

Farming Assistance for Vertical Gardening of Smart Irrigation

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Abstract - Smart farming and precision agriculture involve the integration of advanced technologies into existing farming practices in order to increase production efficiency and the quality of agricultural products. As agriculture is medium of income to almost half population in our country. Also, it is observed that due to less land coverage and low irrigation productivity of agriculture is decreasing which is not good for food security.

Here we develop our idea, that smart farming for vertical garden. A vertical garden is a technique used to grow plants on a vertically suspended panel by using hydroponics. These unique structures can either be freestanding or attached to a wall. Our proposed model guide the persons who have vertical garden, our process make anyone can use.

With integration of neural network with the sensor hardware, we collect the information on the various parameters like moisture, land coverage ratio, height info etc. With this we integrate these data into a metric and according to some predefined standards we predict the nature and some suggestion which can be sought by the farmers. At the front-end for interface with our application we are making the app which is user-friendly.

Key Words: vertical, garden, android, frameworks, architecture, java, web server, internet

1. INTRODUCTION

A vertical garden is a strategy used to develop plants on a vertically suspended board by utilizing hydroponics. These one of a kind structures can either be unattached or appended to a divider. Vertical gardens have been utilized since antiquated civic establishments; numerous advanced vertical nurseries can keep going for quite a long time and give a fly of nature into the cutting edge business.

Vertical gardens are a great option in contrast to pruned plants in the workplace space. While pruned plants have the upside of being put anyplace, they can occupy room and require loads of support. Nonetheless, with vertical nurseries there is just a single enormous board to keep up, and it will give a lavish fly of shading to any expert condition.

On the off chance that you figure your place of business could do with a vertical garden, maybe for an entryway, open

walkway, or a gathering room, at that point you have to contact your nearby Ambius office today. Converse with one of our honor winning architects and talk about what we can accomplish for you to make a stand apart green divider for your work environment.

Vertical nurseries pass by a wide range of names: living green dividers, live dividers and greenery dividers just to give some examples. Anything you desire to call them, these vertical structures of vegetation can be as little as an image outline or as gigantic as a 60 ft wide showstopper.

Vertical gardens can be put in lodging entryways, significant enterprise central command, or even a little private terrace. Vertical nurseries look noteworthy, yet will likewise cause you to feel increasingly great in your condition by taking advantage of nature's intrinsic quieting powers.

Vertical gardens not just make a great focal point to your inside space, however they help the normal wind current to your condition. These nurseries can be comprised of a wide range of kinds of plants; greeneries, ficusrepens, pilea, and calathea being the most well known plant species utilized in green dividers. Vertical nurseries are additionally very space proficient and can occupy any vacant space on a divider.

Numerous representatives in office situations are presented to a ton of unsafe air synthetic concoctions like formaldehyde and carbon monoxide. Vertical nurseries work like a characteristic clean air framework and advance a superior breathing air and a more advantageous condition by and large. Plants additionally help to decrease clamor contamination which makes a calmer workplace for building tenants

Numerous structures around the nation and world have vertical nurseries introduced on their outsides. Numerous outside nurseries contain greenery, vines, and different plants are frequently utilized on vertical nurseries introduced outside. Outside vertical nurseries have the upside of having normal direct daylight that causes them to flourish.

Outside vertical gardens likewise give structures extraordinary insurance and protection from temperature variances, UV radiation and substantial downpour. In the mid year, outside vertical nurseries utilize a procedure

called evapotranspiration, which helps cool the air around it. Since atmospheres are radically extraordinary all through North America, plants for outside dividers Ambius introduces are picked by state atmosphere, so the greenery will be simpler to keep up.

Most indoor vertical nurseries from Ambius have a board or plate framework that is anything but difficult to keep up. Board frameworks like the Sage Vertical Garden framework can assist you with keeping up your delightful vertical gardens on anteroom or office dividers. For certain tasks, a plate based framework like the GSKy Versa Wall would be helpful.

This sort of framework utilizes polypropylene plate and a water safe support board to enable the plants to remain hydrated. On the off chance that you don't have mastery in thinking about the frameworks, a vertical nursery can undoubtedly fizzle without appropriate support. This implies watering the plants, however pruning and expelling dead leaves. Most vertical nursery frameworks have complex water system frameworks that keep the plants appropriately watered albeit some degree of support is frequently required. Fortunately, Ambius additionally gives month to month support on a wide range of frameworks.

2. MODULAR ARCHITECTURE

The farming is essential explanation of creation of nourishment and crude material, which in the end is reason of endurance of the populace. In Indian the vast majority of the populace is reliant on farming. Be that as it may, there is likewise need to survey and renew the component for refreshing the innovation.

In the up and coming years farming will see significant changes. Dissimilar to the prior 'green insurgency' which had an establishment of cutting edge pesticides and composts, presently the horticulture will be upset with the assistance of innovation. We utilize the innovation for help reason. Numerous structures around the nation and world have vertical nurseries introduced on their outsides.

