Composite Image with a Geographic Information System Approach

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Abstract. Geographic information systems are used for spatial data processing. Data processing results from the system can be used as a tool to determine the condition of an area. By using several components one of which is coloring in geographical conditions in the region. The process of combining several colors to form a composite image that can show the clarity of the object. The results obtained from this study reveal the clarity of objects in the Banyumas Regency region by using levels in the band composition in spatial imagery

Keywords: GIS, level, band, image, composite.

1. Introduction
Geographical information systems can be utilized by system users to deal with geographic or geographic issues. Geography has geographic relations, including the surface of the earth's landscape. This section explores relations and characteristics, with computer support used to analyze the image so that the specificity of the image can be sharpened, so users can find out information from the image being processed. The information obtained results from the creation, handling, and storage so that it can be used. Composite image is a combination of multiple channel images. Compilation of composite images is intended to obtain a better visual picture. So that the object observation and sample selection can be improved. RGB is a technique or a way to display a composite image, in one image display there are three single images. RGB or Red Green Blue, or Red Green Blue is used as a technique for displaying images because the three colors are the three basic colors. And the combination of these three colors produces other colors. The difference in color in the composition of this composite image makes it easy to be able to see the appearance of different objects and can distinguish various objects clearly. Because each channel in the image has a different wavelength and shows a different color. The multispectral system produces coverage of regional images recorded on various spectral channels (bands). With this system, an area recorded on n channels will produce n images, each of which has a different spectral variation. Each channel is actually sensitive to certain features, according to the basis for choosing the width and interval spectrum as in the spectral reflection curve from laboratory observations. Sensitivity to certain features (eg variations in vegetation density) logically also contains insensitivity to other features (eg differences in soil color). However, if channels with wide wavelength intervals are used, the overall appearance is not well differentiated. Thus, to be able to
distinguish various types of objects properly, several channels are used together. Information on an 8-bit basis is stored in bytes. A byte is a unit of information consisting of 8 bits.

2. Methods
To get the image from the color composition, the following method is used:
Apply image compression, i.e. by compressing the pixel values of the original range (for example 0-15, 0-32, etc.) to 0-5, on all spectral paths involved then determine the channels that are colored red (and then all values the pixels are called new-red NP_s), which ones are green ( new-green NP_s ), and which ones are blue ( new-blue NP_s ). Apply pixel values to composite images (NP comp ) based on new-red NP, new-green NP, new-blue NP. Present a composite image to the monitor screen with predefined color palette guidelines for composite pixel values[1].

3. Basic Theory
Information on an 8-bit basis is stored in bytes. A byte is a unit of information consisting of 8 bits. For an 8-bit system (= 1 byte), each data (pixel) is stored in separate bytes. In other words, every 1 pixel will be saved as 1 byte. A value of 1 kilobyte (1KB) is equal to $2^{10} = 1024$. If an image consists of 500 columns and 1200 pixel rows, 600,000 bytes are needed. Image-storage systems with row-columns (raster / tesrelation systems) are stored with clear and consistent addresses according to position in rows and columns[1].

3.1. Sequential Band (BSQ)
Image with the sequential band format (BSQ) generated from each channel is saved as a separate file or file. The data storage sequence is carried out from the first line of channel 1, second line, third line, last line. Data is stored as channel 1 file and the process is carried out from the first row to the second channel until the last row.

![Figure 1. Channel 1](image1)

![Figure 2. Channel 2](image2)
Table 1. BSQ Storage Format

| BSQ format | Pixel value          |
|------------|----------------------|
| Channel 1  | 10 11 20 40 1 12 2 5 7 10 2 3 2 2 2 ... 15 |
| Channel 2  | 2 14 32 30 1 18 4 2 8 14 3 4 4 3 3 ... 14 |
| Channel 3  | 70 30 30 31 80 15 64 65 32 81 75 70 70 70 ... 42 |

3.2. Band Interleaved By Line (BIL)
The storage process is carried out from the first row of channel 1 followed by row 1 to channel 2, first line to channel n followed by line 2 to channel 1, line 2 to channel 2, line 2 to channel n and so on until image n. The BIL format for all image data in n will be saved as one file.

Table 2. BIL Storage Format

| BIL Format | Pixel value          |
|------------|----------------------|
| Channels   | 10 11 20 40 1 12 2 5 7 10 2 3 2 2 2 ... 15 |
| 1,2,3; Row 1 | 31 31 80 |
| etc.       |                      |

3.3. Band Interlayed By Pixel (BIP)
Storage is carried out from pixel 1 line to 1 channel, pixel 1 line 1 channel 2, ... pixel 1 last line channel 1, last pixel last line channel 2 and so on.

3.4. Run-Length Encoding (RLE) and Block Encoding
Storage is done by re-expressing the number of consecutive pixels with the same value as one value pair. Block encoding is a compression method that resembles RLE but its application is dimensional (not just along lines).

3.5. Landsat Band 8
Image as raw data is processed separately in each band, image processing requires conversion and merging of bands into image data sets so that an image is composed of a combination of several bands which is then called a composite image.

