PERFORMING VISUALISATION ANALYSIS USING REMOTE SENSING HIGH RESOLUTION IMAGE TO RECOGNIZE MILITARY TARGETING (ESTIMATE MILITARY STRENGTH)

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KEYWORDS: Shadow length, building height, geoinfo, target acquisition, measurement

Abstract: Limitation to access the critical of geospatial information for security and defence purposes determine satellite images as extraordinary for essential assessment. By utilizing high resolution visualization derive time constrain turn valuable and efficient to perform information verification. Nowadays, imagery data is an important element to provide critical information about the situation or event in earth surface. By manipulating the combination of high resolution image, view angle (vertical and oblique), type and sensor capability, one would be able to enhance visualization in order to perform analysis. Image characteristic and features theme such as shadow, shape, tone, colour and pattern indirectly has ability to guide visual analysis. High resolution imageries will provide better visualisation, but the knowledge of military discipline and experience should be in line to assist and guide commander's decision for clear understanding of events occurred.

INTRODUCTION

Imagery is valuable element to provide critical information about the earth's surface. The information is not limited to tangible geospatial information, but it derives from advance analysis to reveal the intangible phenomena. For years, this element has been manipulated into multi purposes discipline to answer the critical question about the event related to the nature or human activities. The ability of remote sensing images depicts the real object and location cause of analysts have strong perspectives to support the decision making process that will impact the selecting the effective action.

Most of the imagery operator and analyst need to have a good visual on the target in order to understand the relationship of each object monitored to realise what is occurring on the ground. By utilising the multi resolution image remote sensing, it will minimise the burden to achieve timely information extraction to lend perspective for decision making. In some cases, the limitation to access high resolution images cause of the analyst need to utilise the existing imagery data in open sources.

The understanding of related between the task and information need, will encourage the analyst to combined image information from many independent sources. Even though the object is hidden by artificial material, integration of images from different sensors will generate advantage to visualisation analysis. Combination of remote sensing images with main knowledge base such as military target characteristic will enable to address critically important questions and decisions that derive from a simple visual analysis process.

OBJECTIVE

The aim of this study is to estimate possibility of military strength by measuring shadow and building height using remote sensing high-resolution image to assess critical information for military decision (critical question).

METHODOLOGY AND STUDY AREA

By understanding the basic interpretation knowledge and conceptual of image analysis, remote sensing data from different types and characteristics are available to determine the visual analysis as a tool to generate the information to support the decision-making process. The basic measurement and interpretation (especially shape, shadow and association) has enough to reveal the intangible information about the ground events. In order to perform the visual analysis, the method in Figure 1 can be utilised.

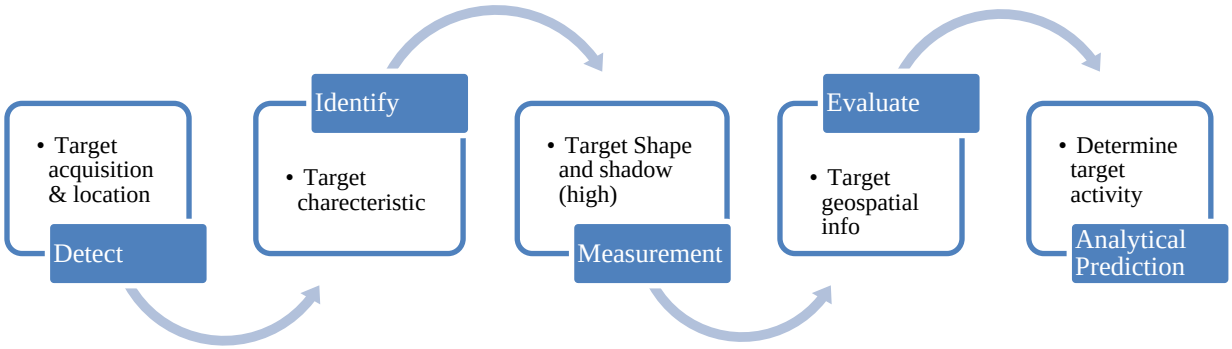

Figure 1: Basic Method for Target Visualization Analysis

Target acquisition process supposed to be more effective. In others term, target acquisition is capabilities to conduct detection and identification to collect the related target characteristic. It also provides the target in sufficient detail to permit the accuracy of measurement to support evaluation of the target information. Integrated high-resolution image with geospatial information should be able to understand the target activity in analytical prediction. In this case, target acquisition is critical events in entire feature and involves the physical chain of functional method.

