A REVIEW ON pH LEVEL DETERMINATION OF SOIL USING IMAGE PROCESSING TECHNIQUES

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ABSTRACT

In agriculture the most important factors from the farmers point of view is the quality and quantity of product they yield. Soil is the most essential natural resources that have been recognized used to describe the degree of acidity or basicity which affect nutrient availability and ultimately plant growth pH of 7.0 is neutral, and soils above or below this value are either alkaline or acidic, respectively. Soil colour is visual perceptual property corresponding in humans to the categories i.e. red, green, and blue and others. Soil colours are the parts of visual perceptual property where digital values of red, green and blue (RGB) provide a clue for spectral signature capture of different pH in soil. The pH properties of the soil have been used to describe the degree of acidity and basicity which ultimately affects the growth of the crops. So in this paper the review has been carried out for the determination of pH level in the soil by digital image processing.

Keywords- agriculture, soil, pH level, neutral, RGB, Digital image processing

1. INTRODUCTION

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications. Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices, graphics software etc. The common steps in image processing are image scanning, storing, enhancing and interpretation. The amplitudes of a given image will almost always be either real numbers or integer numbers. The latter is usually a result of a quantization process that converts a continuous range (say, between 0 and 100%) to a discrete number of levels.

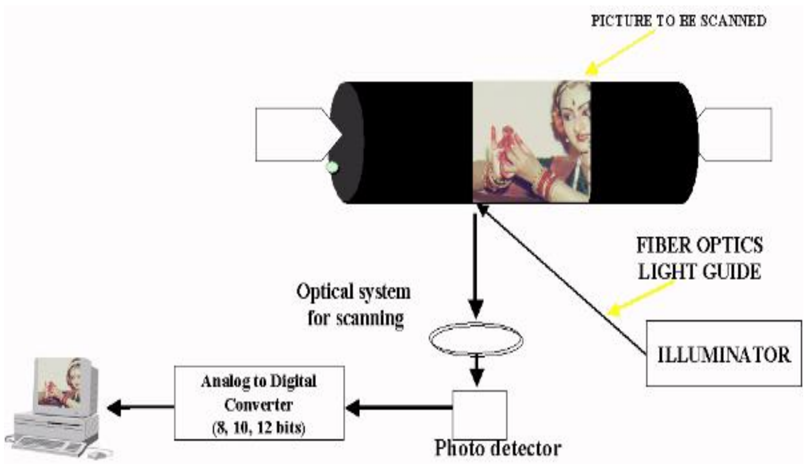

Fig-1 schematic diagram of image scanning

In certain image-forming processes, however, the signal may involve photon counting which implies that the amplitude would be inherently quantized. In other image forming procedures, such as magnetic resonance imaging, the direct physical measurement yields a complex number in the form of a real magnitude and a real phase. For the remainder of this book we will consider amplitudes as reals or integers unless otherwise indicated.

The pH of soil is an important factor in determining which plants will grow because it controls which nutrients are available for the plants to use. Knowing the pH of the soil will quickly allow user to determine if the soil is suitable for plant growth and what nutrients will be most limiting .It provide information on the potency of toxic substances present in the soil. It is indicative of the status of microbial communities and its net effect on the neutralization of organic residue and the immobilization of available nutrient. Soil pH is a measure of the relative acidity or basicity of a given soil. The pH scale (0-14) is a logarithmic expression of hydrogen ion activity. A pH of 7.0 is neutral, and soils above or below this value are either alkaline or acidic, respectively. A soil with a pH of 6.0 is ten times more acidic than a soil of pH 7.0. Changes in soil pH dramatically affect the availability of nutrients to growing crops. The pH meter is the preferred method for determination of soil pH. The flow of basic image processing techniques for determination of pH in the soil is shown below:

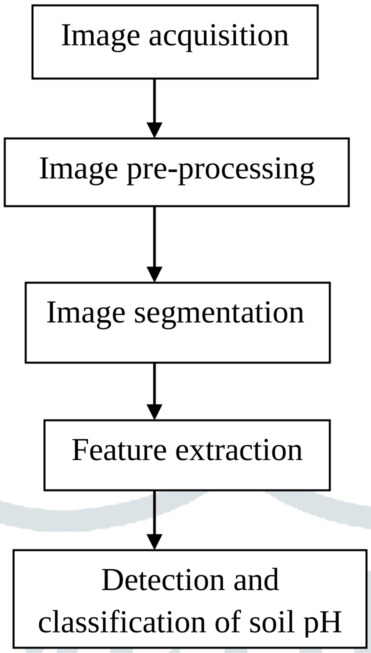

Fig-2 Flow of basic image processing techniques for determination of pH in the soil

A soil analysis is a process by which elements such as P, K, Ca, MG, Na, S, Mn, Cu, Zn are chemically extracted from the soil and measured for there "plant available "content within the soil sample. The soil pH reflects whether a soil is acidic, basic or alkaline. The acidity neutrality or alkalinity of a soil is measured in terms of hydrogen ion activity of the soil water system .The negative logarithm of the H ion activity is called pH and thus pH of a soil is a measure of only the intensity of activity and not the amount of acid present. The pH range normally found in soil varies from 3 to 9.

Mathematically pH is represented as,

$$\text{Log } 1/H = \log H+$$

Following table shows soil pH and Interpretation

<5.0	5.5	6.0	6.5-7.5	7.5-8.5	>8.5
Strongly acid	Moderately acid	Slightly acid	Neutral	Moderately Alkaline	Strongly Alkaline
Not recommended	Maybe recommended	Recommended	Best Range For most crop	Maybe recommended	Not recommended

Soil pH can be determined from soil color using on digital image processing techniques. In which digital photographs of the soil samples were used for the analysis of soil pH. Soil color is visual perceptual property corresponding in humans to the categories i.e. red, green, and blue and others. Soil colors are the parts of visual perceptual property where digital values of red, green and blue (RGB) provide a clue for spectral signature capture of different pH in soil denote the wave lengths of electromagnetic radiation in spectrum band 3(0.63-0.69 µm), band 2 (0.52-0.60µm) and band 1 (0.45-0.52 µm) are distinctly represented by different wavelengths. Reflected energy (Blue, green and red) from the various materials which was captured by digital cameras is responsible for signature capture of the object. Soil colors charts were derived though digital camera is the part of visual perceptual property where digital values of red, green and blue (RGB) provide a clue for spectral signature capture of pH in soil.

The filter pattern is 50% green, 25% red and 25% blue, hence is also called RGBG, GRGB, or RGGB. It is named after its inventor, Bryce Bayer of Eastman Kodak. Bayer is also known for his recursively defined matrix used in ordered dithering. Alternatives to the Bayer filter include both various modifications of colors and arrangement and completely different technologies, such as color co-site sampling, the Foveon X3 sensor, the dichroic mirrors or a transparent diffractive-filter array.

