



## **Performance Analysis of Remote Sensing Application using Area Wise Prediction**

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### **Abstract**

Remote sensors from the Satellite or Aircrafts are generated by huge volume of data which can utilize for impending signification if collected data aggregated effectively incorporates by insight information. Data is collection from simple to hybrid devices, which are continuously working for technology around us and communicate with each other. These devices are transferring huge amounts of real time data daily. The transaction added to the synchronized inaccessible sensing data that is retrieving the useful information in the proficient way of classification in the direction of the severe computational challenges, analyze, the assortment, and accumulate, where gathered data is inaccessible. The real time sensing devices will continuously export data. In this work, we will implement the big data analytics on remote sensing datasets. We utilized BEST software for header analysis of the datasets and retrieving the full resolution image from the dataset. Then retrieved image is divided into smaller blocks for applying statistical. By applying certain rules and conditions in the form of algorithm, determine the land and sea blocks of image dataset. Our end results are proficiently analyzing real-time remote sensing utilizing the land beacon structure. Finally, a comprehensive investigation of the remotely intelligence earth beacon massive information for earth and ocean space are available by utilizing- Hadoop.



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Big data;  
Hadoop;  
Land;  
Remote Sensing;  
Statistical.

### **Introduction**

The expression "remote sensing satellites" is also called as the "aerial photography" regard as the depiction. The main research focused on the evolution of remote sensing satellites in four decades

i.e., 1960-2010. Detecting the portraits of the huge plane from expanded partitions utilized airborne picture making and they utilized to grab the pictures.<sup>1</sup> Remote sensing systems came into the photography and they have been fetched in satellites for depiction

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obtaining. To compare with planes, satellites cover<sup>2</sup> more surface regions and there are widely utilized.

Remotely detected symbolism from satellites<sup>3</sup> – investigate and upgraded with PCs - made it conceivable to recognize and screen these progressions. Only some groups are exceptional with the term remote sensing.

Remote satellites continuously obtaining high resolution pictures of the earth's surface on the base stations. Data will take care of base stations in running several partitions stepwise. These partitions process the data. After gathering data, it is preprocessing so as to eliminate the noisy elements in the data to obtain high throughput. The data transformed into pictures for the purpose of being comprehensible formats and these images can be analyzed. By utilizing parameters by pertaining the threshold provisions to the depictions will partition the picture into the number of blocks which can be analyzed easily processing in making decision and promoting. Then we analyzed the predicted regions from the land surface.

### Related Work

RS (Remote sensors) is utilized for ground observatory and streaming the continuous data and creates an extent of data. Many researchers implemented diverse areas of applications in satellite remote sensing data, for instance, the gradient based edge detection,<sup>4</sup> transformation, identification and so on. The continuous real time streaming data<sup>5</sup> with high speed or huge extent of data available in the form of big data which lead to a many challenges? In this regard, transformation of the sensor data from remote places are difficult to scientific understanding is challenging task. Satellite remote sensing is utilizing of various technologies to construct scrutiny and dimensions of destination that is usually recognizable to the stripped eye. The technologies in remote sensing are classified as, radar, thermal, seismic, sonar, LiDAR, electric field sensing, GPS and infrared radiation. The remote sensing satellites will export the data in the form of offline and online real time data

Many researchers developed models based on satellite data for coastline analysis and erosion.

For example, shoreline changing rates, erosion of coastal and accretion in coastal of Tamil Nadu<sup>6</sup> utilized satellite data. GIS tools<sup>7</sup> are used to analyze Multitemporal remote sensing data from 1976 to 2000 and twenty scenes are taken for changing pattern of accretion and erosion of sub aerial delta of Yellow River. Black and white aerial photographs<sup>8</sup> are utilized to estimating the shoreline change rate in Neuse River Estuary, USA. Space simulation<sup>9</sup> is introducing a new way of understanding the geographical space which includes the dynamic processes in the space analysis.

### Framework

#### Evaluation Methods

#### Dataset

Dataset is utilized in this work from "European space agency" which contains the number of tasks that are executed in the earlier period. And also took the necessary data for implementation and to examine the complex parameters for evaluation. After preprocessing, datasets will be added to description. Then this data set is classified into three main fields. The entire products are classified beneath of Advanced Synthetic Aperture Radar (ASAR).

