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Novel GIS tool for the analysis and extraction of geographic information from noisy satellite image

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ABSTRACT

As we all know Satellite image processing assumes a crucial job for research and improvements in Astronomy, Remote Sensing, GIS, Agriculture Monitoring, Disaster Management and numerous different fields of study. Satellite pictures are recorded in computerized structures and after that handled by the PCs to remove data. Varieties in the scene attributes are spoken to as varieties in splendor on pictures. In this paper we proposed a GIS tool which is able to extract different information from Satelite image and those information are like Road, Building & Green extraction. In this tool we devolve a new algorithm for road ,green& building extraction. According to our algorithm we are able to get more clear result in term of building, road & green extraction in low time complexity.

KEYWORDS: DIP, GIS, ARCGIS, Mapping, Extraction

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1 INTRODUCTION:

Changes in human social orders happen with quick pace and they are showed in different ways. A standout amongst the most critical sort of changes is urban changes. Since the start of humankind, people are driven by monetary, social, ecological and different components to change their environment. Particularly in present day ages, there is a blast in urbanization, implying that people move from provincial to urban regions as a result of modernization and industrialization. This mass development of people is typically joined by extensive changes in a urban situation and these progressions are normally showed by building development and annihilation. A building is a crucial piece of the life of a person as it assumes the job of a position of living or work. Therefore, the movement of people prompts new structures being developed and others getting decimated. This implies structures or all the more for the most part the urban framework reflects and features human exercises in a zone. New structures are built and others are surrendered and get pulverized as the number of inhabitants in a urban region varies. The tremendous increment of the number of inhabitants in earth prompts a comparable acceleration of the human exercises. Since such exercises can be straightforwardly connected to development activities in a zone, the adjustments in a urban domain are significantly expanded. The speed, with which urban changes happen, has prompted major issues in the urban change discovery and mapping. This reality drives us to the issue of urban change checking that we as society need to confront. As urban change observing, we allude to the undertaking of recognizing and checking changes that happen in a urban domain. Changes in street foundation, lodging and other man-influenced structures to have a place with the class of urban changes. Notwithstanding, in the system of this proposal, we concentrate on changes in building foundation as they are meant by building development and annihilation. Building location from satellite pictures was relatively outlandish a couple of decades prior because of low goals satellite pictures that did not permit the recognizable proof of individual structures in a picture. Along these lines, building discovery must be accomplished by utilizing flying pictures or as a major aspect of the general issue of land cover arrangement from satellite pictures that examined and assessed urban development. Be that as it may, the most recent two decades, there were critical advances in the innovation of the sensors satellites convey and these days the catch of high-goals multi-ghostly satellite pictures is practical. These high-goals pictures delineate the urban condition with extraordinary detail, making the identification and grouping of individual structures and other man-made structures from satellite pictures conceivable and more exact than any time in recent memory. Building identification from 2D high-goals satellite pictures is a PC vision, photogrammetry and remote detecting assignment that can be used in a few applications that require the production of urban maps or the investigation of urban changes.

Geographic information system: A Geographic information system (GIS) is a framework intended to catch, store, control, break down, oversee, and present spatial or geographic information. GIS applications are devices that enable clients to make intuitive inquiries (client made pursuits), examine spatial data, alter information in maps, and present the aftereffects of all these operations.[1,2] GIS (all the more usually GIScience) once in a while alludes to geographic data science (GIScience), the science basic geographic ideas, applications, and systems.[3] GIS can allude to various diverse innovations, procedures, and techniques. It is joined to numerous tasks and has numerous applications identified with designing, arranging, the executives, transport/coordination's, protection, broadcast communications, and business.[2] For that reason, GIS and area knowledge applications can be the establishment for some, area empowered administrations that depend on examination and representation. GIS can relate inconsequential data by utilizing area as the key record variable. Areas or degrees in the Earth space– time might be recorded as dates/times of event, and x, y, and z arranges speaking to, longitude, scope, and height, individually. All Earth-based spatial– worldly area and degree references ought to be relatable to each other and at last to a "genuine" physical area or degree. This key normal for GIS has started to open new roads of logical request. is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.[1, 2] GIS (more commonly GIScience) sometimes refers to geographic information science (GIScience), the science underlying geographic concepts, applications, and systems.[3] GIS can refer to a number of different technologies, processes, and methods. It is attached to many operations and has many applications related to engineering, planning, management, transport/logistics, insurance, telecommunications, and business.[2]For that reason, GIS and location intelligence applications can be the foundation for many location-enabled services that rely on analysis and visualization. GIS can relate unrelated information by using location as the key index variable. Locations or extents in the Earth space–time may be recorded as dates/times of occurrence, and x, y, and z coordinates representing, longitude, latitude, and elevation, respectively. All Earth-based spatial–temporal location and extent references should be relatable to one another and ultimately to a "real" physical location or extent. This key characteristic of GIS has begun to open new avenues of scientific inquiry.

