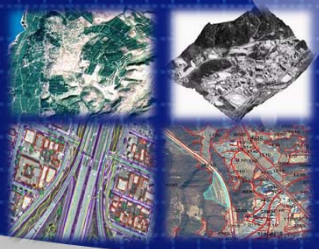
An Approach to Effective Land Registration Using Satellite Imagery

2012. 4



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Contents

Introduction

Digital Satellite Photogrammetric Technique

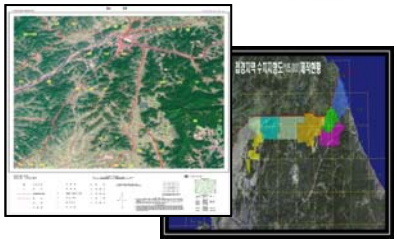
✓ Advent of satellite imagery high-resolution within 0.5m or less

✓ Cost-effective and Time-saving way better than Other Techniques

✓ Being utilized in many areas, especially in spatial information industry

✓Less contributed to cadastral mapping purpose

Topographic map



Land Use Planning, monitoring

Introduction

Why not in Cadastral Area?

✓ Still not satisfying positional accuracy because of ownership protection

✓Being likely to cause inconsistency with already existing legal boundaries

Feasibility?

✓ In case Area where registration is newly or renewably required

⇒ Not associated with existing legal boundaries

✓In case land information management is more important than ownership security

⇒ Less influenced by positional accuracy

Current Status(Turkmenistan)

Land affairs in Turkmenistan

✓ All nation's lands are owned and managed by the government

✓The government distribute a certain amount of land to household for cultivation

✓Drafting annual report covering land information is as a reference data for taxation and national decision-making

✓Trouble in drafting annual report due to poor quality of reference map and analog method

✓The government has attempted renewal and computerization of land administration for better land information management

Joint Pilot Project for 'The Modernization of Cadastral System in Turkmenistan'

Pilot Project

Title

The Modernization of Cadastral System in Turkmenistan

Overview

- **Period**
  - **-12.2010~06.2012(18 month)**
- **Project Area:**
  - **-Baharly, Ahla Velaya(600sqkm)**
- **Implementing Agency**
  - **- Korea Cadastral Survey Corporation**
- **Major Activities**
  - **- GPS Surveying for GCPs observation**
  - **- 1:5000 Digital Cadastral map Production**
  - **- Land information Management System**

Using Satellite Imagery

✓ Renewably Land Registration
✓ For Land Information Management
✓Cost-effective and time-saving way in a wide range of lands

Pilot Project

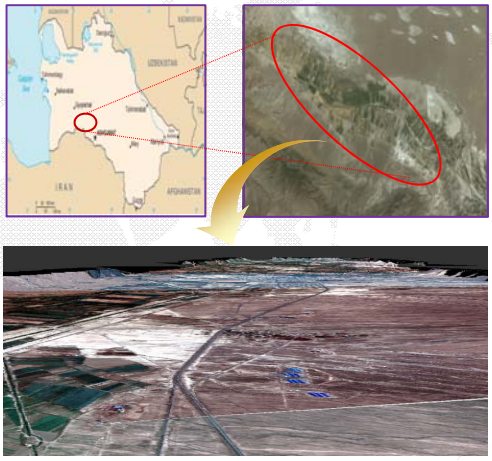
Pilot Project Area

✓ Location
-Baharly, Ahal Velaya, Turkmenistan

✓ Size
-600sq km

✓ Main Area
-Farming, Residence. Pasture Land

✓Terrain
-Flat and Plain
⇒ Minimizing Positional distortion
While AT is under taken