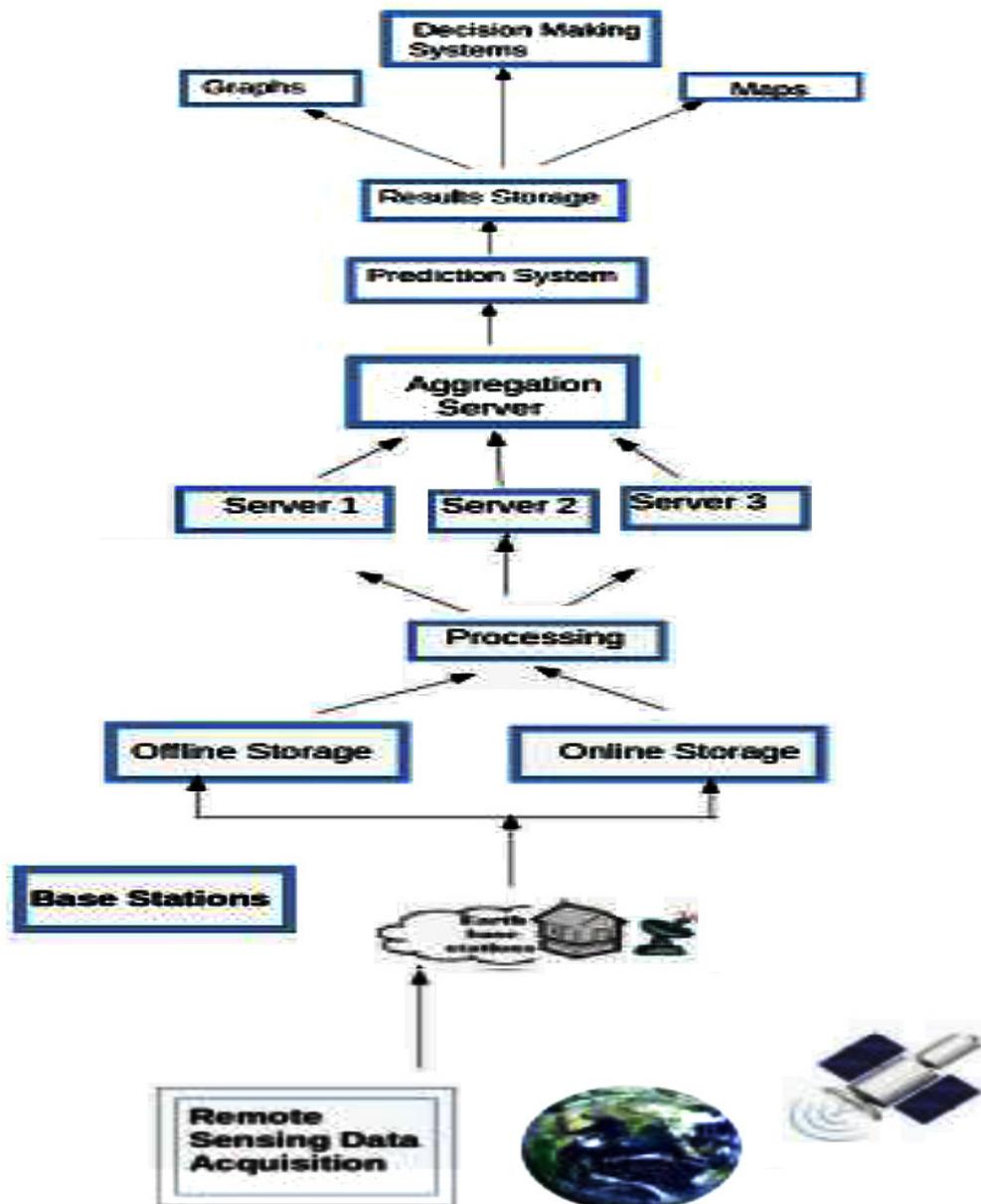
### Category 1: Agency of European

ASAR product optional domain is APM (Alternating Polarization Mode) and it includes both Co-registered pictures belongs to one of the three divergence amalgamation secondary modes (VV and VH, HH and VV, HH and HV). In addition, the result utilizes the Range Doppler (RD) algorithm and preprocessing data parameters accessible. It can be activated to infer added animated items for SAR account superior appraisal, alignment, and interferon metric applications, if accustomed of the device attainment. The entire products will be in the structure of (.N1) extension categorizer design.

Preprocessing data: In this phase, cleaning the data for removing the unwanted elements. The authentic preprocessing techniques consist of header analysis, missing values and noise elements. These datasets having will .HAN extension files. Given dataset is inputted to header analysis and it converting the dataset into picture format. For every time, it will carry on producing the set of documents that sustain the data retrieval.

HAN documentation contains investigation and restrictions of the datasets. This documentation contains size, largeness and magnitude in pixels, dimensions and constraints like SPH indicators, etc. After header observation completed the properties of the datasets are able to understand and the dimensions of the datasets will be utilized for partitioning the picture into an amount of chunks.

Full resolution pictures of the dataset are .N1 form in .XT documents. The information is set up to be export in the form of understandable for humans, which looks like GeoTIFF, TIFF picture formats. Preferring any of the result's format (for our experiment results we utilized TIFF) and sending the picture in needed directory file. A fundamental fault occurs if the time concerns and continuous without coordinating



3.1. Framework of remote sensing application

dataset. Beside the picture, it furthermore generates the accurate restrictions of the datasets.

