Parametric Model for Flora Detection in Middle Himalayas

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ABSTRACT

Plant detection forms an integral part of the life of the forest guards, researchers, and students in the field of botany and for common people also who are curious about knowing a plant. But detecting plants suffer a major drawback that the true identifier is only the flower, and in certain species, flowering occurs at major time period gaps spanning from few months to over 100 years (in certain types of bamboos). Machine learning-based systems could be used in developing models where the experience of researchers in the field of plant sciences can be incorporated into the model. In this paper, the authors present a machine learning-based approach based upon other quantifiable parameters for the detection of the plant presented. The system takes plant parameters as the inputs and will detect the plant family as the output.

KEYWORDS

Machine Learning, Plant Recognition

INTRODUCTION

The present era is been led by artificial intelligence and machine learning which has enabled us to use the existing technologies in virtually all walks of life and solve real-world problems. Machine learning is the sub-domain of artificial intelligence that allows machines to replicate the behavior of learning. As humans perform learning from observations, machines can also do the same when supplied suitable examples for the same.

A large increase has been observed in the potential applications that could use the various machine learning algorithms where the machine can be trained to perform various tasks and give unexpected results(Singh et al., 2016). All the industries have been accumulating data since the time of their inception and the pace of data generation has gone up in the modern days and hence the requirement for a fast-paced analysis tool. Applications of machine learning have been expanding and it is now used from oil and gas to transportation, financial services, and health care to government organizations. The ultimate goal of building these applications is to utilize the capabilities of machine learning for process automation to increase productivity and reduce human efforts to facilitate everyday tasks.

Plant species recognition is one of the complex tasks to be performed in everyday life which involves several challenges given the diverse biodiversity present. The complexity increment exponentially if the given job is to be performed for any bio-diversity hotspots especially the Himalayan region which has been bestowed with an extremely varied gene pool and species, stretched over a geographic area of four million square kilometers. Artificial intelligence and machine learning thus find a potential application in this area. The recent times have observed a significant expansion and

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increment of various approaches that could be useful for plant species recognition, detection of weeds in plants, etc. The research on these topics has the final goal of fully automating the agricultural process beginning from detecting the species itself. While the final goal is still to be achieved, significant advancements in the area have been made. The proposed algorithm needs to be precise and should increase productivity with the least margin of error possible.

PLANT PARAMETERS

Eight parameters were selected for plant detection based upon the inputs from the concerned subject matter expert. These are as follows:

HABITAT: Habitat is the home of any particular type of species. It the place where a particular type of species can be found. As we can observe from numerous maple species that they always have a shrubby habit and almost always form bushes or hedges but never a tree. Certain alpine plants have been chosen for cultivation because of their dwarf habit. A few plants created wood as an instrument to neutralize the dangerous impacts of wind, ice, mechanical harm, and flame. Erect and thick development propensities advanced to oppose wind impacts and other mechanical harms. Plants without wood adjusted prostate, tangle framing, spreading, crawling, or climbing propensities. As creatures connected with plants and before, both developed at the same time. Different plants created prostrate and tangle shaping propensities so as to persevere through exceptional brushing and trampling, or erect and tall development structures to avoid perusing and touching.

HEIGHT: The height of a plant makes one of the distinguishing features especially between varieties. It the shortest distance from ground level to the topmost photosynthetic tissues of the plant. This is usually expressed in meters. While measuring the height of a plant, for any species, the under consideration entity is a typical mature entity of the said species in a particular habitat. Maximum height is associated with numerous growth factors like the position of the plant as compared to the vertical light gradient, reproductive size, competitive vigor, whole-plant fecundity, lifespan and allied between two different events of disturbance like a wildfire. Plant propensity is likewise called vegetation structure. It is a procedure that all plants experience that is a type of transformative adaptation. It misrepresents the plant's capacity to change, endure, and eventually effectively recreate regardless of consistently evolving conditions. The plant propensity provides some insight into how the plant has advanced to withstand even emotional climatic swings, utilization by herbivores, loss of daylight, and increment/decline in water. The term likewise alludes to how well a plant, at last, recreates and colonizes in worldwide locales. For instance, succulents can endure desert-like conditions because of its plant propensity. Succulent plants built up their interesting appearance through developmental survival in brutal conditions, i.e., their advancing plant propensity. Succulents can exploit brisk, inconsistent precipitation cycles because of their capacity to hold and store water – these characteristics are for the most part because of plant propensities.

BARK TYPE: Bark is the outermost layer of the trunk or roots of the tree. It is comparative from multiple points of view to human or animal skin. Underneath the bark of the tree, cambium is found. Each developing season adds a layer of Xylem cells around the cambium which encompasses the cambium. Xylem cells act as the mode of transport for the movement of minerals from trees to root. It comprises dead cells and constitutes a significant part of the tree. This layer is inside the cambium. The bark is essentially made up of the few layers that are outside the cambium. The external edge of the cambium delivers another set of cells that make phloem, which delivers sugars from the leaves to the rest of the tree. Outside phloem, most of the trees consist of a layer known as the plug cambium, which creates the stopper – the intense external layer of the tree. This external layer is all that we, for the most part, observe the bark. The external