International Journal of Research in Advent Technology (IJRAT) Special Issue
E-ISSN: 2321-9637
Sharadchandra Pawar college of Engineering, Dumbarwadi, Pune 410504,
Organizes
National Conference "MOMENTUM-17", 14th& 15th February 2017
Available online at www.ijrat.org

Analytical architecture for Geo informatics systems Technology

Mrs. Priti S. Lahane
Assistant Professor, Department of Information Technology
MET.BKC.IOE Adgaon, Nashik priti.met@gmail.com

Abstract - *Geo informatics system is the collection of data about the spatial distribution of the significant features of the earth's location surface which has been a very important part of the activities of organized societies. There are numerous geographic information technologies like Global positioning system, Geographic information system out of which this paper focuses on remote sensing & designing an analytical architecture for its application. Big data is used for analysis; the big data is useful technology for handling data which comes from different sources. The architecture compromises of three units i) Data acquisition ii) Data processing iii) Decision unit.*

Keywords**:** *Geo Informatics System, Remote Sensing, Normalized Difference vegetation Index, Principal Component Analysis.*

1. INTRODUCTION

Geo informatics system may use manual systems ,however it is always refer as software system for capturing, storing , analysis as well as display of location data it is most useful when perform data analysis it has number of application which act as a problem solving solution[4]. Out of all the technology remote sensing system generates large volume of data. Big data solutions are very useful for analyzing data collected from different sensors which is compromises of different media. Characteristics like volume, Varity & velocity makes the big data more applicable. In the every passing year large volumes of data are stored having the combination of all five media which is complex for handling as well as processing in such cases big data come to rescue[7]. Varity of data generates from different social networks like Tweeter, LinkedIn, and facebook. For geo informatics systems number of technologies are there which has the job of processing its data but the data generated from remote sensing is complex to handle and process [8].

2. Remote Sensing Technology

Remote sensing is technology which is combination of science and art of gathering information about an spatial object, area or phenomenon by an analysis of the data acquired by different devices which is not in sight with the object. There are different types of sensing systems which is used in remote sensing such as active sensing and passive sensing system. Space borne sensors are currently used to assist in scientific and socioeconomic activities like weather prediction, crop monitoring, mineral exploration, waste land mapping, cyclone warning, water resources management, and pollution detection [5]. All this has happened in a short period of time [9, 6]. RS technology uses different platform for generating GIS data such as spacecraft, balloons, photogrammetric, aircraft and different sensors mounted on platform is use for data acquisition. RS technology uses radar system for that the data generated from radar system is need to be converted into digital form and process by using technologies such as visual image interpretation & digital image processing [3]. So, the generated data from radar is of raw data compromises of variety as well as volume. To handle such volume of data Big data concepts are useful. In RS data acquisition is done by sensors mention above.

3. Architecture

Remote Sensing analytical Architecture compromises of data acquisition unit, data processing unit and decision unit.

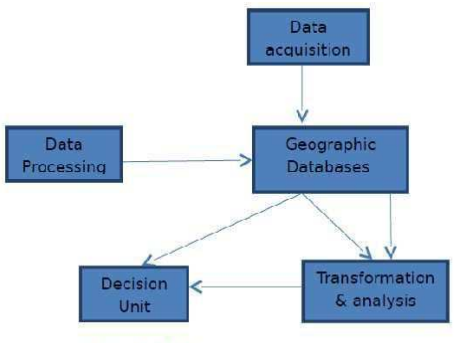

Fig.1: System Architecture

International Journal of Research in Advent Technology (IJRAT) Special Issue
E-ISSN: 2321-9637
Sharadchandra Pawar college of Engineering, Dumbarwadi, Pune 410504,
Organizes
National Conference "MOMENTUM-17", 14th& 15th February 2017
Available online at www.ijrat.org

a) Data acquisition

In Data acquisition data is acquired by taking the value from sensing parameters like instrumental parameter & viewing parameter of different earth resources satellite which work in different combination of band from radar waveband. Effective data analysis can be done applying preprocess which gathers the data from number of sources, which is cost efficient and also improves accuracy of analysis. Common preprocessing techniques such as data integration, cleaning, and elimination of redundancy are applied. For getting raw data and making it accurate for further processing which may be generated from digital image processing or visual image interpretation in digital image processing after preprocessing techniques such as registration, enhancement, filtering, transformation and classification is used which generate satellite digital data.