2 LITRECTURE REVIEW:

As we know in this era there is need of fast system which is able to generate accurate result in minimum time. So as per GIS tools there is lots of features are require which are:

- **Automatic Road Extraction from Satellite Image**

- **Automatic extraction of ecological responses to environmental change**
- **Automatic Building Extraction from Satellite Image**

So as per these features there is lots of researchers are there who worked on this area.

Automatic Road Extraction from Satellite Image: GIS or topographical database has been assessed in [1] and [2], and on heuristics [3], [4] or a stochastic suspicion [5]. In a self-loader strategy human mediation is required at the underlying stage and now and again amid the handling stage. A remarkable normal for ground target following is that earlier nonstandard data, for example, target speed imperatives, street systems, etc can be misused in the tracker to diminish the vulnerability of target movement and give better gauges of the objective state[1]. The associating different model estimator [7] is extraordinary compared to other known numerous model estimators. Late uses of numerous model estimators to ground target following were introduced in Ref.[6, 8, 9, 10, 11]. Kirubarajan and Bar-Shalom noticed that for ground target following a different model estimator with settled structure needs to comprise of an extensive number of models, inferable from the numerous conceivable movement modes and different street constraints[8]. It isn't just computationally unfortunate yet in addition conceivably results in profoundly debased evaluations (due to the intemperate "rivalry" among the numerous models). So as to beat this issue, they proposed a versatile or variable structure connecting numerous model estimator for ground target following [8]. The purposes behind the predominance of this molecule sifting based methodology, as noted in Ref. [12], is that with particles or arbitrary examples the reproduction based molecule channel can fuse progressively precise elements models and gauge non-Gaussian appropriations (e.g., at a crossing point) more precisely than the Kalman separating based cooperating various model estimator. The predominance of different model molecule channel over the connecting various model estimator inside the settled structure numerous model system was shown in Ref.[12]. Various model estimation falls into the class of nonlinear separating regardless of whether each and every model is a straight framework with Gaussian clamor. An adequate measurement of the mixture state circulation with a settled measurement is in this way inconceivable. A self-loader street tracker dependent on street profile relationship and street edge following for flying pictures was proposed in [13]. The tracker was instated by the client to get beginning for position, heading and width of the street. Street following dependent on single perception kalmanchannel has been considered on [14]. Calculation dependent on molecule sifting have been used in [15]. A strategy for feed forward neural system connected on a running window to choose whether it contains a three-or a four arm street intersection has been looked into in [16]. Separated of street from one raster picture require not be extricated similarly from another raster picture, as there can be an intense change in the estimation of vital parameters dependent on nature's state, instrument variety, and photographic introduction has been inspected in[7].

Parameters utilized for extraction are its shape (geometric property) and dim dimension force (radiometric property).No logical data was utilized. The strategy works exclusively on picture qualities. The strategy is self-loader, with manual determination of the begin and end of street fragments in the info picture.

