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NORMALIZED DIFFERENCE VEGETATION INDEX NDVI ANALYSIS BY USINGDATACAPTUREDFROMUNMANNEDAERIALVEHICLE UAV

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ABSTRACT

This paper presents the normalized difference vegetation index (NDVI) analysis by usingimages captured from unmanned aerial vehicle (UAV). This normalized vegetation index(NDVI) estimated from drones' images or other unnamed aerial vehicle can be done by usingthe standard RGB camera with the visual atmospheric resistance index (VARI) algorithmobserving the "greenness" of the land or a crop in the field of agriculture. In the proposedapproach, images of the land cover in order to create a visual memory of the surroundings,images of the land are first sampled, saved, and organized as a set of ordered key images. Bythiskey imageswecaneasy toknowthehealthofvegetationorthegreennessoftheenvironmentwiththehelpofvisualatmosphericresistanceinde x(VARI).Thisdynamicmodelcanbeused toseethe overallhealth of the vegetationand thelandwith greenness.

Keyword: UAV,VARI,NDVI

I. INTRODUCTION

Unmannedaerialvehicles(UAVs)arealsoreferredtoasdrones.Itisanaircraftwithnocrew,passengers,orpilots.UAVi srapidlyusingmoreandmoreinmanyapplicationsbecauseofitsrapid and cost efficient deployment. UAV are used across the world for commercial, civilian,military purpose and it is also growing mainly in the field of agriculture. Until 20th centuryimage monitoring was a difficult task due to the due to storage and high cost of technologybased equipment. On the first decade of 21stcentury rapidly increasing in the fieldoftechnologyreachesouttousersusingtechnology,turningtheusesofthistechnolo giesortool sonsomething racticable.The multispectral remote sensing, records the energy in differentinterval of electromagnetic spectrum permit the obtaining of data about biophysical andbiochemicalfactorsofthevegetationfortheforestrystudies.Inagriculture,themainobjectiveis to know the healthy vegetation for better growth of crops. Normal difference vegetationindex (NDVI) is the measurement of the amount of better and live vegetation in an area and iscommonly used in agriculture purpose. The health of vegetation is indicating by NDVI astraightforward metric. When the leaf of the healthy plant hits by the infrared it is reflectedback in the atmosphere. As the amount of chlorophyll produce in the plant decreases less nearinfraredisreflected.Thiscanbeeasytoseetheoverallhealthoftheplant.TheNDVIalgorithmis used to compare the reflected intensities of near infrared (NIR) and visible light. We seeseveral sector using NDVI. For example, in farming, farmer used NDVI for precision farmingand to measure biomass. While in forestry, foresters use the NDVI to calculate the amount offorestandtheleafareaindex. NASAalsostatestheNDVIisgoodindicator of drought.Whenwaterlimit vegetationgrowth,it has alower relative NDVIand densityof vegetation.Many data can be evaluated by remote detection using high resolution data from thesensorsattachedtotheUAV.Additionally,theseplatformhasshownthereforlargeamplitudeof environment application including specific studies to monitoring the health of plant, togeneratespecificdatainashorttime,likevegetationindexforagricultureandForestrystudies.Live plants have NDVI readings that range from -1 to 1, with 1 being the healthiest and -1representingthe least healthy.In order to support healthy vegetation, this study's goal is to assess the first method ofvegetation index potential retrieved from multispectral images based on UAV. It can easilymeasure the state and health of crop. The association between this vegetation index, whichgaugeshow green a region is,and greenbiomass,agrowthindicator, isfavorable.

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II. METHODOLOGY

StudyArea:

Since NDVI is utilized in many different industries, farmers primarily employ it inagriculture for precision farming and to assess biomass. Whereas, in forestry, foresters usedNDVI for leaf area index. As we taken a specific farming area as seen in fig.1.1 to analyses thevegetation indexbyusingNDVIwith UAV.

