INTEGRATION OF DIGITAL PHOTOGRAMMETRIC OBTAINED DATA WITH AUTOCAD TO CAR SURFACE MODEL

Bahadir Ergun, Sitki Kulur
Istanbul Technical University, Department of Geodesy and Photogrammetry
bergun@srv.ins.itu.edu.tr
skulur@srv.ins.itu.edu.tr

Working Group V/2

KEY WORDS: Digital Photogrammetry, Close Range Photogrammetry, CAD

Aim of this entire work is to establish a fast and adequate 3D- object model with real time measuring opportunities. The result is a real 3-D object model at digital environment. A car and and a propeller surface has been selected as objects to be analyzed and all the physical characteristics of this models have been determined. In this study, KODAK DCS 200 and PICTRAN D and PICTRAN B digital photogrammetric software have been used. Then these photogrammetrically obtained 3D data that was posed, converted into the solide model in 3D STUDIO MAX 2.0.

1. INTRODUCTION

The requirement for an application of photogrammetry in the industry is a workstation with necessary hardware and software .. After having this equipment, right geometry of convergent multistation images can be obtained. Aim all of this works is to establish a fast and adequate 3D-object model with real time measuring opportunities. The result is a real 3-D object model at digital environment. We are able now to analyse all the physical characteristics of this model.

2. GEODETIC MEASUREMENTS

A hundred additional points are used for whole study . 40 of them have control points for photogrammetric outer orientation. 60 of them have been used for measuring photogrammetric methods and interpolation of these points for defining the surface.(Renault 11) On the car surface all points have been significated at least three additional points every part of surface. Afterwards measuring net have been defined with four polygon points. T2002 electronic theodolite has been used spatial resection from at least two polygon points with one set vertical and horizantal angul. Distance measuring were used only between polygon points for net scaling with DI3000 from WILD. For one set was being saving time for geodetic measurements. After geodetic measurements, error for instrument have been calculating for every spatial resection triangle with LSM (least square methods). In this study, maximum erros were 2mm in xy direction and 2mm in z direction which enough for orientation and real visualization car surface model.

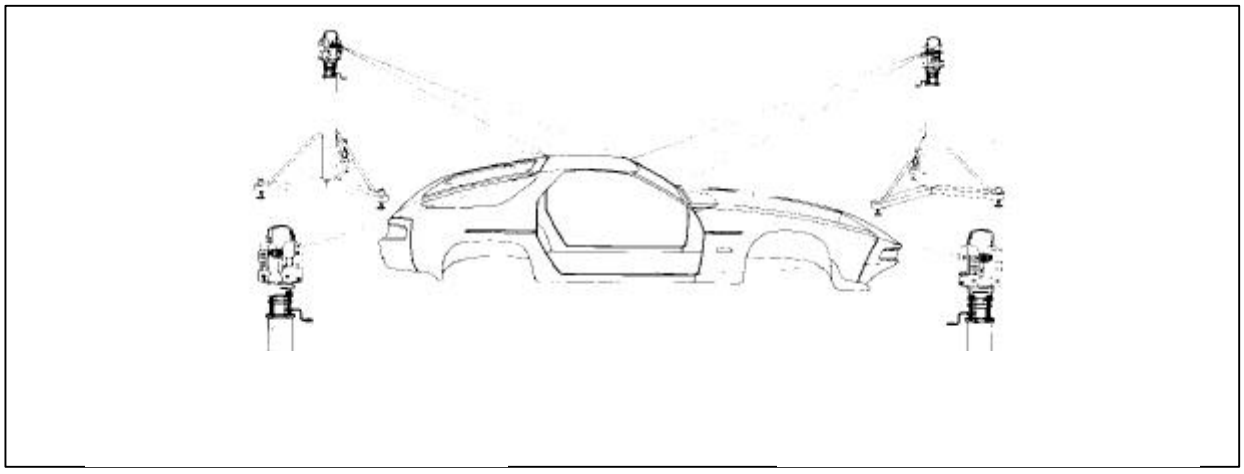

Figure:1 Geodetic Measurement Method

3.PHOTOGRAMMETRIC MEASUREMENTS

In this study, a calibrated KODAK DCS 200 (Kulur, S., 1998) and Rollei 6008 have been used for the car surface images then PICTRAN D and PICTRAN B digital photogrammetric software have been used for digital orientation and restitution.At the restitution, with using software, images are first inner oriented. Then images are outer oriented with additional and pass points and the 3D model.(NV=1.77µ) obtained. Car surfaces defined with additional points, pass points and characteristic points are measured by the model. 39 digital images were used for bundle block adjustment. In the orientation 20 digital images have been used for whole surface. 16 digital images have been used for drawing of details on the car surface.(Fig:2)