Fig. 2 Remote Sensing Image

Registration process compromises of generation of digital coordinate's .In enhancement edge detection and contrast enhancement is done which makes edges more visible whereas under filtering low pass filtering & high pass filtering is used for suppressing the frequency which generate noise. The data need to be corrected to remove distortions, noise caused due to the movement of the platform to the earth, attitude, earth curvature as well as variations in sensor characteristics. The Base Station gathers the data & transmits to the data center for storage.

b) Data Processing

In data processing unit after preprocessing where noise is removed from raw data the storage part is important load balancing and filtration algorithm are applied which gives the facility of classifying the filtered data into parts and assign them to different processing servers [1]. Processing server generates statistical calculations, measurements, and performs mathematical or logical tasks against each segment of data. Aggregation, compilation & result generation has been done over result storage.

c) Transformation & Decision Unit

All the transformations in image processing of remotely sensed data allow the generation of a new image based on the arithmetic operations, mathematical statistics and Fourier transformations. Transformation technique such as NDVI & PCA is used which identify the relevant band information. Aggregation server is responsible for storing organized results into the result's storage [2]. General parameters, like mean, standard deviation, variance matrix and correlation coefficients of different patterns like water, forest, industrial, and residential, data compromises of different band have been analyzed to test the performance. The decision making server is responsible for generating decision related to application point of view where decision is based on the analysis and applicable such as urban planning, management, and management of watersheds, floodplains, wetlands, forests & aquifers. The decision methods must be strong enough which generate efficient result and minute error for decision making may degrade the quality & efficiency of the result.

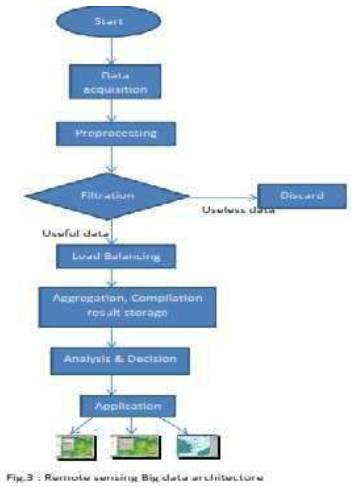

Fig.3 : Remote sensing Big data architecture

4. Algorithms

Algorithms are used to process large amount of remote sensing data which is generated by data processing, analysis & design unit. Four algorithms are use which work on filtration & load balancing, processing & calculation, aggregation, compilation & decision making.

Algorithms Parameters & variables
IB 1 , IB 2 , IB 3 , IB 4 , IB 5 . . . IB N is image fixed size blocks
IBS: Image block size (i.e., block size of IB 1 , IB 2 , . . . , IB N). PB: Processed sample block (PSB = {IB 1 , IB 3 , IB 5 , IB 7 . . .IB N−1 }).
UPB: Unprocessed sample block (UPSB = {IB 2 , IB 4 , IB 6 ,IB 8 . . . IB N }).
MD: Measurement data set.
XIBi = Sum of all values of the image block B i /size of block
SD IBi : Standard deviation of sample values of image block B i .
Abs_Diff: Absolute difference between XIBi and SD IBi .
max_val: Threshold value is set and is greater than normal range to check how many values of the block are deviated from the normal range.
NG max_val : Number of values in the block is greater than max_val.