Automatic extraction of ecological responses to environmental change: The NDVI was utilized initially to create maps, including the spearheading mapping of vegetation appropriation and efficiency in Africa [17]. The natural importance of such maps is numerous: the NDVI empowers us to separate biological community useful sorts or bio zones[18,19], to evaluate the yearly net essential efficiency (ANPP) at different scales overall [20] and to separate land cover at the mainland [21] and worldwide [22] scales. By utilizing the NDVI, it is conceivable to separate savannah, thick woodland, non-timberland and horticultural fields (in Africa [23] and in Asia [24]. The utilization of the NVDI in the observing of dry season or in the assessment of dynamic fire hazard depends on the affectability of the file to vegetation dryness, a noteworthy inclining factor for flame event. For instance, utilizing 16 years of information ablaze event in Tuscany, Maselli et al. detailed predictable negative connections be tween's flame probabilities and institutionalized NDVI dimensions of past or contemporaneous decades [25]. The creators were then ready to acquire chance gauges that could be utilized for operational applications on various spatial scales. The prescient exactness accomplished was evaluated as low at high spatial goals, yet achieved halfway dimensions on commonplace and provincial scales [26]. Since water has a much lower NDVI esteem than do other surface highlights, immersed zones can likewise be recognized by changes in the NDVI esteem when the surge, in the wake of taking out the impacts of different factors on the NVDI. This strategy was utilized in China to survey surge harm in 1998, and the outcomes demonstrated high relationship with surge harm evaluated utilizing different strategies [27]. At last, since vegetation elements and nearby atmosphere are characteristically connected, vegetation elements could give data about climatic occasions, for example, ices. In New Zealand, for instance, the NVDI was utilized to clarify a lot of variety (from 10 to 20%) in the date of the main (the NVDI in harvest time) and last (the NVDI in spring) ice, and additionally the length of the ice free period (the NVDI in fall) [28].

Automatic Building Extraction from Satellite Image: All in all, the essential informational collections utilized in most building extraction frameworks are pictures and DSM, which are utilized independently or at the same time. Brunn and Weidner [29] fragmented DSM for building extraction. Anyway it is hard to apply this calculation to DSM got from LIDAR information because of loud exceptions. From that point forward, many building extraction strategy from LIDAR information were recommended [30] in any case, the building extraction results utilizing DSM still experience the ill effects of exceptions and generally low goals. There are numerous endeavors to utilize elevated or

satellite pictures as the single information hotspot for building extraction by methods for assistant data, for example, shadow [31]

As we can see in previous existing work there is a set of novel region refinement procedures that enables the transition from an object-based to a pixel-based classification result. These procedures include an unsupervised image segmentation algorithm that automatically determines the optimal number of classes an image can be split, a novel image region scoring procedure for the selection of initial road, building , ecological candidates, But still those

According to previous existing algorithm there is following issues:

- **Accuracy Issue**
- **False Detection on Noisy Images**
- **Image Quality**
- **Time Complexity for HD images**

These all are the research gap where we can focus and try to reduce those problems. In this paper basically we focus to introduce a set of novel region refinement procedures that enables the transition from an object-based to a pixel-based classification result

Accuracy:A Normalization and an Euler transform layers for the improvement of the accuracy of a building detector.

Quality: The Normalization layer takes advantage of both raw and normalized features to improve the quality ability of the building detector

Image enhancing: A novel method of enhancing changes and improving the performance of change detection algorithms by magnifying the phase differences of the Fourier transforms of image pairs.

3 PROPSOED METHADOLOGY:

In this paper basically we proposed a tool which is able to extract the following information form satellite images:

1. **Road Extraction**
2. **Building Extraction**
3. **Green Extraction**

According to our proposed approach initially we insert an satellite image with have noise issue. In next stage we remove those noise issue by using of Discrete Wavelate transformation approach according to this approach we are able to get noise free satellite image. After this process our tool provides options which particular information you want extract. Based on input option we perform the extraction method.

