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20 - 21, June 2012
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PREFACE

The activities of the International Conference is in line and very appropriate with the vision and mission of the UBL to promote training and education as well as research in these areas.

On behave of the First International Conference of Engineering and Technology Development (ICETD 2012) organizing committee; we are very pleased with the very good responses especially from the keynote speakers and from the participants. It is noteworthy to point out that about 45 technical papers were received for this conference

The participants of conference come from many well known universities, among others: Universitas Bandar Lampung, International Islamic University Malaysia, University Malaysia Trengganu, Nanyang Technological University, Curtin University of Technology Australia, University Putra Malaysia, Jamal Mohamed College India, ITB, Mercu Buana University, National University Malaysia, Surya Institute Jakarta, Diponogoro University, Unila, Universitas Malahayati, University Pelita Harapan, STIMIK Kristen Newmann, BPPT Lampung, Nurtanio University Bandung, STIMIK Tarakanita, University Sultan Ageng Tirtayasa, and Pelita Bangsa.

I would like to express my deepest gratitude to the International Advisory Board members, sponsors and also welcome to all keynote speakers and all participants. I am also grateful to all organizing committee and all of the reviewers which contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector which give us endless support to these activities, such that the conference can be administrated on time.

Bandar Lampung, 20 Juni 2012

Mustofa Usman, Ph.D
ICETD Chairman

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Forest Fire Detection Using String Matching In The Satellite Imagery

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Abstract - **Wildfires are still one of the problems that are difficult to overcome and into the spotlight of the world, especially those related to Global Warming or Global Warming. During this time, it can be resolved using conventional means, but it often happens that problems in the field of fire leads to delayed treatment. Seeing these conditions, it would require methods or the relatively more rapid manner. Forest Fire Detection Systems using String Matching on the satellite imagery particularly hotspot data can be used as one solution. System uses the Boyer-Moore String Matching Algorithm on the image or images of satellite imagery by selecting a color image, convert** image forms the string, and then performed a search with string.Sistem way pattern matching can provide output in the form of a warning if there are differences in the pattern string is found and exceeds the tolerance is understood as an indication of a fire on the specific forest area being processed.

Keywords - **Forest Fire Detection System, Image, Boyer-Moore String Matching Algorithm, String, ASCII**

I. INTRODUCTION

To prevent flooding, erosion and drought as well as absorbing CO2 gas. Various measures and systems to solve this problem have been done and built, for example by regular patrol in the forest system, the laws and legislation to protect the forest. But there are times when an attempt was missed and the system of functions so that there are still leaks to this problem. weakness of conventional systems to detect these problems that led to the idea of using automation to increase the capacity and capability of this system of detection problems. Expected by the automated system is the system will not be careless and misses to perform its functions which are real time. Satellite technology is increasingly being used for various needs manusia.Salah of which is imaging the earth from space, to record and analyze the state of the earth. Imaging functions can be used for fire detection systems and illegal logging

II.THEORY OF SUPPORT

2.1. String Matching

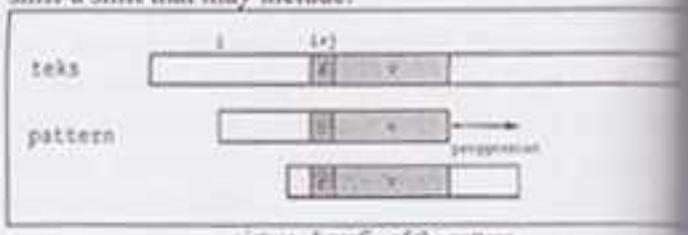
In the world of informatics, there are a lot of String Matching-based applications, ie applications that require a search for a particular string pattern in a text. In simple terms the concept of string matching can be translated as a way to search the same string in a collection of texts (documents) or a database. This concept is similar to the Find function in your word processor (Word processor) or in the Query database But in its development, the string matching is not only defined as such a simple concept. String matching is the [illegible] correction based quipped with certain patterns. Some [illegible] such as string matching

a. String Matching algorithm is often called the [illegible] approximate string matching, namely a search for [illegible] patterns (containing some process that is counting [illegible] number of different characters, insertion and dele[illegible] characters) so close to the pattern or the pattern [illegible] string being searched.
b. String search algorithm is a process of finding a pi[illegible] satau or some string that is found in a collection or [illegible] string. The simplest path is to read the characters [illegible] one and calculate the position of the existing error [illegible] searched string.