Table 3. Landsat Composite

| Closing Type | Combination of Spectral Channels |
|--------------|----------------------------------|
| The waters   | Bands 1, 5 & 8 / Bands 2, 3 & 4  |
4. Result And Discussion

4.1. Image pre-processing
Pre-processing is done to prepare the image data as initial processing before processing more images. This procedure aims to correct the image data that is experiencing distortion or error into its original form. There is work being done at the stage of pre-processing of the image are: correction of geometric and correction radiometric. Landsat 8 image data generally has been corrected geometrically can be seen from its parallelogram shape in accordance with the direction of motion recording vehicle. While the radiometric correction needs to consider the objectives, the segmentation and majority method actually requires the original image so as to facilitate the segmentation of recorded objects. In pre-processing often encounters an image mosaic stage because the study area is on two different recording sheets, as the Banyumas district is in path 120 raw 65 and path 121 raw 65. This condition requires that the interpreter combines the two sheets after being united will be cut again according to the study area.

Figure 4 is two different landsat images, while the study area is in both images so it needs to be mosaics.

![Figure 4](image4.png)

**Figure 4.** Path 120 raw 65 and path 121 raw 65 (Landsat image 8)

Figure 5 below is the result of a mosaic of two images.
Limitations on the ability of the hardware to work will greatly affect the success of the work process, one of which is caused by very large data memory with limited hardware capacity. Limitation of image coverage in accordance with the study area will reduce the workload, in other words this procedure is an attempt to select data for further processing in research analysis and ignore data not included in the study area.

4.2. *Image Composite*

The composite image used is the color composition of the band that is able to highlight the geomorphological theme. Noting the image used is Landsat 8 image, with 11 bands owned making it easier to do color composites. Identification for the theme emphasizes how to distinguish basic objects such as water, soil and vegetation. These three basic objects each have sensitivity in each band so it is necessary to avoid bands 1, 2 and 3 because the band will be able to obscure the basic information on Landsat 8 images that are classified as medium scale. Bands 1, 2 and 3 each have their expertise on water objects, settlements and vegetation so that the results of visualization have not been able to characterize the object specifically. Figure 6 below shows the composite landscape view 467 used.

Composite recommendations for identification on Landsat 8 imagery so that it gives rise to the uniqueness of the color of objects and the distinct difference is composite 467. This composite
presents three main objects expressly, vegetation is represented in green and its gradation shows the condition of vegetation where dark green indicates dense or healthy vegetation and light green indicates needle-leafed vegetation or grassland.

Figure 7. Image of a part of Banyumas (bright green agriculture)

Figure 8. Image of a portion of the Banyumas area (Vegetation: bright red)

Band ratio is used to produce certain effects in relation to the spectral aspect of the vegetation, the reduction of the shadowing effect, and the lithology. Through this material, a new image with pixel values is generated which is the quotient of the pixel value of channel A and channel B.

An image can emphasize the aspect of vegetation density, especially for the infrared channel close to the red channel. Besides that, in general, penis material can suppress the effects of shadows, for example on vegetated slopes.
In addition to image sharpening, there are still other transformations that are often used to produce new information. This transformation can be grouped into two, namely: a) Transformations that can sharpen certain information, but at the same time eliminate or suppress other information; and b) Transformations that 'summarize' information by reducing the dimensionality of data. Unlike the case with various sharpening algorithms, this particular transformation operates more on the spectral dominant. Another feature is that in many cases, this transformation involves several spectral channels at once.

**Figure 9.** Image of a portion of the Banyumas area (Vegetation: Bright green)

Light blue indicates rice fields whereas settlements and land objects are visually dominant in red color and gradation. The following is an example of the result of calculating the number of pixel counts based on channel 1 in the table 1 below.

**Table 4.** Pixel values from channel 1

| Pixel value | 2 | 26 | 0 | 2 | 0 | 2 | 5 | 9 | 12 | 0 |
|-------------|---|----|---|---|---|---|---|---|----|---|
|            | 36| 33 | 2 | 0 | 2 | 2 | 9 | 7 | 0 | 0 |
The result of the composite in a channel 2 represented in table 5.

**Table 5.** Pixel values from channel 2

| Pixel value |
|-------------|
| 2 34 0 0 0 0 0 5 5 5 0 |
| 36 31 2 0 0 2 5 2 0 2 |
| 36 36 2 0 0 5 7 5 0 7 |
| 34 34 0 0 2 14 14 17 0 5 |
| 31 34 2 0 0 0 14 2 0 10 |
| 2 31 2 2 2 0 0 14 7 5 |
| 0 2 0 2 0 2 2 5 5 7 |
| 14 17 12 17 26 29 2 2 7 5 |
| 17 7 12 19 29 31 29 34 0 2 |
| 7 5 5 29 29 34 34 34 0 2 |

The result of the composite in a channel 3 represented in table 6.

**Table 6.** Pixel values from channel 3

| Pixel value |
|-------------|
| 0 33 0 0 0 0 31 29 31 0 |
| 33 31 0 0 0 0 24 2 0 0 |
| 31 33 0 0 0 33 31 31 0 24 |
| 27 31 0 0 0 22 20 18 0 33 |
| 24 29 0 2 2 2 18 0 0 22 |
| 2 29 0 2 0 2 0 15 24 33 |
| 0 0 0 2 0 0 0 33 33 31 |
| 20 18 18 15 31 33 2 0 29 33 |
| 18 24 15 24 27 31 29 27 0 0 |
| 27 33 33 31 33 31 29 27 0 2 |

5. **Conclusion**

The image as raw data is processed separately in each band, by using the band's color composition it can highlight the contents of the image, (for example land) and provide basic object information on the
image. In utilizing spatial imagery as a data source to be displayed on a geographic information system, it is very influenced by the complexity of the objects stored in the image. The results obtained from this study reveal the clarity of objects in the Banyumas Regency region by using levels in the band composition in spatial imagery.

6. References

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