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Vertical gardens are a great option in contrast to pruned plants in the workplace space. While pruned plants have the upside of being put anyplace, they can occupy room and require loads of support. Nonetheless, with vertical nurseries there is just a single enormous board to keep up, and it will give a lavish fly of shading to any expert condition.

Our proposed system uses the "state-of-the-art" technologies to make it advanced and relevant in the society. Our system uses cloud technology to store data in the server and the user can access the data from the server. Deep Learning algorithms like Recurrent Neural Networks (RNN) makes the system learn about the crop better with time. Implementation of Time Series Algorithms like Seasonality and ARIMA can help us predict the overall life span of the plant and check the seasonal aspect of the plants.

Our approach is modular. In our back-end system we are divide some modules, and they work independently and link with API's so that easily we can integrate and collect data and process it.

Module 1: Exploratory data analysis

Graphs generated through EDA are distinct from final graphs. You will typically generate dozens, if not hundreds, of exploratory graphs in the course of analyzing a data set. Of these graphs, you may end up publishing one or two in a final format. One purpose of EDA is to develop a personal understanding of the data, so all your code and graphs should be geared towards that purpose. Important details that you might add if you were to publish a graph² are not necessary in an exploratory graph

Module 2: Ensemble Learning

Literally means that after one algorithm is applied to your image, the output of that algorithm is fed to the input of some other algorithms, while an enhanced image should be the final result for a particular algorithm. Of course, an image enhancement algorithm can also have steps, while an enhanced image can still be used as an input for other algorithms.

Convert color images too grayscale to reduce computation complexity: in certain problems you'll find it useful to lose unnecessary information from your images to reduce space or computational complexity.

For example, converting your colored images to grayscale images. This is because in many objects, color isn't necessary to recognize and interpret an image. Grayscale can be good enough for recognizing certain objects. Because color images contain more information than black and white images, they can add unnecessary complexity and take up more space in memory (Remember how color images are represented in

three channels, which means that converting it to grayscale reduces the number of pixels that need to be processed).

One important constraint that exists in some machine learning algorithms, such as CNN, is the need to resize the images in your data set to a unified dimension. This implies that our images must be pre processed and scaled to have identical widths and heights before fed to the learning algorithm.

Another common technique involves augmenting the existing data set with perturbed versions of the existing images. Scaling, rotations and other affine transformations are typical. This is done to enlarge your data set and expose the neural network to a wide variety of variations of your images. This makes it more likely that your model recognizes objects when they appear in any form and shape.

Module 3: Model Creation

It is also possible to standardize pixel values across the entire data set. This is called feature standardization and mirrors the type of standardization often performed for each column in a tabular data set.

You can perform feature standardization by setting the and `featurewise_std_normalization` arguments on the `ImageDataGenerator` class. These are in fact set to `True` by default and creating an instance of `ImageDataGenerator` with no arguments will have the same effect.

A whitening transform of an image is a linear algebra operation that reduces the redundancy in the matrix of pixel images.

Less redundancy in the image is intended to better highlight the structures and features in the image to the learning algorithm.

Typically, image whitening is performed using the Principal Component Analysis (PCA) technique. More recently, an alternative called ZCA (learn more in Appendix A of this tech report) shows better results and results in transformed images that keeps all of the original dimensions and unlike PCA, resulting transformed images still look like their originals.

Image Augmentations techniques are methods of artificially increasing the variations of images in our data-set by using horizontal/vertical flips, rotations, variations in brightness of images, horizontal/vertical shifts etc.

Module 4: Prediction

This algorithmic approach is based on distinctive analysis by analyzing the expected error minimization. This approach considered the empirical risk to improve the training procedure. The risk estimation is here based on the structural

analysis so that the generalization error will be reduced. The error margin is analyzed under class deviation and based on training patterns are obtained. This model is also based on the polynomial kernel representation so that the effective learning to the elements will be done and more accuracy will be obtained.

As such, it can be used to create large recurrent networks that in turn can be used to address difficult sequence problems in machine learning and achieve state-of-the-art results. Instead of neurons, LSTM networks have memory blocks that are connected through layers.

A block has components that make it smarter than a classical neuron and a memory for recent sequences. A block contains gates that manage the block's state and output. A block operates upon an input sequence and each gate within a block uses the activation units to control whether they are triggered or not, making the change of state and addition of information flowing through the block conditional.

