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Survey on Soil Classification Using Machine Learning

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ABSTRACT: Computers are widely used in many engineering fields. Geological engineering is only a few steps behind. In addition to speeding up the classification process, computers also make it more objective. There is less chance of human error, which saves energy, time, and money. Avoiding agricultural product loss is made easier by determining the type of soil. Mechanical properties should be the primary consideration when establishing a classification system for use in the engineering field. Support vector machine classification of soil types is explained in this paper. Image acquisition, image preprocessing, feature extraction, and classification all play a role in the classification process of soils. Color, edge detection, and texture features are extracted from soil images. Classifying soil features using a support vector machine (SVM) helps determine the type of soil. In light of this information, we'll be able to recommend the best crop for this soil.

KEYWORDS: Image preprocessing, Feature Extraction, Edge Detection, Texture Features, SVM;

I. INTRODUCTION

For a geologist, soil is a term that means different things to different people. It refers to the leftovers from previous surface processes. A penologist interprets this as a representation of the current state of physical and chemical processes. Soil, in the eyes of an engineer, is the rock-solid foundation upon which structures such as houses, factories, buildings, and highways can be constructed. For different purposes, people may describe soils in different ways. Soil study is the study of soil patterns that can be seen from a distance. To run a successful farm, it is essential to group soil together. The key to reducing product losses is to recognise the soil's characteristics. Countries that export several types of agricultural products need it the most. In the field of engineering, the primary focus should be on mechanical properties such as permeability, stiffness, and strength when developing a classification system. A soil's classification can be used to describe it. When it comes to farming, construction, and other endeavours, knowing the type of soil is a huge asset. The success of a plant depends critically on its ability to be planted in accordance with the soil's specific characteristics. Many factors, including the power of hydrogen (PH), exchangeable sodium percentage, moisture content, etc., influence the nature of soil. They show different characteristics depending on the amount of soil in which they are found, and this varies from region to region. Different methodologies are used to classify and analyse the different soil types that can be found in any given area. The manual segmentation and classification method is monitored during the preparation stage. It takes a lot of time, effort, and money, and it's not for the faint of heart. The primary goal is to make the process more efficient. When image processing and machine learning came into existence The soil sample can be efficiently categorised into the various groups to which it belongs. This paper explains how Support Vector Machines (SVMs) can be used to classify the segments found(SVM).

II. PROBLEM STATEMENT

For different purposes, people may describe soils in different ways. Soil study is the study of soil patterns that can be seen from a distance. To run a successful farm, it is essential to group soil together. The key to reducing product losses is to identify the soil type. Countries that export several types of agricultural products need it the most.



III. LITERATURE SURVEY

Sr. No	Author/ Paper Name	Proposed Work	Implemented Techniques	Advantages
1	Srunitha.k, Dr.S.Padmava thi, “Performance of SVM Classifier For Image Based	This work explains support vector machine based classification of the soil types. Soil classification includes steps like image acquisition, image preprocessing, feature extraction and classification.	1. Support Vector Machine(SVM) 2. Gabor Filter	The classifications of non-sandy soils are better classified with SVM (through WEKA).
	Soil Classification”	The texture features of soil images are extracted using the low pass filter, Gabor filter and using color quantization technique.		
2	Małgorzata Charytanowicz, and Piotr Kulczycki, “An Image Analysis Algorithm for Soil Structure Identification”	This work presents an image segmentation approach for detecting the soil pore structures that have been studied by way of soil tomography sections. In so doing, a research study was conducted using a density-based clustering method, and in turn, the nonparametric kernel estimation methodology. This overcomes the rigidity of arbitrary assumptions concerning the number or shape of clusters among data, and lets the researcher detect inherent	1. Density-based clustering algorithm 2. Kernel estimation methodology	The presented approach is more objective than classical parametric methods, and can be successfully applied for many tasks in data mining, particularly where arbitrary assumptions concerning the number or shape of clusters among data are not recommended.



		data structures.		
3	Richard J. Flavel, Chris N. Guppy, Sheikh M. R. Rabbi, Iain M. Young, “An image processing and analysis	The objective of this study was to develop a flexible and free image processing and analysis resolution, based on the Public Domain Image platform, for the segmentation and analysis of complex biological plant root systems in soil from x-ray tomography 3D images.	1. Growth and scanning parameters and protocols	High speed, accurate, segmentation and analysis protocols.
	tool for identifying and analyzing complex plant root systems in 3D soil using non destructive analysis: Root1”	Contrasting root architectures from wheat, barley and chickpea root systems were grown in soil and scanned using a high resolution micro-tomography system.		
4	Karisiddappa, Ramegowda, Shridhara, S. “Soil Characterization Based on Digital Image Analysis”	This paper investigates the development of digital image analysis approach for estimation of physical properties of soil in lieu of conventional laboratory approach. The present research deals collecting soil samples for trail pits at designated site as per IS code procedure. The digital image database is prepared for the collected soil	1. Curve fitting technique 2. Image analysis approach	There is a great potential in the use of fractal dimension for estimating physical soil properties for practical application, with minimum human error.