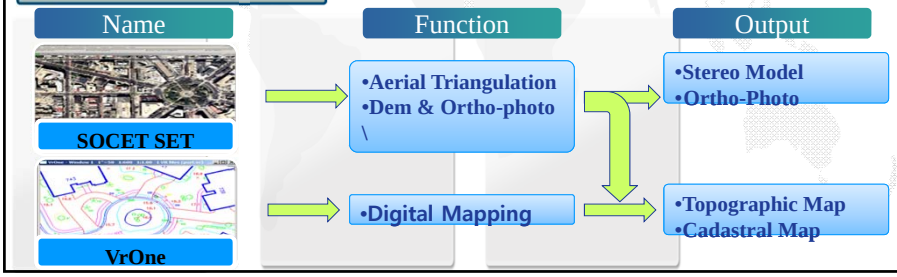


Pilot Project

Satellite Imagery

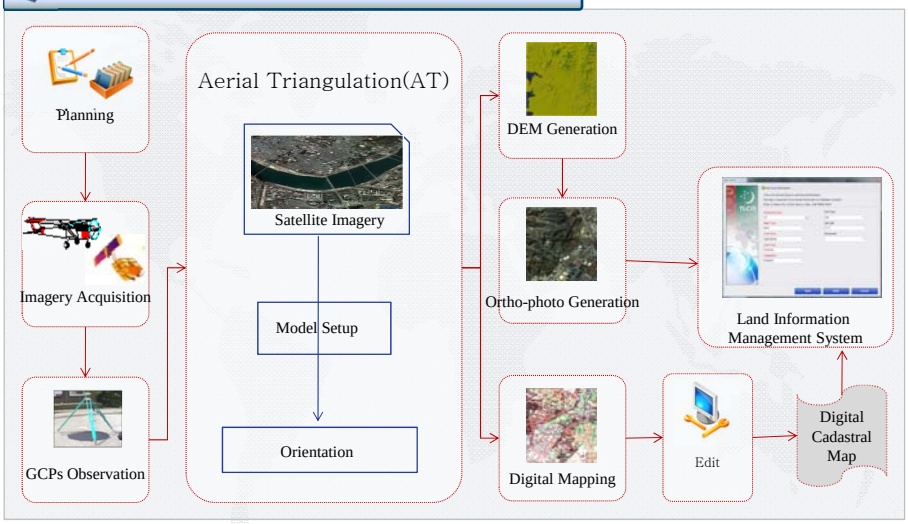
Product type	Geo Stereo	Output Projection Type	Universial Traverse M ercator(UTM)
Spectral type	Bundled(Pan+MSI)	Projection parameter	UTM 40 North
File Structure	NIR/R/G/B-Sperate MSI Files	Datum	WGS 84
File Format	GeoTIFF	Maximum Cloud Cover	15 percent
Radiometric Resolution	11 Bits/Pixel	Ground Sample Distance	0.5 meter
Source Type	New Acquisition	Collection Vehicle	GEOEYE-1
Min/Max Elevation Angle	90/60	Collection Date	September, 2011

Modules



Pilot Project

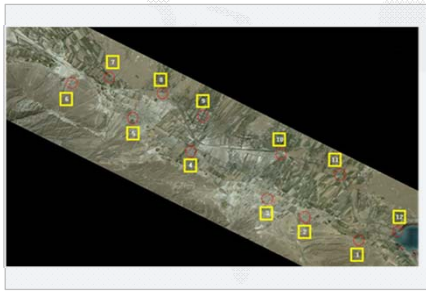
Work Flow of Practical Work

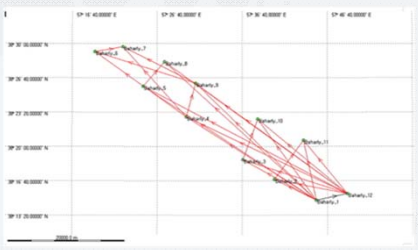


Pilot Project

GPS Surveying

- ✓ 12 GCPs Observation associated with IGS Network
- ✓Around 250 Check points Acquisition
- ✓ WGS 84 Datum & UTM Projection Method





Pilot Project

Aerial Triangulation(AT) Result

✓ The Root Mean Square (RMS) was in easting(x)=0.2237, northing(y)=0.3497, elevation(z)= 0.31307, and total RMS was computed as 0.5908.