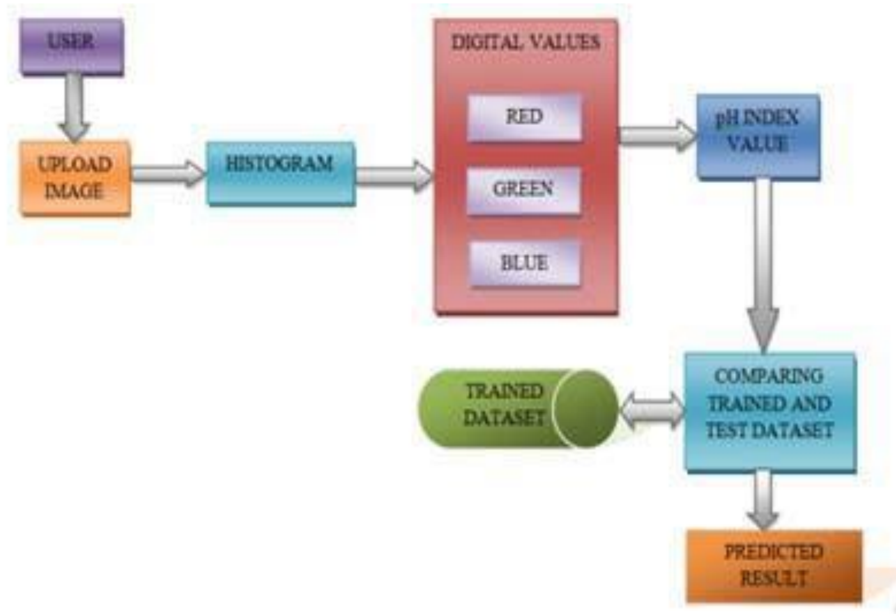

Fig- 3 Block diagram of RGB wavelength

Bayer filter technique separate the colour bands for given information about the intensity of light in red, green, and blue (RGB) wavelength regions. Digital photographs or images were displayed with colour composites as well as incorporated wavelength bands corresponding to red green and blue colours. Bayer filter technique separate the colour bands for given information about the intensity of light in red, green, and blue (RGB) wavelength regions.

2. LITERATURE REVIEW

Bhawna J. Chilke Neha B. Koawale Divya M. Chandran [1] 2017 focuses on different methods for detection and classification of soil Ph. Also in proposed methodology and also discuss different methods of segmentation, feature extraction ,and classifier that can be modified available algorithm so that we will obtain good accuracy and efficiency in determination of soil pH. Approach is to turn the manual process to a software application using image processing. Image of the soil with different moisture content are captured and preprocessed to remove the noise of source image. An advantage of accurate and early detection of soil pH is that we can determine which crop is suitable for particular soil which helps to increase agriculture productivity.

Sudha.R1, Aarti.S2, Anitha.S3, Nanthini.K [2] 2017 designed a model is based on digital image processing technique where digital photographs of the soil samples were used for soil pH determination. Digital photographs were collected during sunlight while photographs of the soil sample were taken in dark room for the purity of digital value of the spectra. RGB values in deep brown colored soil were 133-98-30 to 207-186-157 and its value in light yellowish soil 128-105-27 to 229-210-152 whereas in greenish soil RGB value ranged 152-122-52 to 189- 164-113. Correlation between digital value and soil pH values should be helpful in determination of soil pH of different type of soils. Ranges of soil pH and pH index values were 7.30-7.50 and 0.0070-0.0261, respectively in deep brown colour. Similarly, soil pH range varies from 6.80-7.04 and 5.58-6.58 in light yellowish and greenish colour respectively while their corresponding pH index values were 0.0071-0.0451 and 0.0084- 0.0239.

Makera M Aziz, Dena Rafaa Ahmed, Banar Fareed Ibrahim [3] 2016 find the pH value of soil, according to the soil colour by using neural network. The sample of soil is taken from many lands and its pH value was estimated according to the sample colour. And the data needed for the sample that we want to find its pH are (RGB). The two RGB values of the sample and database will compare to find the value of pH. The secondary data has been used that are already collected by another study. And these data have the RGB values that need to compare and the pH values. These data can classify in three classes, dark brown, light yellowish and greenish. And have the pH values from 5.5 to 8.3.

Vinay Kumar1, Binod Kumar Vimal2, Rakesh Kumar2*, Rakesh Kumar3 and Mukesh Kumar [4] 2014 designed a model based on digital image processing technique in Remote Sensing and Geographical Information System domain where digital photograph of the soil samples were used for soil pH determination. Correlation between digital value and soil pH values should be helpful in determination of soil pH of different type of soils. Ranges of soil pH and pH index values were 7.30-7.50 and 0.0070-0.0261, respectively in deep brown colour. Similarly, soil pH range varies from 6.80-7.04 and 5.58-6.58 in light yellowish and greenish colour respectively while their corresponding pH index values were 0.0071-0.0451 and 0.0084-0.0239. Thus soil pH range varies from 7.30-7.50, 6.80-7.04 and 5.58-6.58 in deep brown colour, light yellowish colour and greenish colour respectively.

Sanjay Kumawat1, Mayur Bhamare2, Apurva Nagare3 , Ashwini Kapadnis [5] 2017 installed the automatic irrigation system and determining the pH value it saves time and ensures judicious usage of water and farmers get to know earlier that what crops can be grown in his field. The system works in areas where there is no regular supply of electricity. Digital photographs were collected during sunlight while photographs of the soil sample were taken in dark room for the purity of digital value of the spectra. RGB values in deep brown coloured soil were 133-98-30 to 207-186-157 and its value in light yellowish soil 128-105-27 to 229-210-152 whereas in greenish soil RGB value ranged 152-122-52 to 189-164-113. The system is reducing human intervention therefore less energy of the farmer is required and also provides an automatic irrigation system thereby saving time, money power of the farmer.