2.2 Boyer-Moore algorithm

Boyer-Moore algorithm is a string search algo[illegible] published by Robert S. Boyer, and J. Strother M[illegible] 1977.Algoritma is regarded as the most efficient algor[illegible] applications such umum.Tidak string search algorithm [illegible] earlier, the Boyer-Moore algorithm starts matchi[illegible] characters from the right pattern. The idea behi[illegible] algorithm is that by starting the matching characters fro[illegible] right, and not from the left, it will be more informa[illegible] obtained.

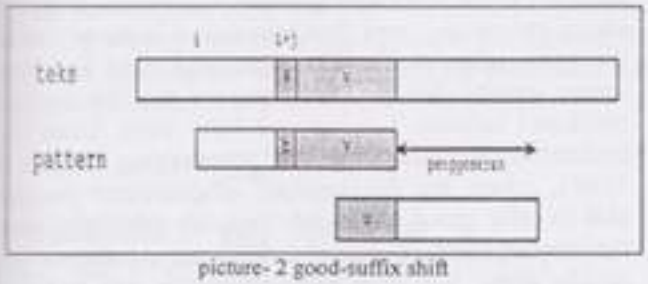
2.2.1 How it works For example, there is a matchi[illegible] that occurs in the text [i .. i + n - 1], and consider th[illegible] mismatch occurs between the text [i + j] and pattern [j] wi[illegible] <j <n. Means, text [i + j + 1 .. i + n - 1] = pattern [j + 1 .. [illegible] and a = text [i + j] is not equal to b = pattern [j]. If u is a [illegible] of the pattern before the b and v is a prefix of the patter[illegible] shift-a shift that may include:



picture- 1 prefix of the pattern

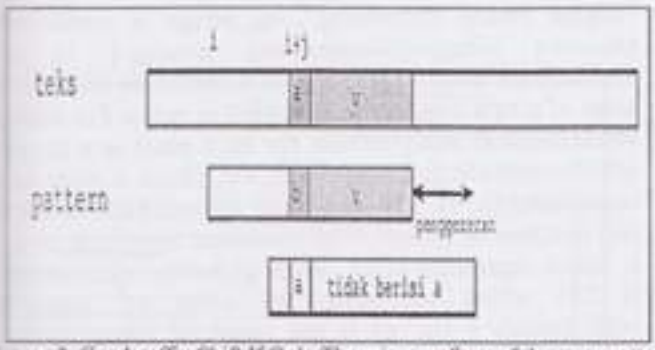
Good-suffix shift consists of aligning the pieces of tex[illegible] + 1 .. i + n - 1] = pattern [j + 1 .. n - 1] with the rig[illegible] occurrence in pattern, which is preceded by a di[illegible] character with the pattern [j]. If there is no such piece[illegible]

the algorithm will align the text of the suffix v [i + J + 1 .. i + n- 1] with the prefix of the same pattern.

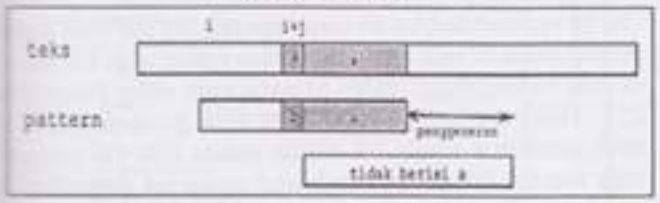


picture- 2 good-suffix shift

If Only There is a prefix v of the same pattern with a suffix of u



Picture-3. Good-suffix Shift If Only There is a prefix v of the same pattern with a suffix of u



Picture-4 .Penggeseran *Bad-Character shift* if the character not contain a Chraracter

1. Bad-character shift consists of aligning the text [i + j], with the emergence of right-most character in the pattern. If the character is not in the pattern, the pattern will be aligned with the text [i + n + 1]. Systematically, the steps are performed Boyer-Moore algorithm when the match string is:
2. Boyer-Moore algorithm starts at the beginning of the text pattern matching.
3. From right to left, the algorithm will match character by character pattern with the corresponding character in the text, until one of the following conditions are met:
4. Character in the pattern and the text is compared do not match (mismatch).
5. All characters in pattern matching. Then the algorithm will notify the discovery in this position.
6. The algorithm then shifts the pattern to maximize the value of good-suffix shift and the bad-character shift, then repeat step 2 until the pattern at the end of the text.