**Domain 2: Resolution Image Mode Medium**

When the device was in picture mode the data accumulated at Level zero ASAR-IMM created. By comparing with ASA\_IMP, this result has lesser resolution but elevated radiometric resolution which is adequate for ice applications which apply to a continuous area besides the imaging swath and features a radiometric resolution (ENL). Preprocessing is same as the domain 1.

**Domain 3: Image in Global Monitoring Mode**

When the device was in global monitoring mode the data accumulated at Level zero ASAR-GM1 created. Each item covers an entire trajectory. The research work includes slant range to land modifications. Standard for ASAR Global Monitoring Mode is the strip-line product. By utilizing the SPECAN algorithm it processed to one km resolution approximately.

**Methodology**

In our proposed method, the image which is retrieved from the dataset is partitioning into a small blocks for analyzing the geometric parameters. The partition is done due to come across the precise information. For every chunk, identifying the statistical parameters and assessment analysis is prepared from blocks. In this work, every image is partitioned into 20 blocks; these blocks are utilized for accurate analysis.

The bunch of chunks derived from the picture will be using as input for the proposed algorithm. The algorithm acquires every chunk of the picture and updates the image list. This list is utilized diverse methods and functions for the purpose of analyze the statistical parameters of every chunk. For every picture chunk, the algorithm determines absolute difference, mean, standard deviation, etc.

For estimating decision analysis process, the major parameters are:

**Table 3.1. Data set of three major domains**

Domian	/Dataset Details	I/P Dataset Details	Final Dataset Output
ASA_APM	Alternating Polarization Mode	APM uses Range Doppler Algorithm used to drive higher level products for SAR image quality assessment, calibration, and interferometric applications,	ASA_APM. XT converted to image
ASA_IMM	Image Mode Medium Resolution Image	IMM uses Covers a continuous area along the imaging swath and features an ENL (radiometric resolution good enough for ice applications.	ASA_IMM. XT converted to image
ASA_GM1	Global Monitoring Image mode product	GM1 is processed to approximately 1 Km resolution using the SPECAN algorithm	ASA_GM1. XT converted to image

**Table 4.1. Maximum and minimum of parameters**

Product/ Dataset	Max_mean	Min_mean	Max_std	Min_std	Max_abs diff	min_abs diff
ASA_APM	43.3173687776	1.86531039356	10.4488577999	0.391309719305	0.391309719305	1.40931380522
ASA_IMM	126.605075138	0.616355714003	40.7494092775	0.0604999073497	85.5566586	0.130082799048
ASA_GM1	76.2293183657	2.6266050089	33.1323265705	0.637487603441	48.5039592165	1.98911740546

1. Xi (Mean) 2. SD (Standard Deviation) 3. AD (Absolute difference)

By means of the above mention limitations, the subsequent will help in constructing the provisions and decision making.

The variables and parameters utilized in our proposed algorithms.

The upper limit mean from mean of chunks is known as Maximum mean

Fixed size chunks of Picture are B1, B2, B3, B4, B5 ... BN \.

The maximum SD from SD of chunks is known as Max SD.

Number of lines in the Image = NR.  
 Number of pixels in every line = NSR  
 Block of image size = Total number of chunks in the picture = N ( N =NR xNSR)  
 BS  
 Mean of model values of chunk B i = X Bi where i = {1, 2, 3, 4 ... N}.

Maximum AD from AD of chunks is known as Max AD

Minimum AD from AD of chunks is known as Min AD.  
 Mean of all the chunks /Number of chunks = Centric mean

Summation of all values of the chunk B i /the size of chunk = X Bi

SD of all the chunks = Centric SD  
 Number of chunks

SD of sample values of chunk Bi. = SD Bi  
 AB between X Bi and SD Bi = Abs\_Diff  
 | X Bi - SD Bi | = Abs Diff

For simplifying the restrictions, the in detail conditions are identified. Those:  
 Mean less than Centric mean = MLCM  
 Mean greater than centric mean = MGCM  
 SD less than centric SD = SLCS  
 SD greater than centric SD = SGCS