John Carlo Puno1, Edwin Sybingco1, Elmer Dadios1, Ira Valenzuela1, Joel cuello [6] 2018 describes the study of image processing and artificial neural network was used to efficiently identify the nutrients and pH level of soil with the use of Soil Test Kit (STK) and Rapid Soil Testing (RST) of the Bureau of Soils and Water Management: (1) pH, (2) Nitrogen, (3) Phosphorus, (4) Potassium, (5) Zinc, (6) Calcium, and (7) Magnesium. The use of Artificial Neural Network is to hasten the performance of image processing in giving accurate result. The system will base on captured image data, 70% for training, 15% for testing and 15% for validation as default of neural network the program will show the qualitative level of soil nutrients and pH. Overall, this study identifies the soil nutrient and pH level of the soil.

Umesh Kamble1 Pravin Shingne2 Roshan Kankrayane3 Shreyas Somkuwar4 Prof.Sandip Kamble [7] 2017 determines the amount of fertilizer and pH of soil that must be applied. From Farmers perspective soil pH value plays an important role because growth of plants and vegetables based on pH factor present in the Soil. Generally soil pH is measured manually in Government Labs. The manually calculated value of soil pH by pH meter with its original pH values. The process of manually testing soil if not taken properly, it also affects original result. So the software gives the result of 60%-70% in accuracy which can also provide the report of tested soil with type of soil, deficient nutrient present in the soil as well as it suggest the suitable crop for the soil on the basis of pH value.

Utpal Barman*, Ridip Dev Choudhury , Niyar Talukdar , Prashant Deka [8] 2018 detailed study of soil pH property is necessary for cultivation. But laboratory method of soil pH calculation is a very costly and tedious process.

They have found the range of soil pH and pH index values are 7.30-7.50 and 0.0070-0.0261, respectively in dark brown samples. Similarly, soil pH range varies from 6.80-7.04 and 5.58-6.58 in yellowish and greenish soil samples respectively. Without any standard correlation, they found that RGB values in deep brown colored soil were 133-98-30 to 207-186-157 and its value in light yellowish soil 128-105-27 to 229-210-152 whereas in greenish soil RGB value ranged 152-122-52 to 189-164-113. The soil dataset prepared in their experiment using neural network. They have found the coefficient of bets fit as R2 = 0.8 which is low as compare to coefficient of linear regression of the study. Soil pH slightly different from the original values of soil pH but they have not explained the difference.

M.A. Abu, E.M.M. Nasir, and C.R. Bala [9] 2014 design and develop control systems to provide and maintain agricultural soil pH value corresponding to a particular type of plant. The suitable pH value will help the growth of plants perfectly. In order to provide efficient control of lighting intensity, fuzzy expert system is design with a graphical user interface (GUI) in Matlab. A fuzzy expert system developed to recognize changes in temperature, humidity and lighting in the plant area and determine the level of intensity of light. Graphical user interface (GUI) for this project is the design to show the real value of temperature, humidity and lighting in the room expansion and animation illustrates the output to change soil pH Trend and also aims to control the level of soil ph for roses using fuzzy expert system by altering ph soil to an adequate level to replace the adding of the fertilizer directly and ensure a healthy growing of the plants. The input for this system is temperature, light intensity and humidity.

F. J. Sikora, P. Howe, D. Reid, D. Morgan, and E. Zimmer [10] 2011 studied for effectiveness of an AS3010D LabFit robotic instrument in measuring soil pH and soil-buffer pH. Various software settings for time of pH analysis, buffer and soil stirring times, and buffer and soil equilibration times were evaluated and compared to manual pH measurements. There were no differences between robotic and manual pH measurements for the various software settings that required from 57 to 300 min to complete 120 samples.