Figure 2: Photogrammetric Measurement Method

With this used method and software the 3D model with enough quality at the CAD environment is obtained. In the most important part of the industrial digital photogrammetry right geometry of the convergent multistation is defined for rising up the precision of the photogrammetric measurements. Firstly, this aim is achieved with digital camera with suitable geometrical signalised 3D car surfaces model is defined with interpolation methods from the about a thousand and five hundred measuring points with photogrammetric methods in AUTOCAD R12 and its subsoftware Quicksurf that used the three digital interpolation methods. (TIN, GRID, CONTOURS). Then this 3D data that was posed, converted into the soil model in 3D STUDIO MAX 2.0. Another object to be analyzed was a propeller of a ship which has two simetric hard soft surfaces. The contours of these surfaces must be simetrically. Planning of taking photos has been include three critical decisions for covering 3D model. All surfaces of the propeller has been covered with at least four photos with multiconvergent geometry. (Dowman, I.J., 1996) Rollei 6008 metric camera with 120 mm focus length was used for taking photographs. In the second step images are scanned with a HP scanner with resolution of 1000 dpi. (Fraser, C. S., 1997) In At the end of the works, for a propeller twelve photos have been taken. After the bundle block adjustment 3D model was obtained with epipolar geometry in a 1:1 scale. Three dimensional data was obtained by 3D restitution part of the PICTRAN Software (Fig:3) and a comparision of the three surfaces of the propeller has carried out. (Fig :4)

