In this system, oblique cameras are mounted in north, south, east and west directions with an angle of about 40°- 45°. The nadir camera locates in the middle. The average flying height is 1000 m and resolution is approximately 15 cm for nadir images and 12-18 cm for oblique images (Nelson, 2008).

This configuration generally provides minimum 12 and maximum 24 images of a point, which allows the establishment of image libraries by gathering images meeting the quality standards after the completion of photogrammetric processes.

Figure 4. Five views of a building (Nelson, 2008)

4. APPLICATIONS

Oblique Photogrammetry is used as a powerful tool in a wide range of applications. Applications can be generally grouped into 5 main topics, which are (Grenzdörffer et al., 2008):

- Tax Assessment & Building Deviation
- Urban and infrastructural planning
- Management of military and security operations
- Critical infrastructural protection
- Cadastral capturing and management.

Since oblique photogrammetry provides accurate measurements of distances, heights and areas, it is exploited for tax assessment effectively. Together with identification and documentation of deviations, raise in tax revenues is obtained.

Powerful measurement capabilities help users to compare buildings and structures for any kinds of planning purposes. In addition, designing pylon construction can be handled easily. Line of sight analyses have an important role at urban and infrastructure planning as well.

Figure 5. Height and distance measurements (Aeromap, 2006)

In terms of military and security operations, oblique photogrammetry strengthens the management by providing accurate and fast information during crisis times. This includes critical site information as well as information on surrounding areas and infrastructure. During crises, access and evacuation routes play a crucial role. Oblique photogrammetry is a great tool to do planning for them in addition to determination of entrances and openings.

Critical infrastructures including airports, harbors, terminal stations, shopping centers, power plants, water resources, military and police facilities, government buildings, hospitals, prisons, dense populated areas, tower blocks, factory premises and industrial areas can be protected using the multi-vision ability of this technology.

Oblique photogrammetry is an effective tool for cadastre projects. As mentioned several times, robust measurements on 3D space make accurate mapping and organization of cadastral activities in rural areas possible (Grenzdörffer et al., 2008). Apart from measurement capabilities, this technology might be used as a support in splitting parcels and parcel formation by preliminary boundary determination (Lemmens et al., 2007).

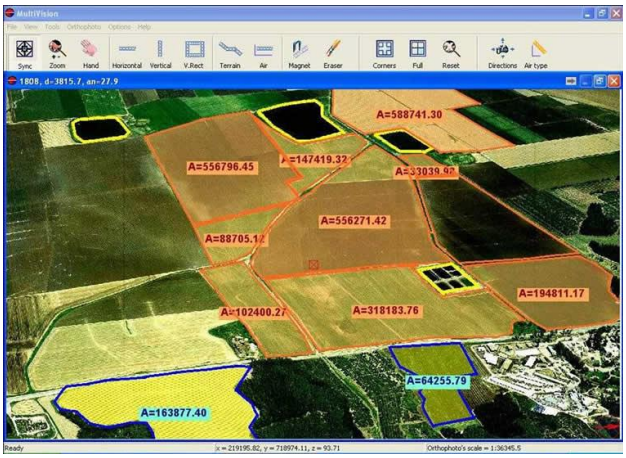

Figure 6. Parcel area measurements (Aeromap, 2006)

Realistic 3D city models obtained by texturing oblique data are used as an important base for 3D cadastre projects and provide convenience in urban planning. Besides, these 3D city models are used to take the environmental factors into account while performing real estate assessment.

Oblique images can be used for getting information, which cannot be obtained using topographic maps and orthophotos in the determination of land use. While it is hard to distinguish poor quality and luxury houses on vertical images, it is possible to get more meaningful data using oblique photogrammetry.

5. CONCLUSIONS

Intensive use of lands triggered by rapid population increase and complex city structuring enabled by technological advancements have caused existing 2D cadastral registration system to remain inadequate for administrating rights, restrictions and responsibilities (RRRs) belonging to land. To overcome this issue, 3D cadastre approach should be adopted and performed. Thus, healthy and effective land administration

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can be enabled, which is also the key for obtaining sustainable development.

To be able to realize 3D cadastre, 3D data is required to be gathered. Oblique photogrammetry emerges as a powerful tool to fulfill this requirement. This method can be effectively used as base for 3D Cadastre and Land Administration projects. Besides, it provides a wide range of applications not only in cadastral mapping and management but also in tax assessment & building deviation, urban and infrastructural planning, management of military and security operations and critical infrastructural protection.

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