A setting that required about 90 min for completing 120 samples was adopted for routine laboratory use of the instrument compared to the shortest time of 57 min for 120 samples because of slightly better r2 values from comparisons of manual versus robotic measurements. Operating the robotic instrument with the routine setting on 2933 soils resulted in soil pH and soil-buffer pH measurements comparable to manual pH measurements.

Zhenyu du, Jianmin zhou, Huoyan wang, Xiaoqin Chen, and Qinghua Wang [11] 2014 conducted an experiment with an acidic soil and a calcareous soil to study the soil pH changes in micro sites close to the fertilizer application site as affected by the application of MCP or KCl alone and the combined application of the two fertilizers. Results showed that both MCP and KCl significantly decreased soil pH in fertilizer micro sites after 7 and 28d of incubation, which declined with time. In the acidic red soil, MCP slowed the decrease of soil pH close to the fertilizer site induced by applied KCl, possibly a result of the Al–P interactions and the exchange of $H2PO4^-$ and OH^- on soil surfaces. However, in calcareous soil, MCP promoted greater decrease of soil pH induced by KCl, which was probably due to $Ca_2KH_7(PO_4)_4 \cdot 2H_2O$ precipitation. The soil pH changes in both acidic red soil and calcareous soil after the addition of MCP with KCl would benefit plant growth in contrast to KCl alone.

Anastasia Sofou, Georgios Evangelopoulos, and Petros Maragos [12] 2005 propose the use of a morphological partial differential equation-based segmentation scheme based on seeded region-growing and level curve evolution with speed depending on image contrast. Secondly, analyze surface texture information by modeling image variations as local modulation components and using multi frequency filtering and instantaneous nonlinear energy-tracking operators to estimate spatial modulation energy. By separately exploiting contrast and texture information, through multi scale image smoothing, they propose a joint image segmentation method for further interpretation of soil images and feature measurements.

Srunitha.k, Dr.S.Padmavathi [13] 2016 presents the classifications of non-sandy soils are better classified with SVM (through WEKA). Almost all misclassified objects are relayed near to the segment line. Near the segment boundary Measurements spotted as often noisy and thus can be decided that the enactment of classifiers was excellent. Images were classified with an unsupervised nearest neighbor classification method with several different processing steps. Five different classes were separated and quantified for each sample. With more data and soil science domain-specific tricks, the potential for applying machine learning to soil property prediction would surely be maximized. It is able to achieve a 95% accuracy rate for classifying.

C.S.ManikandaBabu1, .M.Arun Pandian [14] 2016 determines the properties of soil physical and chemical calculation. These output of pH value of the sample compared with the laboratory report. The percentage of error between conventional laboratory and image analysis approach varies from 1%. These soil physical properties is used in the field of civil and agriculture management. Soil pH value is used to identify the acidic and basic nature of the soil.
This system reduces the manual assessment and time. It also reduces human errors and delay of testing. It also determined physical properties (water content, coefficient of curvature, liquid limit, plastic limit, shrinkage limit, coefficient of uniformity, field density) and chemical properties (pH and pH index). Physical recognition is based on fractal dimension calculation using box counting method. Soil pH recognition is based on Red-Green- Blue values of the

image or Intensity-Hue-Saturation model of the samples. It also helps to nutrition level of the soil. It has the great potential in the agriculture management.

Mrutyunjaya R. Dharwad, Toufiq A. Badebade, Megha M. Jain, Ashwini R. Maigur [15] 2014 aims to introduce software "Soil moisture Assessment". The software has revolutionized the method to find moisture content in soil. The color and texture characters of moist soil are extracted. Color characteristics analyzed using the RGB and the HSV model. Texture features are analyzed using entropy, energy, contrast, homogeneity and proposed a system is an automated technique to estimate the moisture content in soil. System finds the moisture content along with report generation that gives information about whether the input soil is deficient moisture or correct moisture content. It gives proper suggestion based on the result and report generated. Use of image processing makes it accurate and error free.

S. Aydemira, S. Keskinb, L.R. Drees [16] 2004 proposed new thin section method which provides reliable, automated classification of mineral, non-mineral constituents (e.g. organic matter), non-crystalline, or poorly crystalline components (e.g. Fe–Mn oxides) and voids. A color image flatbed scanner scanned 10 soil thin section slides that contain the same features. Equal portions (about 6.3 cm2) of each slide were imported into the Erdas Image Processing software (version 8.4) as 24 bit 3-band images. Classified features were checked with 500 reference points under the petrographic microscope.

