AMASYA CANIK MOUNTAINS MODELLING BY TERRESTRIAL LASER SCANNING

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ABSTRACT:

Amasya is one of the provinces which have both natural and historical values. Amasya lies in a naturally beautiful narrow river valley, bounded by the mountains. Amasya is one of the most attractive towns in Turkey. The old houses lie down over the Yesilirmak River, the green and brown of the valley's slopes and its old buildings give the town a beauty. There are also ruins of the castle on the rock face, old water-channels, old bridges, a mental hospital, an Ottoman Palace and a secret underground passageway. On the rock faces there are impressive rock tombs of the Pontus Kings, which contribute very much to the attractiveness of the city. Amasya was hosted to Frig, Hittite, Kimmer , Lydia, Persia, Rome, Byzantine, Danismend , Selcuklu , Ilhanli and Ottoman Empire civilizations until to present days. The ancient historian and geographer Strabo was born in Amasya.

There is project which was started by the governors of Amasya. In 1915 years, there was a big fire in this area. A lot of old houses and historical places damaged. In this project, a small model of Amasya will be prepared according to 1915 years. So measurements of the mountains were needed to prepare small model. The mountain is about 2 km long. In this study scanning of the mountain was completed using OPTECH ILRIS laser scanner. Measurements were evaluated in Polyworks software.

1. INTRODUCTION

Amasya stands in the mountains above the Black Sea. Black Sea The Black Sea is an inland sea sea bounded by southeastern Europe, the Caucasus and the Anatolia and is ultimately connected to the Atlantic Ocean via the Mediterranean Sea and Aegean Seas and various straits, coast, the city was built in a narrow valley along the banks of the Yesilirmak River. Although near the Black Sea this area is very high above the coast and has an inland climate, well-suited to growing apples, for which the province of Amasya is famed. In antiquity Amaseia was a fortified city high on the cliffs above the river. This area has a long history as provincial capital, a wealthy city producing kings and princes, artists, scientists, poets and thinkers, from the kings of Pontus. Pontus or Pontos is a region on the southern coast of the Black Sea, located in modern-day northeastern Turkey. The name was applied to the coastal region in Antiquity by the Greeks who colonized the area, and derived from the Greek name of the Black Sea: Pontos Euxeinos, throug Strabo Strabo was a Ancient Greeks history, geography and philosophy....the geographer, to many generations of the Ottoman imperial dynasty and right up to being the location of an important moment in the life of Ataturk. With its Ottoman period wooden houses and the tombs of the Pontus kings carved into the cliffs overhead Amasya is still attractive to visitors.

Amasya covers an area of 1730 km², and the population is 133,000, of which 74,000 live in the city and the remainder in surrounding villages. Altitude is 411 m from sea above. Amasya is situated between 34° 57' 06" - 36° 31' 53" east longitudes and 41° 04' 54" - 40° 16' 16" north latitudes.



Figure 1. Location of Amasya Canik Mountain

2. TERRESTRIAL LASER SCANNER

Laser scanners are optical measuring systems based on the transmission of laser light. Terrestrial laser scanning captures accurate, 3D point clouds enabling many engineering projects in computer-aided design software. By sending laser beam over a real object, the laser scanner can record millions of 3D points in seconds. These X, Y, Z measurements can be imported into CAD or 3D application software and displayed on a computer monitor as a "point cloud" which has photographic qualities portrayed in one-color, gray-scale, false-color or even true color. Since all laser scan points are 3D, the files can be viewed, navigated, measured and analyzed as 3D models.For many engineering projects like excavation of historical places civil engineering, Architectural surveys, Construction, Environment, Facility and Plant design, Mining, Pipelines, and Transportation, were needed 3D spatial information for their projects. Surveying results must meet certain specifications in order to provide the necessary accuracy standards for a certain application. On the other hand, if instruments and methods are used which yield accuracy far above the needed standard, this will result in unnecessary cost and expenditure. Therefore, any geometric surveying task comprises not only the derivation of the relative positions of points and objects but also an estimation of the accuracy of the results. Least squares adjustment based on over determination usually yields reliable information concerning the accuracy of the results as well as the accuracy of the observations.

3. AMASYA PROJECT



Figure 2. Canik Mountain

There is model project which was started by the governor of Amasya . In 1915 years , there was a big fire in this area A lot of old houses and historical places damaged In this project , a small model of Amasya will be prepared according to 1915 years At the beginning of the 20. years ,Amasya was an important city. Amasya model project is covering 2000000 m² (square) areas.

- Over 1000 houses
- All topographical details,
- Historical monuments,
- Roads,
- Plant cover,
- Tombs,
- Bridges,
- Train station and railway
- Etc....

will modeled in this Project.

First step for this project was the obtaion 3D modelling of the mountain But Mountain is very big and there was no topographical proporties and 3D DATA SO; scanning of the mountain were completed using OPTECH ILRIS-3D laser scanner . In this study, Canik Mountain was scanned with 3D terrestrial laser scanner.



Figure 3. Fiel work –scanning the mountain with Optech laser scanner

Measuements (point clouds) were evaluated in Polyworks software to obtain real 3D model of the mountain. All point clouds were aligned as one point cloud.



Figure 4. Point clouds of Amasya Canik Mountain

Obtained data trasferred well known cad format like dxf, dgn etc. An animation of mountained was also obtained using cinema 4D software



Figure 5. Textured model and animation of Amasya Canik Mountain

4. CONCLUSION

The 3D information that is obtained from terrestrial laser scanner is used by different disciplines. In today's, this technology is used at several civil engineering applications, preventing historical, cultural heritage, rolove and restoration Works and The High Resolution Laser Scanner has been used for scanning natural objects such as hills, mountains, etc. If you use laser scanner high point density data ensures a complete topographic survey. Laser scanning technology can provide customized solutions tailored specifically too many projects. 3D data can be obtained as High-density, accurate and with direct measurements

REFERENCES

Ilris 3D user manuel

Polyworks software user manuel

http://www.absoluteastronomy.com/topics/Amasya

http://en.wikipedia.org/wiki/3D scanner

http://optech.ca/

http://www.innovmetric.com/polyworks/3D-scanners/home.aspx?lang=en

http://www.amasya.gov.tr/

http://www.amasya.bel.tr/

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