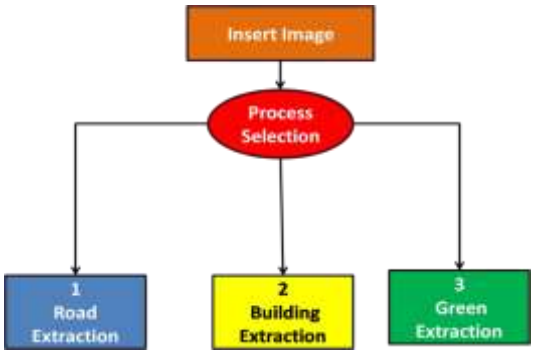

Figure 1: GIS Tool Flow

As per our proposed approach here are the details for all different extraction approaches:

1. **Building Extraction**
    a. Initial Image filtering
    b. Resize
    c. Edge Detection
    d. Calculation of Line regions
    e. Link of Lines
    f. Detection of intersection of lines
    g. Building corner detection
    h. Identify Buildings with Resize

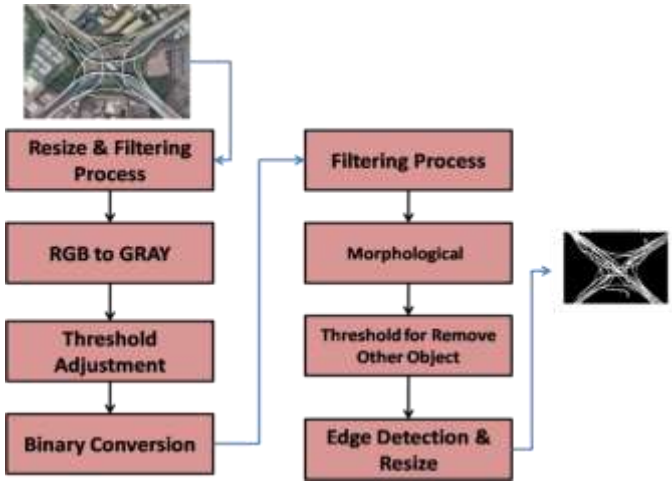

Figure 2: Building Extraction Flow

2. **Road Extraction**
    a. Resize & Filtering Process
    b. RGB to GRAY
    c. Threshold Adjustment
    d. Binary Conversion
    e. Filtering Process

f. Morphological

g. Threshold for Remove Other Object

h. Edge Detection & Resize

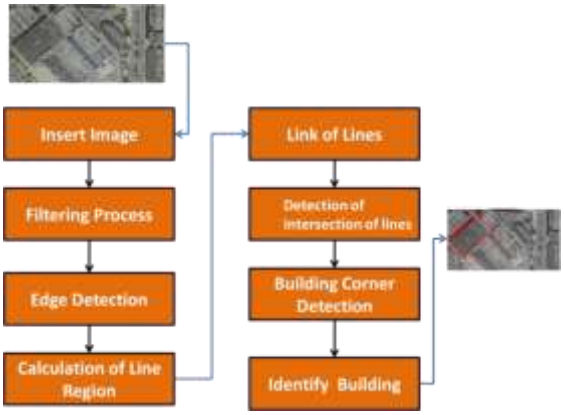

Figure 3: Road Extraction Flow

3. Green Extraction

a. Resize

b. Initial Image filtering

c. R Part Separate

d. G Part Separate

e. Calculation of NDVI

f. Threshold

g. Resize

h. Green Identification

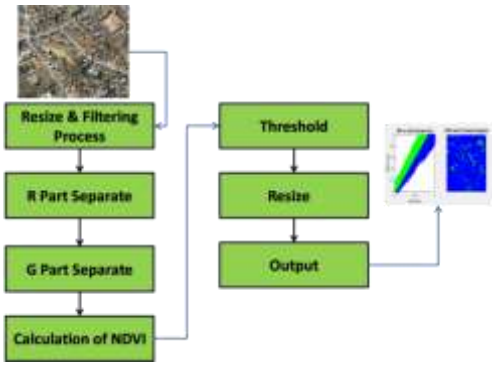

FIGURE 4: GREEN EXTRACTION FLOW

4 RESULT & ANALYSIS

In this section we present the output from our proposed algorithm as compare to previous existing approach our proposed is far batter in terms of quality & accuracy vice.

Green Extraction Result Analysis: As per our approach here we can see the output of the every

step. Initial we remove the noise after that we start process to find the green information from the Denoised image.