2.2.2 Complexity:

Table for the bad-character shift and the good-suffix can be calculated by time and space complexity of O (n + σ) with σ is the alphabet of the space. While the search phase, this algorithm takes time of O (mn), in the worst case, the algorithm will perform 3n matching characters, but the best performance of this algorithm will only perform O (m / n) matching.

2.2.3 Pseudocode Boyer Moore algorithm:

Counters Table bmBc

```
Procedure preBmBc(
   input P : array[0..n-1] of char,
   input n : integer,
   input/output bmBc : array[0..ASIZE-1] of integer
)

Deklarasi:
   i: integer

Algoritma:
   for (i := 0 to ALPHABETSIZE-1)
      bmBc[i] := n
   endfor
   for (i := 0 to n - 2)
      bmBc[P[i]] := n - i - 1
   endfor
```

Pseudocode Boyer-Moore Algorithm

```
Procedure BoyerMooreSearch(
   input m, n : integer,
   input P : array[0..n-1] of char,
   input T : array[0..m-1] of char,
   output ketemu : array[0..m-1] of boolean
)

Deklarasi:
   i, j, shift, bmBcShift, bmGsShift: integer
   BmBc : array[0..ALPHABETSIZE] of integer
   BmGs : array[0..n-1] of integer

Algoritma:
   preBmBc(n, P, BmBc)
   preBmGs(n, P, BmGs)
   i:=0
   while (i<= m-n) do
      j:=n-1
      while (j >=0 n and T[i+j] = P[j]) do
         j:=j-1
      endwhile
      if(j < 0) then
         ketemu[i]:=true
         shift := bmGs[0]
      else
         bmBcShift:= BmBc[charToInt(T[i+j])]-n+j+1
         bmGsShift:= BmGs[j]
         shift:= max(bmBcShift, bmGsShift)
      endif
      i:= i+shift
   endwhile
```

2.2.4 Sample of Boyer Moore Algorithm Implementation

Shift by: 1 (bmGs[7]=bmBc[A]-8+8)

Shift by: 4 (bmGs[5]=bmBc[C]-8+6

Shift by: 7 (bmGs[0])

Shift by: 4 (bmGs[5]=bmBc[C]-8+6)

Shift by: 7 (bmGs[6])

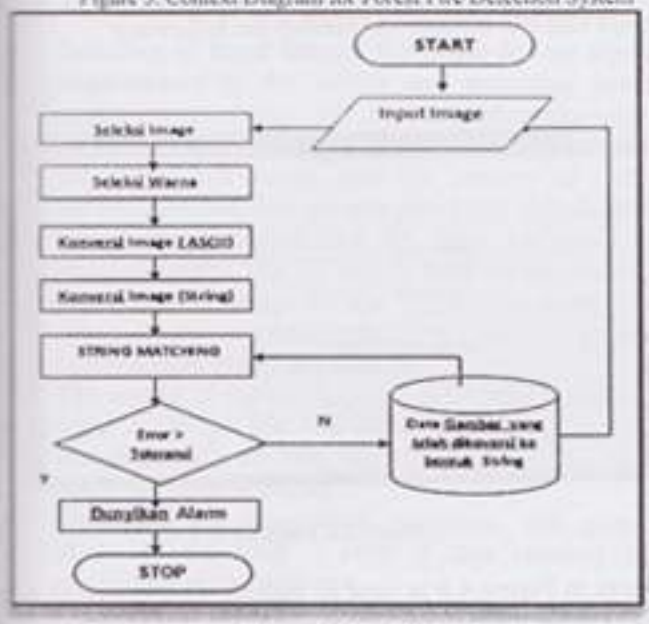
In the example. Above: AlgoritmaBoyer-Moore make comparisons 17 characters