Separation and identification was almost 100% for calcite, about 97% for void in all samples, but values decreased for sesquioxides, plasma, and quartz (96%, 96%, and 80%, respectively). Requirement of simple and inexpensive hardware and quick and routine identification and quantification of features (calcite, void, sesquioxides, and plasma) with much less error than other methods are two advantages of the proposed method to the earlier studies.

Xudong Zhang, Nicolas H. Younan, and Charles G. O'Hara [17] 2005 present an automatic soil texture classification system using hyper spectral soil signatures and wavelet-based statistical models. Previous soil texture classification systems are closely related to texture classification methods, where an image are used for training and testing and develops a novel system using hyper spectral soil textures, which provide rich information and intrinsic properties about soil textures, where two wavelet-domain statistical models, namely, the maximum-likelihood and hidden Markov models, are incorporated for the classification task. It is also shown that the HMM classifier is a promising tool due to its robustness. For instance, the simplification of the HMM training and an increase of the hidden states may increase the classification performance.

X. Zhang, H. Tortel, S. Ruy, and A. Litman, [18] 2011 deals with the monitoring of the volumetric water content of a soil column in a fully controlled environment by means of a noninvasive microwave imaging system. Indeed, soil moisture is an important piece of information to improve fluid flow modeling or to better understand the water uptake by plant roots. The problem of recovering the footprint of soil moisture evolution with respect to time using a built-in laboratory microwave setup coupled to a robust qualitative microwave imaging method: the linear sampling method (LSM)

The LSM method is particularly suited for the detection of discontinuities, such as the localization of stones in soil column or water diffusion from a macropore in a homogeneous soil. This situation is therefore considered as a difficult case study and was used to test the applicability of the LSM and MUSIC methods for the qualitative imaging of a heterogeneous medium mixing the smooth and rough variability. It is worth pointing out the robustness offered, for the problem at hand, by the LSM and MUSIC methods against incorrect environment modeling.

Rishi Prakash, Dharmendra Singh, and Nagendra P. Pathak [19] 2012 carried out the study that acknowledges the problem of soil moisture retrieval in vegetated region and an algorithm based on the information fusion approach of PALSAR, a SAR data and MODIS, an optical data is proposed to retrieve the soil moisture over vegetated area. The PALSAR data was efficiently utilized with polarimetric capability to classify the land cover in urban, water, vegetation and bare soil and subsequently to mask the urban and water region. The problem of vegetation characterization in retrieval of soil moisture from SAR images has been dealt with optical image by appropriately utilizing the NDVI, a vegetation indices, which describes the abundance of vegetation. The scattering coefficient of the PALSAR data was normalized and an empirical relationship was developed with NDVI in order to provide the scattering coefficient of bare soil in HH- and VV-polarization.

Maëlle Aubert, Nicolas N. Baghdadi, Mehrez Zribi, Kenji Ose, Mahmoud El Hajj, Emmanuelle Vaudour, and Enrique Gonzalez-Sosa [20] 2013 proposes a methodology to exploit TerraSAR-X images in an operational process of bare soils moisture mapping. The mapping process uses only mono-configuration TerraSAR-X data (incidence angle, polarization) both for bare soils detection and for the estimation of soil moisture content. Supervised and unsupervised classifications using only the mean signal of segmented objects provides bare soils maps with overall accuracies based on objects of approximately 92%. The overall accuracies of bare soils maps of the same areas based on pixels decreased to 84% because of misclassified pixels present in the ragged object boundaries created by the Terra SAR-X segmentation. The overall accuracy based on pixels can be improved by using digitalized plot boundaries instead of Terra SAR-X segmentation (94%).