First Method

First method is evaluating the building height by direct interpretation by looking at the different angle. Sensor position some time produces an image with high obligation, which can appear clear view on the side of the building. By understanding the pattern and shape of height building, each floor can be counted easily. Rooftop pattern, shape and design also become a relevant knowledge to identify the probable housing type. Imagery data collection can be utilized to determine the suitable images which provide good obligation view to easiest the analysis process.

Second method

Second method is implemented simple similar triangle using shadows of a building with known high and shadow object.

Figure 2: Standard height of a street lamp is 12 meters (local authority standard), and shadow measure is 6 meters. Meanwhile, building shadow is 30 meters in the same image. Standard floor height of each floor is 4 meters. Roof top height is standard 3 meters.

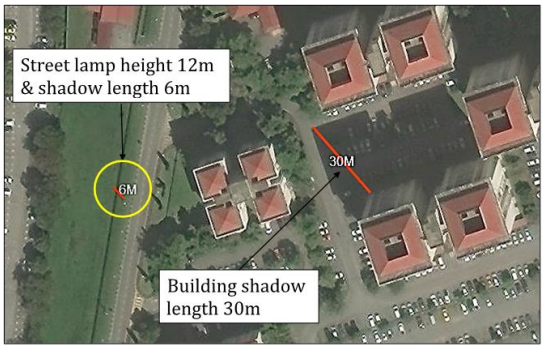

Figure 2
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The Basic formula is:

Height Building = (street lamp height/ Length shadow) x Length building shadow
H = (12/6) x 30m
H = 60m

Possible total floor (TF) is:

TF = Building height / Floor height
TF = 60/4
TF = 15 floor building – roof height 3m
TF = 12 floor

Each floor possible consist of 8 units housing (4 housing of each site), which means 96 units inside each building (8-unit x 12 floor). If the building provides for family quarters, possibly 96 personnel occupy the building. The total strength of personnel will depend on how many buildings inside the garrison as Figure 3.

Figure 3
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RESULT

Figure 4: Area A is possible housing consists of 5 single storey and 4 double storey semi detach and 2 bungalows (basic shadow length 4m). 5 single storey are possible for 5 staff officers. 4 double storey semi detach are possible 8 staff officers. 2 bungalows are possible for 2 Superior. Predicted strength at Area A is possible 15 staff officers.

Figure 4
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Figure 5: Area B is possible barrack area consists of 15 units of 2 storey barrack. The shadow length measure is 4m that means possible building height is 8m and relevant for 2 storey barrack building (using the second method). As usual, barrack implementing the dorm concept of 20 personnel at each floor. Each barrack possibly occupied by 40 personnel. The total strength at Area B is possible 600 personnel (15 unit's x 40 pers).

Figure 5
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Figure 6: Area C and E are consisted with 16 high apartments with 12 floors (shadow length 30m), 2 semi detach apartment with 4 storey (shadow length 8m), 4 medium apartments 3 storey (shadow length 6m) and 10 medium apartments 2 storey (shadow length 4m). There are possible 1536 personnel in high apartment (96 personnel x 16 building), 64 personnel in the 2 semi detach apartment (8 x 4 floor x 2 Building), 24 personnel in medium apartment 3 storey (6 unit each floor x 4 building) and 80 personnel at medium apartment 2 storey (4-unit x 2 floor x 10 building). Based on this number, probable strength occupied at Area C and E is 1704 personnel.

Figure 6
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Figure 7: Area D consists of 7 double storey semi detach (shadow length 4m), possibly occupied by 14 staff officers. 2 storey terrace (shadow length 4m) with 12 units, possibly occupied by 12 staff officers. 3 Medium Apartment 3 storey (shadow length 6m) are possible to for 60 personnel (3-unit x 20 personnel each building). Possible strength is 26 staff officers and 60 personnel. Therefore, total 86 personnel possible occupied that area.

Figure 7
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Based on the figure above, the grand total staff officers and personnel occupy the garrison is possible 2405 people (not include family). This strength similar with division consists of a brigade or three (3) battalion units.

CONCLUSION

The result of this study shows that the ability of remote sensing high-resolution image can be used to estimate possibility of military strength by measuring shadow and building height. The tangible and intangible features information must be well understood to answer the critical question in order to support military assessment.

The readiness of imagery database with variety of resolution and type, it provides visualization to be utilized to assist quick decision process for planning or operational purposes. Moreover, by using the remote sensing images as a “First Looks” concept also able depict the critical information needed that cannot be accessed on the ground. Implementing and manipulating the remote sensing images will assist more advantages because it provides right and accurate geoinfo to be taken for further action.