2.3. Image Processing

Image processing or image processing is a form of an image or images with numerical caramemproses of the drawing, in which case the process is each pixel of the image atautitik .. One of these image processing techniques make use of the computer as a device to process masingmasingpixel of a gambar.Olch because that term appears in the processing or digital image, or "Digital Image Proces Istilahmanipulasi image or "Image Manipulation" are used to name istilahpemrosesan Image or image. "Digi image processing" was first introduced in New York, US the early tahun1920's. The first time used to improve image quality delivered newspapers that lie under the olehkabel between London and New York. Until the perkembangannyatidaklah too encouraging. But in the 1960's, where the development of computer yangpesat able to offer speed and higher capacity dariimplementasi the development of image processing algorithms that rapidly again. For now pemrosesancitra has surrounded use of a variety of disciplines including the field Architecture, Geography, IlmuKomputer, Medi Photography, Archaeology, and other sebagainya. "Digital Image Processing", an image is considered sequence bilanganbilanganyang arranged in a dimensional array. A picture is a rectangle and contain array of pixels that can be specified in value. For example kitadefinisikan that function for each pixel is a (x, y) adalahamplitudo (eg brightness, etc.) from a point located coordinates (x, y). The amplitude of each pixel in the for real numbers or integer.Nilai minimum amplitude of a pix 0, which represents black, while generally nilaimaksimum is 255 which represents the color of digital im putih.Sebuah a [m, n] is the result of discretization of image analoga (x, y) using a sampling process that is often referred to as process color images digitization.Sebuah can be represented by an array containing the data dua combination of red, green, and blue (otherwise known as or Red Green Blue). value of each each color range from 255. There are two ways to store each pixel that is by each pixel in a single bit which means that the computer only use the 0dan 1 or black and white for each pixel and storing each pixel in the data byte size of 8 bits. If using latter way, then the maximum value of each pixel is 25 "Digital Image Processing", an image is considered sequence bilanganbilanganyang arranged in a dimensional array. A picture is a rectangle and contain array of pixels that can be specified in value. For example kitadefinisikan that function for each pixel is a (x, y) amplitudo (eg brightness, etc.) from a point located coordinates (x, y). The amplitude of each pixel in the for real numbers or integer.Nilai minimum amplitude of a pix 0, which represents black, while generally maksimum val 255 which represents the color of digital images putih.Seb a [m, n] is the result of discretization of an image analog y) using a sampling process that is often referred to as digitization.Contoh a result of the process shown in Figu where for the pixel located dikoordinat [m = 10, n = 3] ha integer value of the brightness of 110. In the picture, ther 16 rows and 16 columns, with the value assigned to each **result** rounding integer value closest to the average of brightness of the pixel itself tersebut.Sebuah color image be represented by an array containing the data dua combination of red, green , and blue (otherwise know

RGB or Red Green Blue). value of each color range from 0 to 255. Terdapatdua way to store each pixel that is the way to save their masingpixel in a single bit which means that the computer can only use the 0 and 1 or black and white for each pixel and by storing each individual pixel in the data- an 8-bit byte of data. If using the latter way, then the maximum value of each pixel is 255.

Figure 5. Context Diagram for Forest Fire Detection System



Picture 6. Flow Chart of

III. RESULT OF REASERCH

3.1. Software Working mechanism of software

a. Working mechanism of the System Software is developed as a whole based Input-Process - Output. Each activity or process contained within the system comprising:

1. A. InputImage or Picture

a. Input / Put an acceptable system is a File Image Image which is a satellite imaging results (Data Hotspot) that ends / extensions GIF or JPEG by Size (Resolution (pixel)) or a specific dimension (1000> = x> = 300pixels and 1000> = y> = 400pixels)

b.At this stage, the process is to check / select and receive pictures or images based on criteria such as those mentioned in Input.selain system will reject it.

c.The result is that only the image size according to the provisions and the extension only GIF or JPG .

2. .Color selection:

a. The input is the output of the phase Input Image

b. The process is done is to choose or select to only 4 colors to be a component of the image to the next stage of the process or

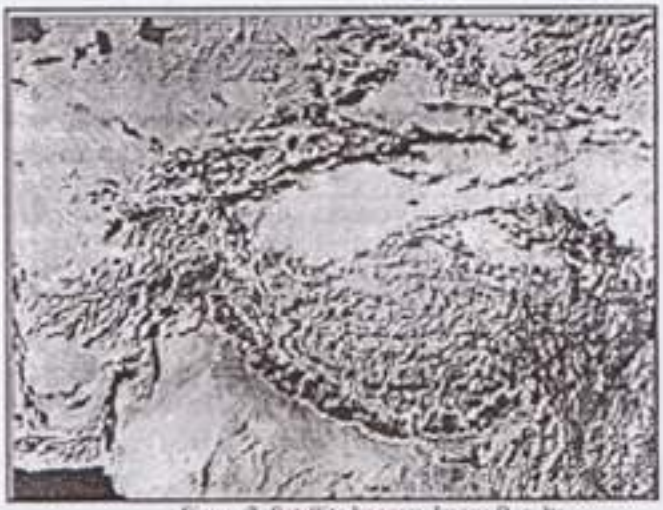


Figure 7. Satellite Imagery Image Results

a. The result is Imageyang only display 4 colors: Red, Orange, Yellow (if any) and white in the background ..