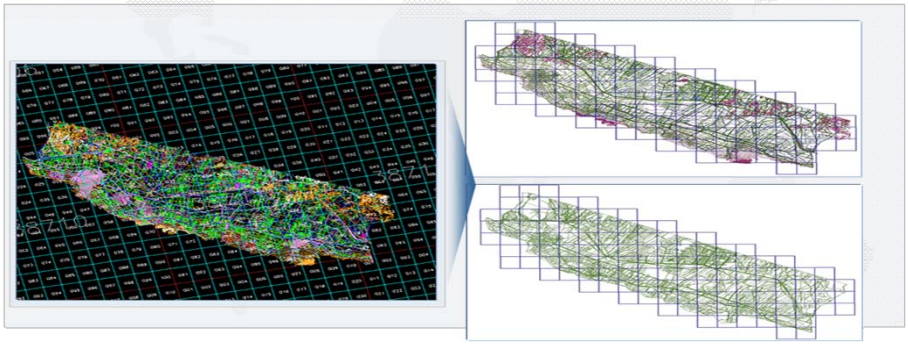
Point No.	GPS surveying result Coordinate		Imagery coordinate		Residual	
	x	y	x	y	d(x)	d(y)
GCP #1	5.6612796710e+005	4.2334504263e+006	5.6612800690e+005	4.2334500186e+006	0.0398049	-0.40766
#2	5.5895094970e+005	4.2370750144e+006	5.5895115177e+005	4.2370746390e+006	0.202068	-0.375366
#3	5.5356586940e+005	4.2405533389e+006	5.5356585528e+005	4.2405533441e+006	-0.0141165	0.00519983
#4	5.4381611110e+005	4.2482032083e+006	5.4381633911e+005	4.2482037356e+006	0.228007	0.527316
#5	5.3637307600e+005	4.2537093304e+006	5.3637296652e+005	4.2537096300e+006	-0.109483	0.299646
#6	5.2811488330e+005	4.2598944378e+006	5.2811442306e+005	4.2598946330e+006	-0.460241	0.19524
#7	5.3287554770e+005	4.2607429883e+006	5.3287544366e+005	4.2607433394e+006	-0.104036	0.351128
#8	5.4001744270e+005	4.2581205016e+006	5.4001765245e+005	4.2581207700e+006	0.209749	0.268365
#9	5.4538728320e+005	4.2542799268e+006	5.4538729385e+005	4.2542797720e+006	0.0106535	-0.154795
#10	5.5601996490e+005	4.2478923748e+006	-0.298074 5.5601966683e+005	4.2478922981e+006	-0.298074	-0.0767453
Count					10	10
Mean					0.16762329	0266146113
Minimum					0.0398049	0.00519983
Maximum					-0.460241	0.527316

Pilot Project

Digital Mapping

✓ Creating parcel layers to extract digital cadastral map
✓ 1:5000 Digital Topographic map generation using Stereo model

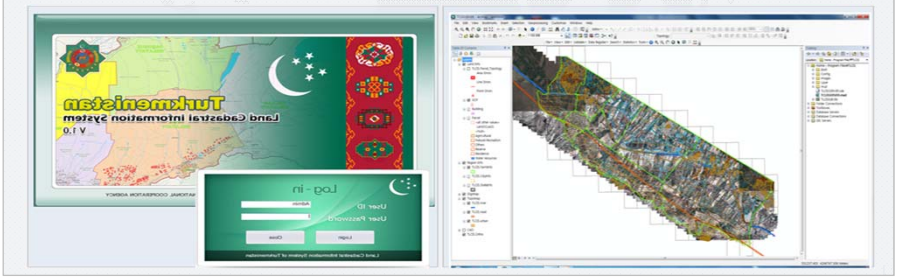
✓ 1:5000 Digital cadastral map extracted from topographic map through parcel layers



Pilot Project

Land Information Management System

- ✓ Vector data(Topographic map, Cadastral map) & Attribute data(Land Information) assigned to DBMS
- ✓ Designed to establish infrastructure as to provide reference data for taxation and national decision-making
- ✓ Enables users to register and manage land information in computerized way



Conclusion

Satellite Photogrammetric Technique

- ✓ Has emerged as a new area to deal with mass data in cost-effective and time-saving way
- ✓Less contribute to cadastral areas due to positional accuracy and inconsistency with existing legal boundaries
- ✓ Could be an alternation solution In case newly or renewably land registration is required, or land information management is top priority

Through Pilot Project in Turkmenistan

- ✓ Attempted land registration renovation through pilot project
- ✓Generating1:5000 topographic map and cadastral map
- ✓Establish land information management system, which enables computerization of land administration