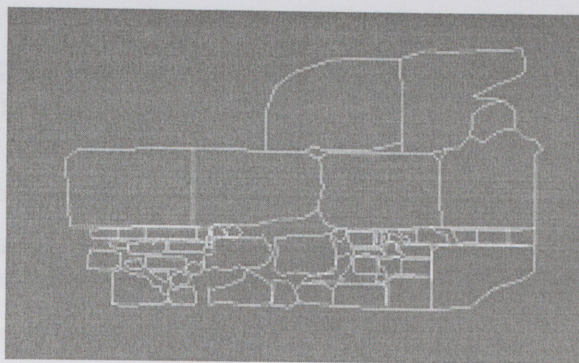

Figure.4 South Front Drawing of Stoas

Figure.5 East Drawing of 17.Stoa

4. CONCLUSION

Geodetic plan and photogrammetric rolove of 20 stoas for which land work have been completed and excavated up to July 2002 were obtained. Land work in this study was completed approximately on 4 days. Duration of this method perhaps seems to be very short while compared with other methods durations.Depending on obtained drawing and digital data, detail data about stoa which will be used for stoas on next works were obtained at a very high geometric accuracy. Owing to photogrammetric method, both data in dxf form and photogrammetric restitution results as digital can be saved easly. These data can be used in following works.Therefore, compenent of new stoa which will be excavated by Archeology team in this area and others component of Knidos Ancient City can be entegrated in this work.

Acknowledgement

5. REFERENCES

Bruns-ÖZGAN, C. And Özgan,R., 2002,Knidos Antik Kent Rehberi, Pozitif Matbaacılık, 115 s., Konya

Leica R5 Handbook

Pictran B/D Handbook

Yıldız,F., Çorumluoğlu, Ö., Yakar, M. And Karabörk, H.,1998, Photogrammetric Inventory Work On Orkhon Monuments And Epitaphs(Inscription) In Mongolia, Third International Forum UNESCO, vol:1, 234 - 241 Melbourne-Australia

Yıldız, F., Çorumluoğlu, Ö., Yakar, M., Karabörk, H. and Yılmaz, H.M., 1999, A Photogrammetric Investigation Study On Ayai-Eleni Church(Sille-Konya), Third Turkish-German Joint Geodetics Days, vol:1, p.265-274 ,İstanbul

Yıldız, F., Yakar, M., Karabörk, H. ve Yılmaz, H.M., 2000, Dijital Fotogrametrinin Arkeolojide Kullanılması ve Göktürk Anıtları Örneği, II. Milletler Arası Göktürk Anıtları Kolloyumu, p.371-376, İstanbul

Yıldız, F., Yılmaz, H. M., Yakar, M., Karabörk, H. and Yigit C.Ö., 2001, Photogrammetric Works of Kelenderis (Aydıncık-Icel-Turkey) Ancient City, Fourth Turkish-German Joint Geodetics Days, vol:1, p.313-318, Berlin

Yıldız, F., Karabörk, H.,Yakar, M., and Yılmaz, İ., 2001, Application of Digital Orthophoto on Close Range Photogrammetry, Fourth Turkish-German Joint Geodetics Days, vol:1, p.307-312, Berlin