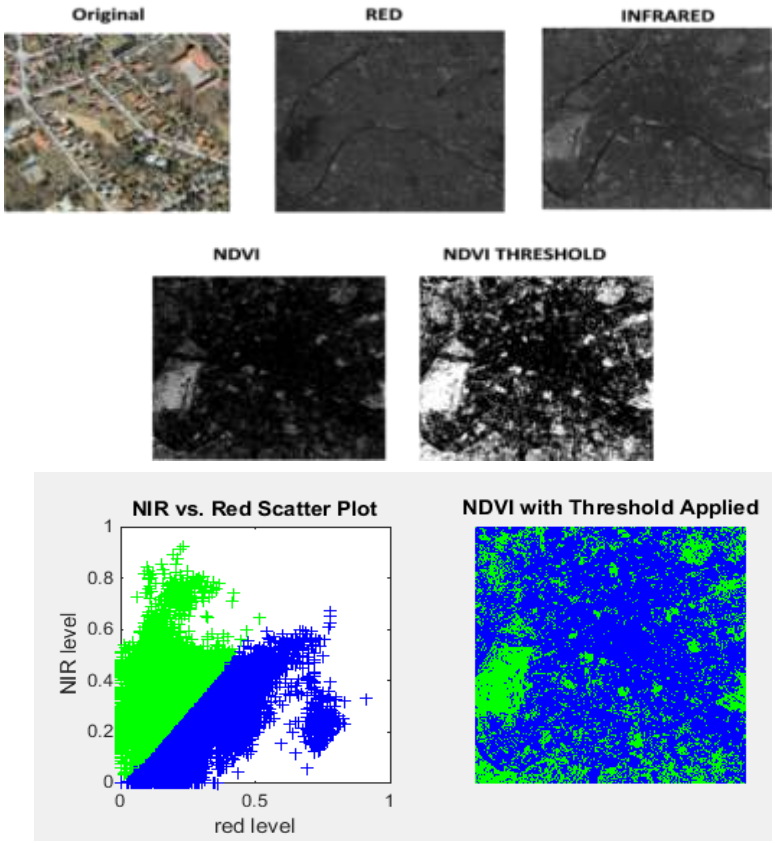

Figure 5: Green Extraction Output

Road Extraction Result Analysis: As per our approach here we can see the output of the every step. Initial we remove the noise after that we start process to find the road information from the Denoised image.

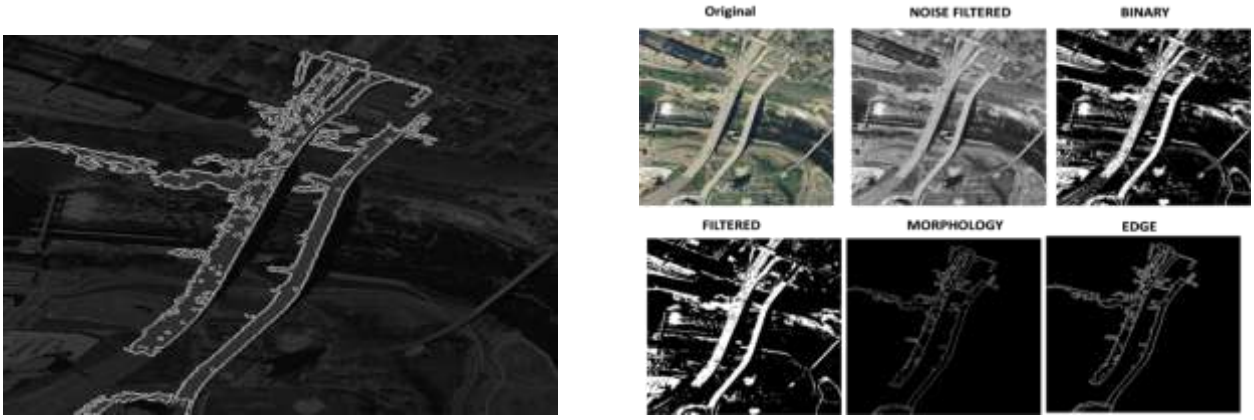

Figure 6: Road Extraction Output

Building Extraction Result Analysis: As per our approach here we can see the output of the every step. Initial we remove the noise after that we start process to find the building information from the Denoised image.