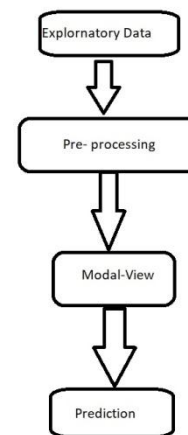


Chart 1 Modular Architecture

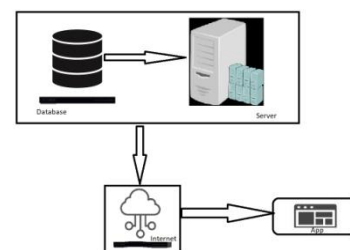


Chart 2 System-Design

3. WORKING OF ALGORITHM

A regular neural network has anything from a few dozen to hundreds, heaps, or maybe tens of millions of artificial neurons known as devices organized in a chain of layers, every of which connects to the layers on either side. Some of them, known as input gadgets, are designed to get hold of

numerous sorts of data from the outdoor world that the network will attempt to find out about, apprehend, or in any other case method. Other units sit down on the alternative aspect of the community and sign the way it responds to the statistics it is found out; those are referred to as output gadgets. In between the input units and output units are one or extra layers of hidden devices, which, together, shape the majority of the artificial mind. Most neural networks are completely linked, because of this every hidden unit and each output unit is connected to every unit within the layers either facet. The connections among one unit and every other are represented with the aid of quite a number known as a weight, which may be either tremendous (if one unit excites some other) or terrible (if one unit suppresses or inhibits every other). The better the load, the greater affect one unit has on any other.

connection weights to the hidden nodes, and then onward through more connection weights to the output nodes.

In the beginning, the network will of course get the wrong answer because it knows nothing. This is where the "training" and "backpropagation" comes in. To train the network on this one example, the correct output is compared to what actually came out of the network. The correct output was "1.0" for node #28 and "0.0" for all other nodes, meaning the face was of person #28 and was *not* of any of the other people. The difference between what the network said and the correct answer is the "error."

The error values are propagated backward through the network using some complicated math that tells the algorithm how to modify each connection weight so that the network will get closer to the correct answer next time. This "training" process is repeated over and over for all the images until the network is doing a reasonably correct job of matching the face images to the identity of the person.

System implementation is the main step towards the completion of our project to end use and to give real time output. As discussed in the previous chapters about the system design and modular architecture, our implementation stack is build on the top of the design we build with concerning all the factors in mind. We create the Android Application which is our front end interface to user providing information about the plantation on the various parameters. Parameters are as follows:

1. Plant Disease
2. Disease Description
3. Remedy
4. Alternatives

These all data is come from the server which has connected with the Bluetooth enabled devices and sensors on the fields and farms to collect the data. With the database we categorise the above parameter in the SQL database and connect with API to call the response and render it in dynamic Web view.

Our flow is very simple, We are connecting the database server with application and script server to collect request for rendering, then synchronized API call are being call to collect subsequent response of the request, and then we call and activate the web server whose client is our android app from where request has been intitaited through 4 buttons.

Request is of 2 types static and dynamic in which server rendered the static response and dynamic response. Now we see the technological stack.

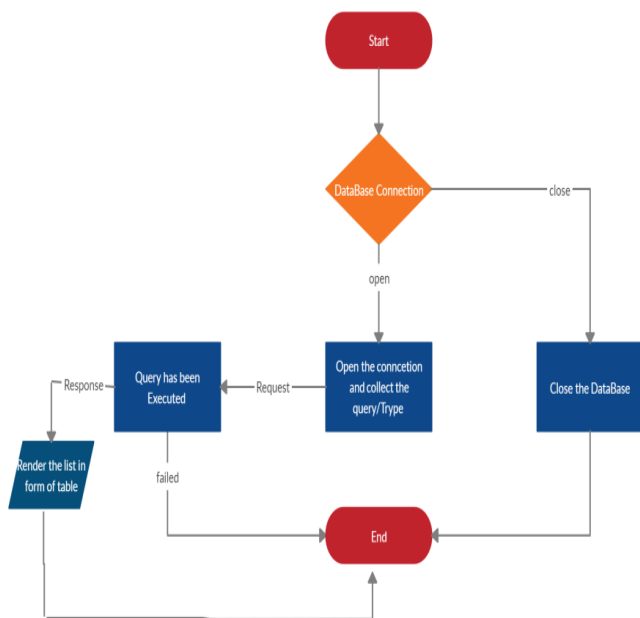


Chart 3 Database Flow

4. IMPLEMENTATION OF THE ALGORITHM

The basic idea is that you have three layers of "nodes." The "nodes" are intended to be analogous to neurons in a neural network of the brain, but the similarity is only metaphorical (real neurons don't work this way, but the analogy is not unreasonable). The nodes have values of 0.0 to 1.0, where 0 represents fully inactive "off" and 1 represents fully active "on" with many values in between. The three layers are an input layer, an output layer, and a "hidden" layer in the middle (hidden means neither input nor output, so not exposed to the outside world).