		sample in the laboratory and physical properties(Y) are determined.		
5	Anita Dixit, Dr. Nagaratna Hedge and Dr. B. Eswar Reddy, ” Texture Feature Based	This work presents a satellite image classification system, which can classify between the vegetation, soil and water bodies. The objective of this work is met by subdividing the works into three important	1. Median filter 2. Contrast Limited Adaptive Histogram Equalization (CLAHE) technique	The performance of the proposed approach is observed to be satisfactory in terms of accuracy, sensitivity and specificity
	Satellite Image Classification Scheme Using SVM”	phases, which are satellite image pre-processing, feature extraction and classification. The image pre-processing phase denoises the image by median filter and the contrast is improved by Contrast Limited Adaptive Histogram Equalization (CLAHE) technique.	3. Support Vector Machine (SVM)	

IV. PROPOSED SYSTEM

In this proposed system we will use the soil image dataset to classify the soil type. Soil classification includes steps like image acquisition, image preprocessing, feature extraction and classification. In image preprocessing, the image is converted in grayscale image and then using filtration techniques to removed the noise of that image. After that in feature extraction step, the color features, edge detection features and texture features of soil images are extracted. Using support vector machine (SVM) classifies the soil features to find the type of soil. Here we will use the training feature dataset for classification. Using the final soil type we can recommend which crop is suitable for this type of soil which used for farmers and agriculture related companies.

Proposed System Architecture:

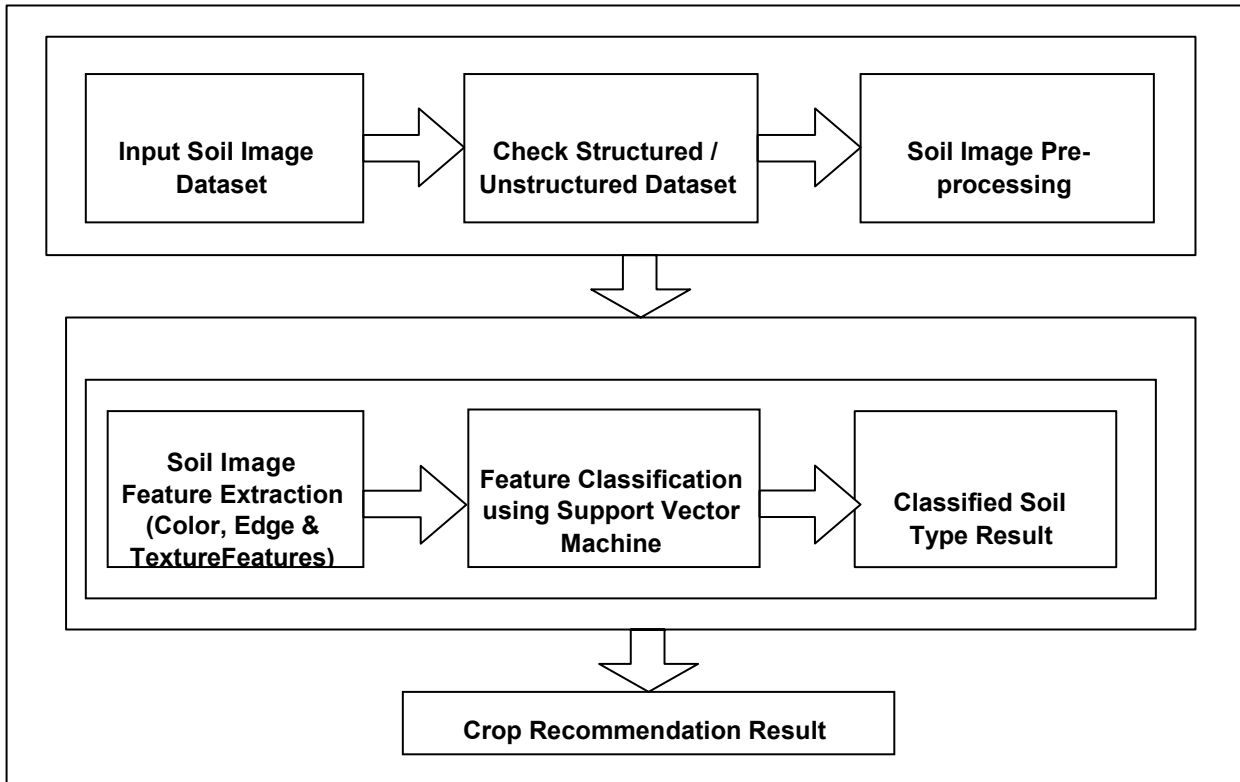


Fig: Proposed System Architecture

V. CONCLUSION

This proposed system we will use the soil image dataset to classify the soil type. Image feature extraction like color features; edge detection features and texture features of soil images are extracted. Using support vector machine (SVM) classifies the soil features to find the type of soil. Finally based on soil type we can recommend which crop is suitable for this type of soil. SO this work will help the farmer regarding crop and increase the productivity soil detection and suggestion according to it will help the farmers.

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