Total chunks mean Bi / the total number of chunks = Centric mean

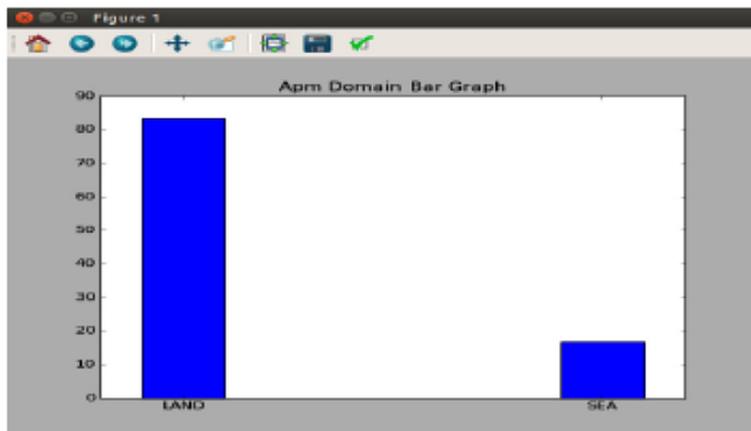


Fig. The output of land and sea percentages in the bar graph representation

S. No.	Product Domain	Product/ Dataset Number	No. of blocks
1	ASA_AMP	10	10*20=200
2	ASA_Imm	10	200
3	ASA_GM1	10	200

AD less than centric AD = ALCA  
 AD greater than centric AD = AGCA

In our approach, we build the following laws for detection of the region

1. Centric mean  $\geq$  Mean of Bi
2. Centric SD  $\leq$  SD of Bi
3. AD of Bi  $\leq$  Centric AD

```

For every (Bi) {
If (law1 == true and law2 == true)
Condition_Bi = earth
Else if (law1 == false and law2 == false)
Condition_Bi = ocean
Else {
If (law3 == false and law1 == false)
Condition_Bi = ocean
Else
Condition_Bi = earth}
}

```

For identifying the earth chunks

1. Centric mean  $\geq$  Mean of Bi
  2. SD of Bi  $\geq$  Centric SD
- Or
1. Centric mean  $\geq$  Mean of Bi
  2. AD of Bi  $>$  Centric AD
- Or
1. Centric mean  $<$  Mean of Bi
  2. AD of Bi  $>$  Centric AD

For identifying the ocean chunks

1. Centric mean  $<$  Mean of Bi
2. SD of Bi  $<$  Centric SD
3. AD of Bi  $>$  Centric AD

### Visualization of Data

The blocks are able to understand that whether they belong to land or sea regions after applying above rules for blocks of image. In our implementation, we take .csv file belongs to the land blocks and sea blocks for the better visualization of data. For this we utilized the python programming and done visualization for the obtained blocks based on the mean of the blocks. The packages in python programming are pandas, Numpy, matplotlib and seaborn which are utilizing for statistical analysis and understandable visualization.

For example, the land and sea percentages for domain Alternating Polarization Medium is  
 Percentage of Land is 83.3710954415  
 Percentage of Sea is 16.6289045585

### Analysis of Performance

We estimate the performance of proposed method by increasing the number of chunks size and predicting the surface area region of land area or sea area.

In our performance analysis testing, IMM products has 86 % land region than the other products which proves that highest land region has less sea region. With this we conclude that IMM has 13.9% sea region where the other products APM and GM1 has land ranging from 78-83% and sea 16-22 %. The table takes the 25 images as input and each produces 20 smaller divided partitions. Each partition will give  $20 \times 25 = 500$  chunks which will be used for predicting the surface region.

By calculating performance analysis, IMM gives more land region when compared with other products/ IMM has 84% land region and 15.4 % sea region whereas the APM and GM1 has land ranging from 77-83% and sea 16-23 %.

The table indicates the performance testing three that the GM1 has 85% land region (than IMM product and 14.9% of sea region whereas the APM and IMM products has land ranging from 77-84% and sea 16-23 %.

Global Monitoring Mode (GM1) is increasing the number of partitioning chunks which gives more land region and less sea region. Whereas APM (Alternating Polarization Mode) product maintains the constant percentage of land region as well as the sea region and it producing large amount of variation between percentages of regions is not seen in three performance testing made.

In case of Image Mode Medium Resolution Image (IMM) the land percentages are decreasing as increasing the number of chunks. As the number of images in the domain of IMM is used for performance testing gives the gradual decrease in land and sea regions.

### Conclusions

In this work, we analyze the dissimilar domains in the remote sensing satellites which are uninterruptedly releasing the data. With the different types of products are increasing we observed and analyzed the data behave with regard to land and sea surface regions. The data from satellite emitting continuously, surface area analysis will be less in time when different areas with diverse products are in use and analyze the surface regions. For analysis of large number of surface regions required high processing computational devices for ex, if we take 10 surface regions will require more than 500 products for each domain.

### Future Work

In further, we will extend our work not only for predicting and identify the land and sea regions but also include diverse areas like forest areas, sand areas etc. we extending this work for predicting the earthquakes, tsunamis and natural disasters that can be recognized with analysis of proper recommendation to avoid the natural disasters. In future we analyze rainfall prediction by utilizing the parameters like  $\text{CO}_2$ , hydrogen, nitrogen contents in air and corresponding land area whether the chance of rainfall is there or not.

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