3. Summarization of Literature Review:

SL. NO	AUTHORS	METHOD USED	PARAMETERS	LIMITATION
1.	Bhawna J. et. al, 2017.	Basic steps for PH Detection of soil using image processing	7.0./ acidic	Modified Algorithm can be used for good accuracy and efficiency in determination of soil pH to increase agriculture productivity.
2.	Sudha.R, et. al, 2017	Soil samples were collected and after processing soil pH were determined by using pH meter.	pH index values 0.0071-0.0451 and 0.0084-0.0239	Do not handle the remote sensing Geographical Information System and should have comparative study of more number of soil samples.
3.	Makera M Aziz, et.al 2016.	Method to determine the PH of the soil by using Artificial Neural Network (ANN)	5.5 to 8.3.	Errors should be reduced by increasing the numbers of sample and this will lead to better performance.
4.	Vinay Kumar	Digital image	pH index values	Remote sensing

	et.al, 2014.	processing technique in Remote Sensing and Geographical Information System.	0.0071-0.0451 and 0.0084-0.0239	frequency is low and geographical information is not accurate.
5.	Sanjay Kumawat et.al, 2017.	automatic irrigation system and determining the pH value.	7.30-7.50	Fully automatic is not cost effective for farmers.
6.	John Carlo Puno, et.al. 2018.	pH level of soil with the use of Soil Test Kit (STK) and Rapid Soil Testing (RST)	15% qualitative level of soil nutrients and pH.	Detected pH doesn't have accuracy.
7.	Umesh Kamble, et.al, 2017.	Determines the amount of fertilizer and pH of soil	60%-70%.	Manually testing soil is not taken properly.
8.	Utpal Barma , et.al 2018.	FD- Fractal Dimension	Average fractal dimension of soil pH 1.51136	Acidic and basic nature of the soil cannot be identified
9.	M.A. Abu, et.al, 2014.	Fuzzy expert system	pH 2.16	System has to be more stabilized.
10.	F. J. Sikora, P. et.al , 2011.	Kentucky soil analysis	0.94 and 0.82	Sample contamination affects the soil pH results.
11.	Zhenyu du, et.al, 2014.	Acidic soil and a calcareous soil to study the soil pH changes	1.44 and 0.93	Greatly affects on reducing soil pH in fertilizer micro sites
12.	Anastasia Sofou, et.al 2005.	Morphological partial differential equation-based	1.23	It doesn't improve soil texture separation for classification.

		segmentation scheme.		
13.	Srunitha.k, et.al , 2016.	Classified with SVM (through WEKA)	95% accuracy rate	Soil property prediction has to be maximized
14.	C.S.ManikandaBabu, et.al, 2016.	Determines the properties of soil physical and chemical calculation	pH value- 7.64277	Do not more samples of various places and improves reliability of the system with various resolutions
15.	Mrutyunjaya R. Dharwad, et.al, 2014.	Soil moisture Assessment	41.56% (soil moisture content)	Low accuracy and it is not error free assessment
16.	S. Aydemira, 2004.	Thin section method	0.5–1%	Concentration of soil is low (< 5%)
17.	Xudong Zhang, et.al, 2005	Automatic soil texture classification system using hyper spectral soil signatures and wavelet-based statistical models.	Accuracy is increased and the pH level is maintained	It have computational complexity
18.	X. Zhang, H. et.al , 2011	Noninvasive microwave imaging system	0.5 and 5 cm (soil moisture extension in terms of radius)	Robustness provided by this system is not adequate.
19.	Rishi Prakash, et.al, 2012.	Algorithm based on the information fusion approach of PALSAR, a SAR data and MODIS	0.25 to 0.44 (volumetric soil moisture)	Retrieval of soil moisture with need of minimum information
20.	Maëlle	Mono-configuration	Soil moisture	It cannot estimate the

	Aubert, et. al, 2013.	TerraSAR-X	values below and above 15%	accurate values of soil moisture.

4. CONCLUSION

The review has been carried out for the determination of pH level in the soil by digital image processing. Major concentration of the study is done based on the detection of pH level along with some classification of soil as application in the image processing domain. It also discuss with the color texture of soil from the particular geographical locations. Soil colour is visual perceptual property corresponding in humans to the categories i.e. red, green, and blue and others. Soil colours are the parts of visual perceptual property where digital values of red, green and blue (RGB) provide a clue for spectral signature capture of different pH in soil. The pH properties of the soil have been used to describe the degree of acidity and basicity which ultimately affects the growth of the crops. We also describe with the parameters of related application which have some advantages and limitations.

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