Figure 8. Pictures showing the results of Figure 4.3 Color Selection

2. Image conversion to String

a. The input at this stage is the image that is output from Color Selection

b. Process that happens all the data is first converted into the form of ASCII / Byte For example: 1 pixel with the color red is 255,0,0 bytenya (RGBnya). Binary is: 11111111 00000000 00 million. Where the conversion starts from the pixel located at position (1,1) or the upper left corner to the position of the pixel located (m, n) or the lower right corner

Convert direction from left to right n columns

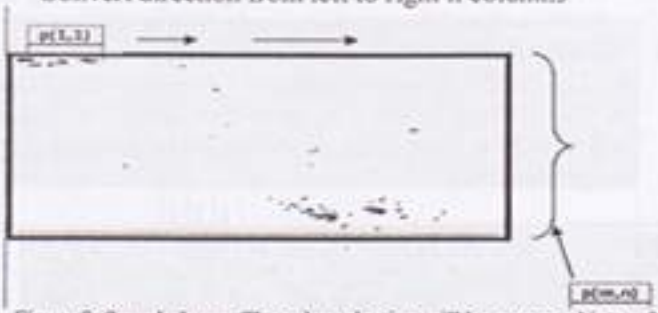
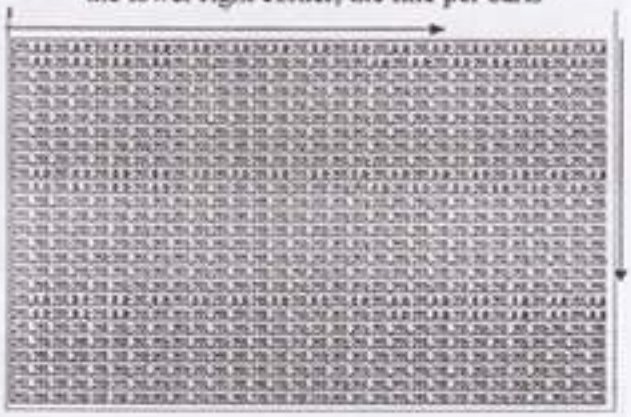


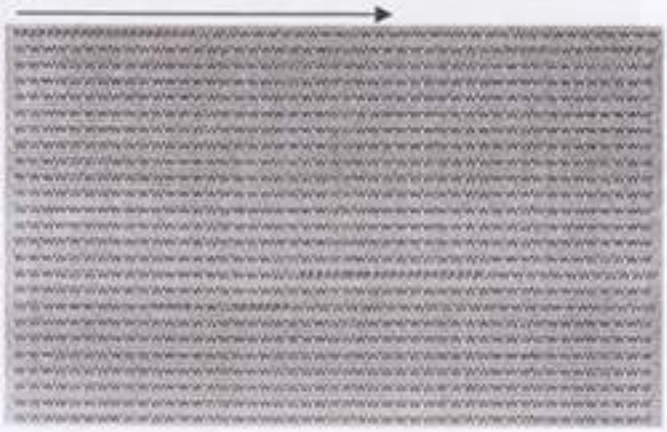
Figure 9: Sample Image The color selection will be converted into a form or ASCII format

The conversion of ASCII data to a string of top left corner to the lower right corner, the line per baris



10Contoh image Image Data Conversion Results in ASCII Format

After the ASCII data is generated, then the next step is to convert the data into the form of a String with the provisions of the displayed character string consisting only of the type 4 W for White or White, Yellow or Y for Yellow, Orange and O to R for Red or Merah.Data string obtained from the conversion of 3-byte binary that represent the colors R, G, B, or Red, Green and Blue.untuk each pixel can be seen in table 4.1



1. Matching String (String Matching)
   a.Input to this phase is the result Conversion (In String Format)

b.In the Match String, The algorithm used is a St Matching Algorithm "Boyer Moore" Systematically steps are performed Boyer-Moore algorithm when match string is: A. Boyer-Moore algorithm matching the pattern at the beginning of teks.Dari to left, the algorithm will match character by char pattern with the corresponding character in the text, one of the following m baris are
   • The characters in the p ıe text compared do not match (mis
   • All characters in pattern matching. Then the algor will notify the discovery in this position.