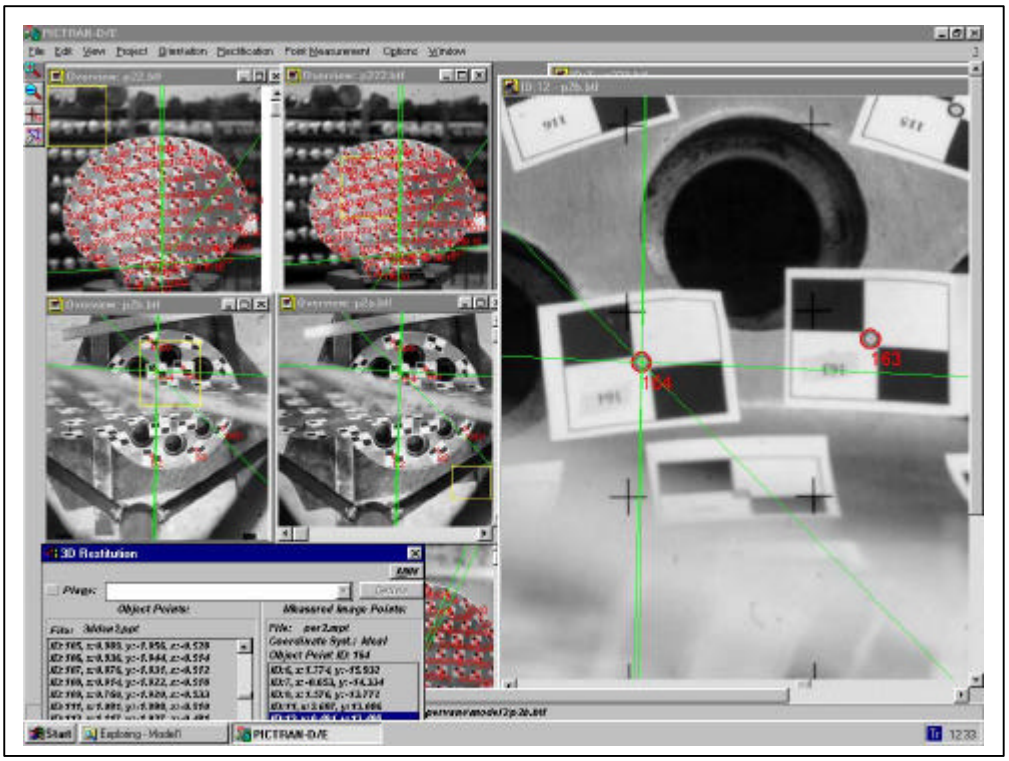

Figure: 3 The photogrammetric measuring process of the propeller surfaces

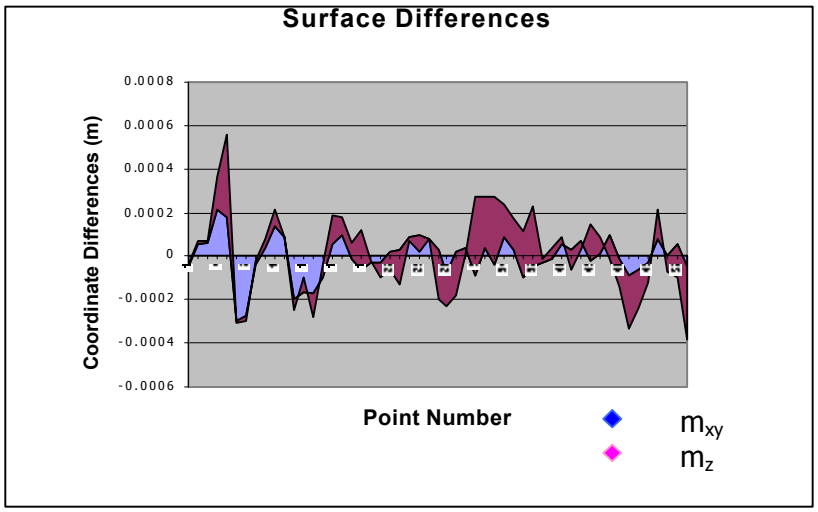

Figure: 4 Comprasion of the co-ordinates on the surface

4. CONCLUSION

Conventional co-ordinate measurement techniques are supplemented today by more flexible and contact-free photogrammetrical recording and evaluation processes. With the development of modern cars, 3-D spatial information data in each of step of the car production are increasingly required for checking the geometric characteristics of vehicles and their components. (Schenk, T.,1996) For this reason a surface modelling system controlled with visualisation and simuliziation is developed. By this system 3-D spatial car models are introduced with close range digital photogrammetrical methods using digital cameras and special developed software. By the second example surfaces of a propeller are analysed and a comparision was made. The surfaces defined with additional points, pass points and if it is necessary characteristic points are measured from the model. 12 digital images were used for bundle block adjustment. In the orientation 12 digital images have been used for whole surface. At least three images have been used for drawing of details on the surfaces. (Fig:5)

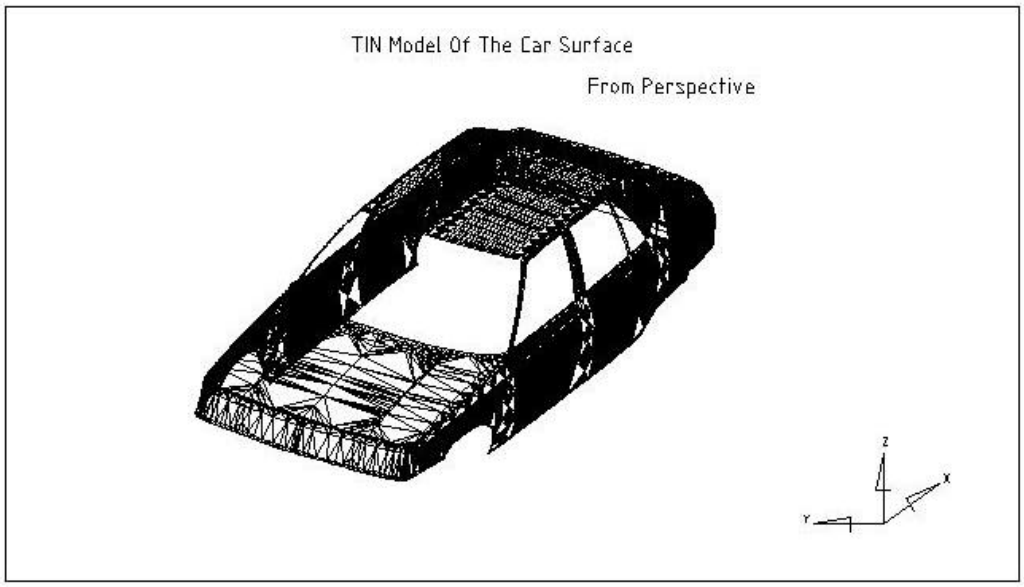

Figure: 5 TIN Model Of The Car Surface

REFERENCES

1. **FRASER, C. S.**, 1997, ‘’Industrial Measurement Applications’’, Close Range Photogrammetry and Machine Vision

2. **DOWMAN, I.J.**, 1996, ‘’Fundamentals of Digital Photogrammetry’’, Close Range Photogrammetry and Machine Vision, Scotland: Whittles Publishing

3. **SCHENK, T.,**1996, ’’ Current Status and Future Directions of Digital Photogrammetry: A Personal View’’, Photogrammetric Engineering and Remote Sensing, Vol.54, June

4. **KULUR, S.,** 1998, ‘’Kalibrierung und Genauigkeitsuntersuchung Eines Digitalen Bildaufnahme Systems’’, Vortage Der 16. Jahrestagarcg Der Deutschern Gesellschaft Für Photogrammetrie und Fernerkundung, München