ACKNOWLEDGEMENTS & REFERENCES

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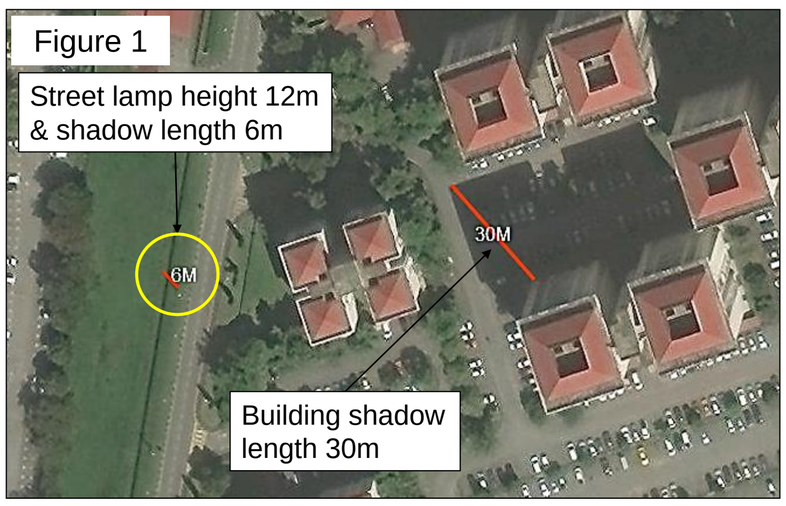
Objectives

The aim of this study is to estimate possibility of military strength by measuring shadow and building height using remote sensing high resolution image to assess critical information for military decision (critical question)

Methodology & Study Area

- **First method** is evaluating the building height by direct interpretation by looking at the different angle. Sensor position some time produces an image with high obligation, which can appear clear view on the side of the building. By understanding the pattern and shape of height building, each floor can be counted easily. Rooftop pattern, shape and design also become a relevant knowledge to identify the probable housing type. Imagery data collection can be utilized to determine the suitable images which provide good obligation view to easiest the analysis process.
- **Second method** is implemented simple similar triangle using shadows of a building with known high and shadow object . For example, the standard height of a street lamp is 12 meters (local authority standard), and shadow measure is 6 meter. Meanwhile, building shadow is 30 meter in the same image. Standard floor height of each floor is 4 meter. Roof top height is standard 3 meter.

Figure 1: Measure the shadow length to predict building height in meter (m).



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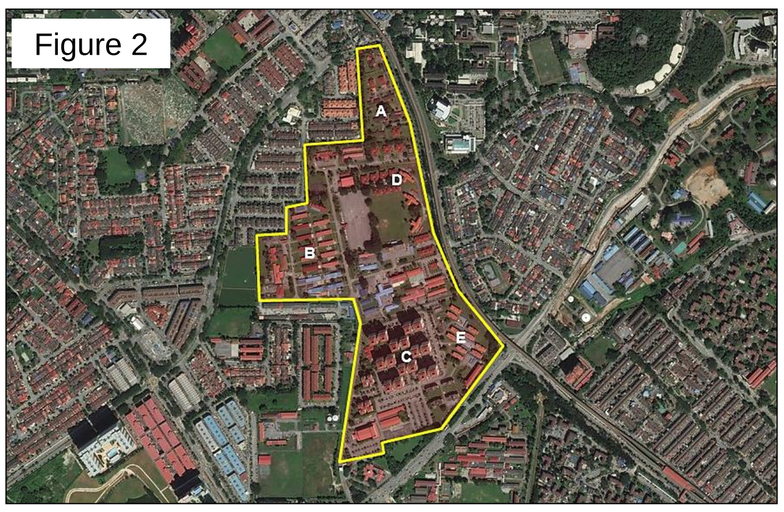

Results

Area A is possible housing consists of 5 single storey and 4 double storey semi detach and 2 bungalows (basic shadow length 4m). 5 single storey are possible for **5** staff officers. 4 double storey semi detach are possible **8** staff officers. 2 bungalows are possible for **2** Superior. Predicted strength at Area A is possible **15 staff officers**.

Area B is possible barrack area consists of **15** units of 2 storey barrack. The shadow length measure is 4m that means possible building height is 8m and relevant for 2 storey barrack building (using the second method). As usual, barrack implementing the dorm concept of 20 personnel at each floor. Each barrack possibly occupied by **40** personnel**.** The total strength at Area B is possible **600 personnel** (15 unit x 40 pers).