2. The algorithm then shifts the pattern to maximize the of good-suffix shift and the bad-character shift, then steps 1 through pattern at the end of the

4.2. Results Interface Design Software

Software designed by starting from the results of inter design that can be seen in Gambat the following:

a. Form Login :

Figure 12. Login form

Form in Figure 4.9 is used to include the identity of Ad It is necessary to ensure the safety of the system because the Admin users who have registered are allowed men identity system.

b. Main Form:

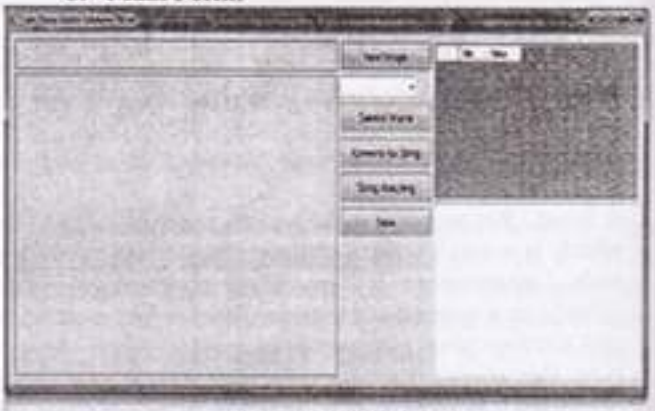


Figure 13. Main Form Display

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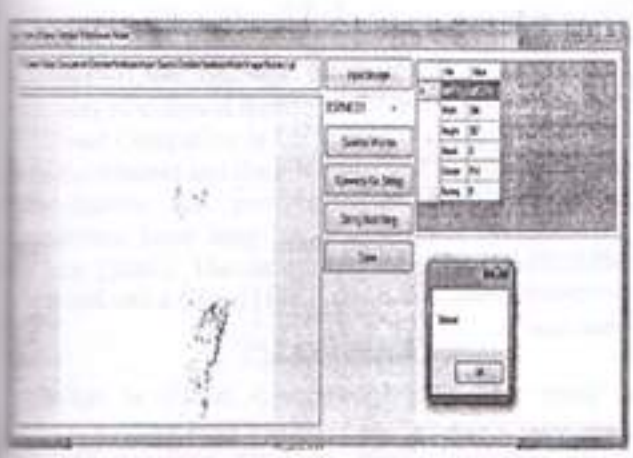

Figure 14 Display Color Selection Results

IV. CONCLUSIONS AND RECOMMENDATIONS

1. Detection of forest fires on the Boyer-Moore algorithm is implemented in the search and matching patterns or patern on the Image file that has been converted to a string and saved to the database prior to the conversion of the string last image and the pattern of differences between the two files are compared this is indicated fires.
2. Forest fire detection can be done by using satellite imaging results. But the results are very dependent on the data inputted image or the input it disebabkan.karena using more accurate data as input, output will menghaslkan closer to the truth.
3. The results of the developed system relies heavily on the input or image file. On different sides, image satellite imaging results are very dependent on weather conditions when the satellite passes.
4. Determine the appropriate tolerance, will give results closer to the truth .. even if this requires complex mathematical calculations.
5. Conclusions and Recommendations

CONCLUSION

1. Forest fire detection can be performed using String Matching Techniques on the satellite imagery, can produce output. Of the alarm is a warning indicating the possibility of fires have occurred at the forest site tertentu.Ini, can assist the Department of Forestry to obtain a relatively fast inforormasi about forest fires that can be stiffened in the handling of a relatively more rapid.
2. Detection of forest fires on the Boyer-Moore algorithm is implemented in the search and matching patterns or patern on the Image file that has been converted to a string and saved to the database prior to the conversion of the string last image and the pattern of differences between the two files are compared this is indicated fires.
3. Forest fire detection can be performed using the satellite imagery, namunsangat depend on the input side image.Di different file, image satellite imaging results are very dependent on weather conditions when the satellite passes.

SUGGESTION

1. This research can be developed Used Weth improve the performance of the Program, through the use of String Matching Algorithms and techniques more quickly.
2. Can use the Image other than the data hotspot.
3. Role of Government in this regard related agencies such as Department of Forestry and BMKG (the Meteorology and Geophysics), especially in the provision of satellite imagery data which results free of charge will facilitate researchers to provide more optimal results

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