Figure 7: Building Satellite Output

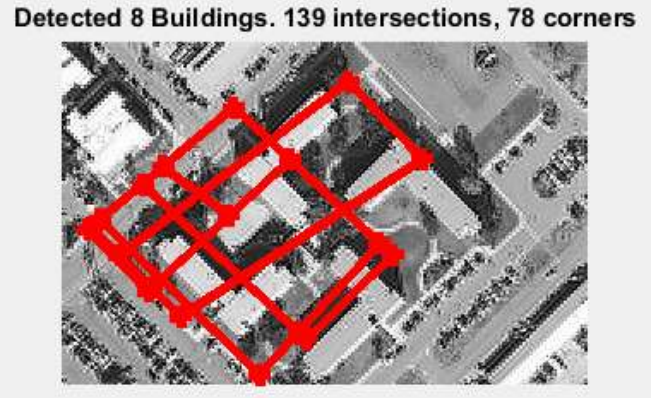

Figure 8: Building Extraction Output

5 CONCLUSIONS

As we are living in the era of 3D and 4G technology , where everyone demand high quality based color image and videos on their mobile and laptop application, so for all those map based application there is need of more accurate system. As we already know this world need a batter system which can design and extract the map information and which is useful for human beings. So in this paper basically proposed an novel tool which is able to find the Geographical information like Green, road & building. In this approach we are able to tackle with the noisy satellite image and generated output is far better than the previous approaches.

REFERENCES

1. A.Baumgartner,C.T.Steger,C.Wiedemann,H.Mayer,W.Eckstein,H.Ebner,"Update of roads in GIS from aerial imagery:Verification and multi-resolution extraction,"in Proc.Int.Archives of Photogrammetry and remote sensing,1996; XXXI(B3/III): 53-58
2. Dan Klang," Automatic detection of changes in road database using satellite imagery,"in Proc.Int.Archives of Photogrammetry and remote sensing,1998; 32: 293-298
3. C.Steger,"Extracting curvilinear structures :a differential geometric approach,"in Proc.of Europeans Conference on Computer Vision,1996; 630-641

4. C. Steger, H. Mayer and B. Radig," The role of grouping for road extraction,"in Automatic Extraction of Man-made Objects from Aerial and space images 1997; (II): 245-256 International Journal of Distributed and Parallel Systems (IJDPS) November 2011; 2(6): 152
5. M. Barzohar and D. B. Cooper," Automatic finding of main roads in aerial images by using goometric-stochastic models and estimation," IEEE Trans. on Pattern Analysis and Machine Intelligence, 1996; l.8(7): 707-721
6. B. Ristic, S. Arulampalam, and N. Gordon, Beyond the Kalman Filter: Particle Filters for Tracking Applications. Boston, MA: Artech House Publishers, 2004.
7. Y. Bar-Shalom, X. R. Li, and T. Kirubarajan, Estimation with Applications to Tracking and Navigation: Theory, Algorithms and Software.New York, NY: John Wiley and Sons, Inc., 2001.
8. T. Kirubarajan, Y. Bar-Shalom, K. R. Pattipati, and I. Kadar, "Ground target tracking with variable structure imm estimator," IEEE Transactions on Aerospace and Electronic Systems, January 2000; 36(1): 26 – 46,
9. T. Kirubarajan and Y. Bar-Shalom, "Tracking evasive move-stop-move targets with a gmti radar using a vs-imm estimator," IEEE Transactions on Aerospace and Electronic Systems, October 2003; 39(4): 1452 – 1457
10. C. Kreucher and K. Kastella, "Multiple model nonlinear filtering for low singal ground target applications," in Proceedings of SPIE Conference on Aero sense, Signal Processing, Sensor Fusion and Target Recognition April 2001; X(4380): 256–266.
11. L. Lin, Y. Bar-Shalom, and T. Kirubarajan, "New assignment-based data association for tracking move-stop-move targets," IEEE Transactions on Aerospace and Electronic Systems, April 2004; 40(2): 714 – 725
12. A. Doucet, N. de Freitas, and N. Gordon, Sequential Monte Carlo Methods in Practice. New York, NY: Springer-Verlag, 2001.
13. J. Mena, "State of the art on automatic road extraction for GIupdate: A novel classification," Pattern Recognit. Lett., Dec. 2003; 24(16): 3037–3058
14. Mckeown, D. Denlinger, J. L.," Cooperative methods for road tracking in aerial imagery", In: Workshop Comput. Vision Pattern Recognition,1988; 662-673.
15. G. Vosselman and J. D. Knecht, "Road tracing by profile matching and Kalman filtering," in Proc. Workshop Autom. Extraction Man-Made Objects Aerial Space Images, Birkhaeuser, Germany, 1995; 265–274.
16. M. Bicego, S. Dalfini, G. Vernazza, and V. Murino, "Automatic road extraction from aerial images by probabilistic contour tracking," in Proc. ICIP, 2003; 585–588.