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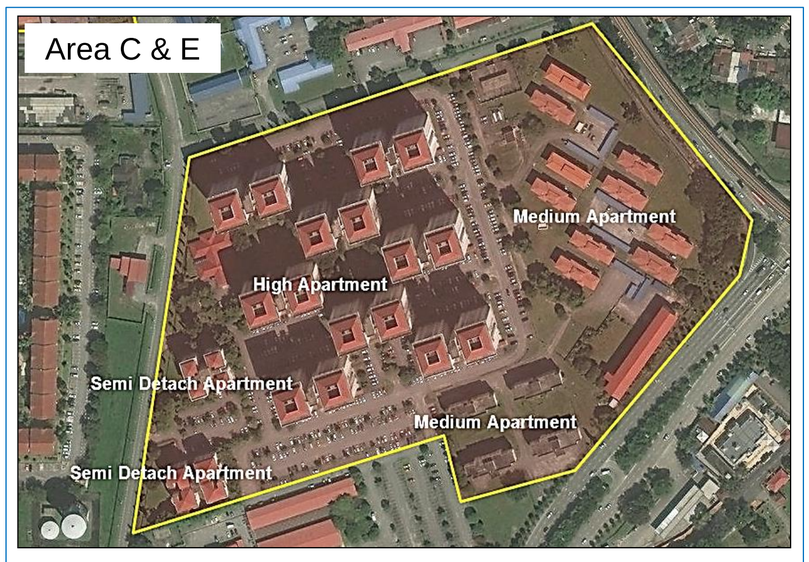
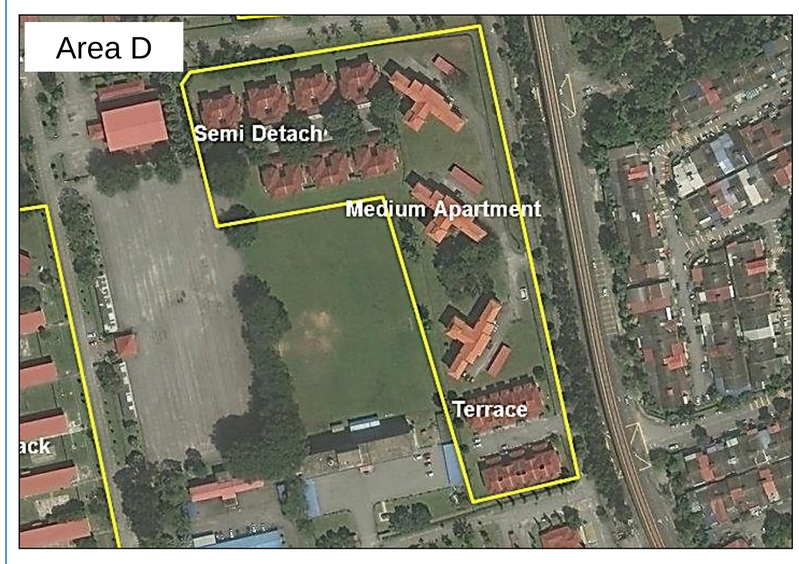


Area C and E are consisted with 16 high apartment with 12 floors (shadow length 30m), 2 semi detach apartment with 4 storey (shadow length 8m), 4 medium apartment 3 storey (shadow length 6m) and 10 medium apartment 2 storey (shadow length 4m) . There is possible **1536** personnel in high apartment (96 personnel x 16 building), **64** personnel in the 2 semi detach apartment (8 x 4 floor x 2 Building), **24** personnel in medium apartment 3 storey (6 unit each floor x 4 building) and **80** personnel at medium apartment 2 storey (4-unit x 2 floor x 10 building). Based on this number, probable strength occupied at Area C and E is **1704 personnel.**



Area D consists of 7 double storey semi detach (shadow length 4m), possibly occupied by **14** staff officers. 2 storey terrace (shadow length 4m) with 12 units, possibly occupied by **12** staff officers. 3 Medium Apartment 3 storey (shadow length 6m) are possible to for **60** personnel (3-unit x 20 personnel each building). Possible strength is 26 staff officers and 60 personnel. Therefore, total **86 personnel** possible occupied that area.

Based on the figure above, the grand total staff officers and personnel occupy the garrison is possible **2405** people (not include family). This strength similar with division consists of a brigade or three (3) battalion units.

Conclusion

The result of this study shows that the ability of remote sensing high resolution image can be used to estimate possibility of military strength by measuring shadow and building height. The tangible and intangible features information must be well understood to answer the critical question in order to support military assessment.

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