The nodes are linked by connections which have a "weight" ("w" in the figure) that are analogous to synapses in the brain. Signal values propagate from the inputs, through the

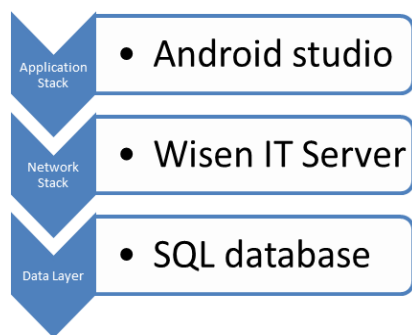


Chart 4 Technology Stack

5. RESULT

Our main element is the android app through which we display the details of the response of the API call/Request has been made to server through app trigger point and request has been query processed in the database and total 13 request has been processed. Following are the performance parameter.

Parameter	Response Time
Resource Scheduling	2.05 ms
Connection Start	1.18 ms
Request Sent	0.35 ms
Waiting	93 ms
Content Download	2.7 ms

Table 1 Performance Metrics

The code which we have written in spider using anaconda framework gives us the output in the output section which is simply all simplified data in user readable form which can be understand and rendered through API in APP which has front-end interface we provided to end-user ie in our use-case is farmers.

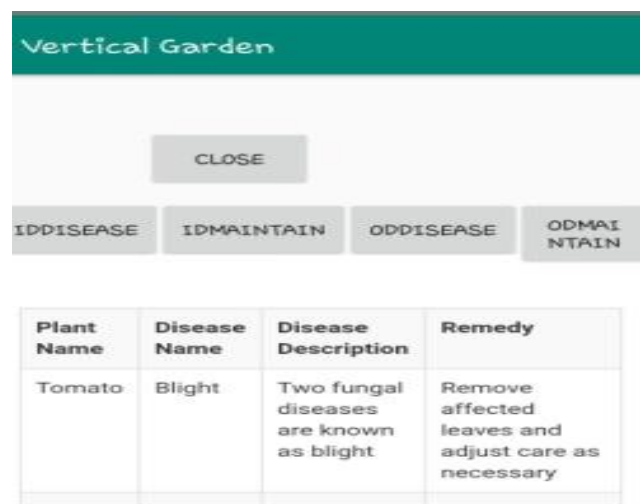


Chart 5 Prediction for Tomato

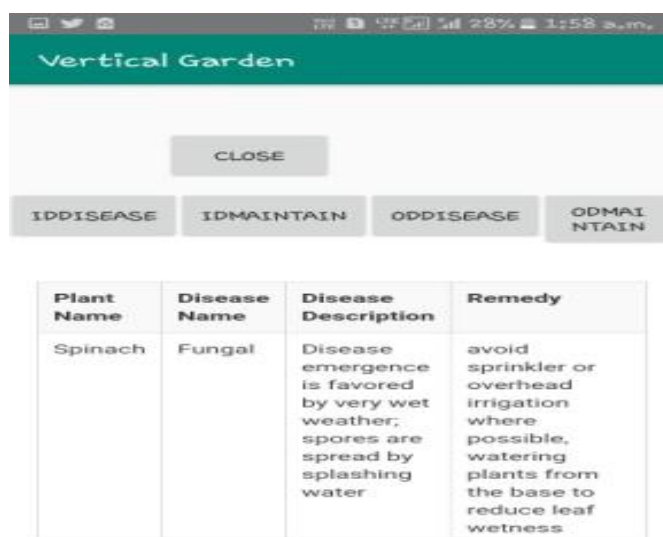


Chart 6 Prediction for Spinach

6. CONCLUSIONS

The agriculture is basic reason of production of food and raw material, which eventually is reason of survival of the population. In Indian most of the population is dependent on agriculture. So we propose to create an app which not only provides notifications but also suggestions related to the farming activities. The app not only provides notifications but also suggestions related to the farming activities. This app is quite user friendly that it can be functioned with mediocre intelligence and without any preliminary training. Also app is easy to operate as compared to websites. In spite of the fact that Artificial Intelligence offers huge open doors for application in horticulture, there still exists an absence of recognition with cutting edge AI arrangements in ranches across most portions of the world. Presentation of cultivating to outer variables like climate conditions, soil

conditions and nearness of vermin is a considerable amount. So what may resemble a decent arrangement while arranging during the beginning of gathering, may not be an ideal one as a result of changes in outside parameters.

The fate of cultivating relies to a great extent upon appropriation of subjective arrangements. While huge scope inquire about is still in progress and a few applications are as of now accessible in the market, the industry is still profoundly underserved. With regards to dealing with practical challenges looked by ranchers and utilizing self-governing choice making and prescient answers for explain them, cultivating is still at an early stage.

So as to investigate the tremendous extent of AI in farming, applications should be increasingly powerful. At exactly that point will it have the option to handle visit changes in outer conditions, encourage constant dynamic and utilize proper system/stage for gathering logical information in an effective way.

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