17. Tucker, C.J. et al. (1985) African land-cover classification using satellite data. Science 227, 369–375 28 Soriano, A. and Paruelo, J. M. (1992) Biozones: vegetation units defined by functional characters identifiable with the aid of satellite sensor images.
18. Glob. Ecol. Biogeogr. Lett. 2, 82–89 29 Paruelo, J. M. et al. Current distribution of ecosystem functional types in temperate South America. Ecosystems 2001; 4: 683–698
19. Nemani, R.R. and Running, S.W. Land cover characterization using multitemporal red, NIR and thermal IR data from NOAA/AVHRR. Ecol. Appl. 1997; 7: 79–90
20. Achard, F. and Blasco, F. Analysis of vegetation seasonal evolution and mapping of forest cover in West Africa with the use of NOAA AVHRR data. Photogram. Engin. Remote Sens. 1990; 56: 1359–1365
21. Achard, F. and Estreguil, C. Forest classification of Southeast Asia using NOAA AVHRR data. Remote Sens. Environ. 1995; 54: 198–208
22. Van Wagtendonk, J. W. and Root, R.R. The use of multitemporal Land sat Normalized Difference Vegetation Index (NDVI) data for mapping fuel models in Yosemite National Park, USA. Int. J. Remote Sens. 2003; 24: 1639–1651
23. Senay, G.B. and Elliott, R.L. Capability of AVHRR data in discriminating rangeland cover mixtures. Int. J. Remote Sens. 2002; 23: 299–312 35 Nagendra, H. Using remote sensing to assess biodiversity. Int. J. Remote Sens. 2001;22: 2377–2400
24. Singh, R.P. et al. Vegetation and temperature condition indices from NOAA AVHRR data for drought monitoring over India. Int. J. Remote Sens. 2003; 24: 4393–4402
25. Maselli, F. et al. Use of NOAA–AVHRR NDVI images for the estimation of dynamic fire risk in Mediterranean areas. Remote Sens. Environ. 2003; 86: 187–197 38 Wang, Q. et al. Using NOAA AVHRR data to assess flood damage in China. Environ. Monit. Assess. 2003; 82: 119–148
26. Hurlbert, A.H. and Haskell, J.P. The effect of energy and seasonality on avian species richness and community composition. Am. Nat. 2003; 161: 83–97
27. Brunn, A. and Weidner, U., Hierarchical Bayesian nets for building extraction using dense digital surface models. ISPRS Journal of Photogrammetry & Remote Sensing, 1998; 53(5): 296–307.
28. Morgan, M. and Tempfli, K., Automatic building extraction from airborne laser scanning data, International Archives of Photogrammetry and Remote Sensing, 2000; 33(B3/2): 616–623.
29. Lin, C. and Nevatia, R., Building Detection and Description from a Single Intensity Image, Computer Vision and Image Understanding, 1998; 72(2): 101-121.