Algorithm I: Filtration and Load Balancing Algorithm
Input: Satellite collected data set
Output: filtered fixed image size block.
Steps:
1. Filter Image data i.e. measurement data set. Useless data will be discarded.
2. Divide the data into fixed size image block i.e. IBS = 100 × 100 MD data values. Each block will be denoted by B i where $1 \leq i \leq IBS$
3. Make different samples of blocks such that one part is of process sample block and other is unprocessed sample block i.e., PB = {IB 1 , IB 3 , IB 5 , . . . , IB N−1 } and UPB = {IB 2 , IB 4, IB 6 ,IB 8 , . . . ,IB N }
4. Transmit unprocessed sample block to aggregation server.
5. Transmit each different image block(s) Bi of processed sample block to processing servers.

Algorithm II: Processing & Calculation algorithm
Input: Image Block B i
Output: statistical results and transmitting to aggregation server.
Steps:
For each image Block B i , Calculate
a. Xib
b. S.D IBi
c. Ab_Dif
d. NG max_val
1. Transmitting the results against image block id, product id to the aggregation server.

Algorithm III:
Aggregation & compilation
Input: Block image B i results
Output: compilation, storage and sending processed sample block results and unprocessed sample blocks information for decision making.
Steps:
1. Collect Every IB i 's result of PB
2. Compilation and transmit to decision making.
3. Store PB blocks with results and UPB blocks without result into result storage. Algorithm IV : Decision making
Input: PB results and UPB information
Output: each image blocks Bi with decision, land area or sea. Finally, the image is divided into sea area and land area.
Rules:
For land area analysis. 1. X IBi$\leq \partial$ X 2. S.D IBi$\geq \partial$ S.D 3. Ab_Dif$\geq \partial$ Ab_dif 4. NG max_val$\leq \partial$ NG max_val
Steps:
1. For Each (IB i of PB)
{
If (Rule1 == true and Rule 2 == true)
S_IB i = Land
Else if (Rule1 == false and Rule 2 == false)
S_IB i = Sea
Else
{

If (Rule3 == false and Rule 4 == false))
S_IB i = Sea
Else
S_IB i = Land
}
}
2. For Each (IBi of UPB)
{ If (S_IB i−1 == Land and S_IB i+1 = Land)
S_IB i = Land Else If (S_IB i−1 == Sea and S_IB i+1 = Sea)
S_IB i = Sea
Else S_IB i =! (S_IB i ⊕ −1 ⊕ S_IB i+1 S_IB i+3)
}

5. Conclusion

In this paper analytical architecture for geo informatics system is discussed. Architecture compromises of three main units. Data acquisition, data processing and transformation analysis decision unit. Algorithm used to analyzed geo informatics system data sets which are used for different application such as land sea.

REFERENCES

[1] M. M Ullah Rathore, A. Paul, A. Ahmad, B.W Chen, B. H, and W. Ji, "Real Time Big Data analytical architecture for RS application," vol. 8, no. 10, October 2015.
[2] D. Agrawal, S. Das, and A. E. A, "Big Data and cloud computing: Current state and future opportunities," (EDBT), 2011, pp. 530–533.
[3] R. Schowenger, RS: Models and Methods for Image Processing, 2nd Ed. New York, Academic Press, 1997.
[4] J. A. Richards, X. Jia, RS Digital Image Analysis: An Introduction. New York, Springer, 2006.
[5] F. Zhang, Y. Wang, "Research on Big Data Architecture, key technologies, and its measures", IEEE 11th Int. 2013, pp. 1–4.
[6] X. Jiang, R. State, "A Big Data architecture for large scale security monitoring", IEEE Big Data, 2014, pp. 56–63.
[7] E. Christophe, J. Michel, "RS processing: From multicore to GP", IEEE vol. 4, no. 3, pp. 643–652, Aug. 2011.
[8] C. Eaton, T. Deutsch, G. Lapis, "Understanding Big Data "NY, USA: Mc Graw Hill, 2012.
[9] J. Shi, J. Wu, A. Paul, L. Jiao, "Change detection in synthetic aperture radar image based on fuzzy active contour models and genetic algorithms", vol. 2014, 15 pp., Apr.2014.