Fig.1.1:-Field toanalyseshealthyvegetation

(Source: https://www.agritechtomorrow.com/article/2018/01/ndvi-vs-false-ndvi--whats-better-foranalyzing-crop-health/10434) Using this particular farming field data of the vegetation index can analyses by multispectralsensorsandfarmerscaneasilyanalysesthehealthyvegetationforthebettergrowthofthecrop.Whereas, in forestry, forester use NDVI for analyzing leaf index to know the greenness of thefieldas shown in fig.1.2.

NDVI is calculated by using formulaNDVI=NIR –RED/NIR+RED Where, NIR = near infrared(Which vegetation strongly reflect)RED=red light (Whichvegetation absorbs)

Data can be classified into two groups healthy and unhealthy vegetation. Each pixel on yourmap has its values calculated and is assigned an index between -1 and 1. On the basis of thisrangewecananalyze thewhethervegetationishealthyorunhealthy.Basedonrangeindicationisgiven in Table.1.

Table.1:- Indication table to analyses the health of crops(Source:https://help.dronedeploy.com/hc/en-us/articles/1500004861181-NDVI-Cameras-for-Drones)

Value	Indication
<0	Inanimate/Deadmaterial
0->0.33	Unhealthyplantmaterial
0.33->0.66	Healthyplantmaterial
->0.66	Veryhealthyplantmaterial

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ImageAcquisition:

Themostcrucialstepstodealwithimagesistocapturethembeforeevaluatingtheimages.In UAV attached camera is used for image acquisition. The camera we needed is of standardcamerascapturered,greenandbluelight.Dependingonthetype,modifiedcamerascanrecordsomecombination ofnear infrared, red,green, andblue light.

Therearemainlytwooptionsforcamera: -

1) Used of standard RGB camera with VARI algorithm. Only when utilizing the VARIalgorithm do RGB Plant Health maps have any real meaning. The "greenness" of a cropcanbedetermined usingthe VARIalgorithm.
2) Purchasea camerathathasbeenadaptedtocatchernear infraredlight.

Byusingthisstandardcameraonce,thecameraiscapturetheimagesofthefieldandonceweuploaded captureimagesintoDroneDeploydashboard,itwillbeautomaticallyproceedinginto NDVI dataset. Then the plant health tool on DroneDeploy is used. The main purposeof the tool ischange the contrast to draw attention to variationwithina field. Thethresholdingtool,whichdisplaystheregioninsideacertainrange,enablesyoutomeasuredamage and forecast yields once you have determined the pertinent plant health ranges.One's,makesureyouareintheMapViewratherthantheModelViewbeforeclickingthePlant Health button in the map page's side panel to begin. The data itself and a histogramofthedatawillbeupdatedinthepanelontheleftasaresult.Hence,wecaneasilyanalyzethe health of the vegetation of the given field. The sample portion of the experimentcomprehendsinfigure1.3highlightedbyRGBimageobtainbythecameraintegratedwithUAV.

Fig.1.3: -RGBcolourimagetothesamplearea

(Source: https://www.agritechtomorrow.com/article/2022/06/2022-top-article-drones-and-robotics-in-agriculture/13796) Theindexofthissamplewherecalculatedbyusingtheplanthealthtoolof DroneDeploytoknow thehealthyvegetation of thefield and theleaf index.

III. RESULT

In this section the result obtained by using NDVI are discussed.NDVI is most known andwidelyusedbyfarmersandforesterstoknowthevegetationindexorthehealthyvegetationofthe particular field and leaf index for the greenness of the forest. NDVI shows the health ofvegetation by using RGB cameras indicates the health of vegetation highlightedby usingsome colours and easily know the health of vegetation in the field and farmers can know inwhich particular area the crop growing ability is more or crop can grow in a healthy manner.Thisstudyis beingpossible withUAV.UAVmoveeasilyandfasterin theagriculturefieldaswell as in forestry and capture the data faster. The result we find by using NDVI with UAVusingtheplanthealthtoolofDroneDeployasshowbelowinfig.1.4.istheresultofthefig.1.4

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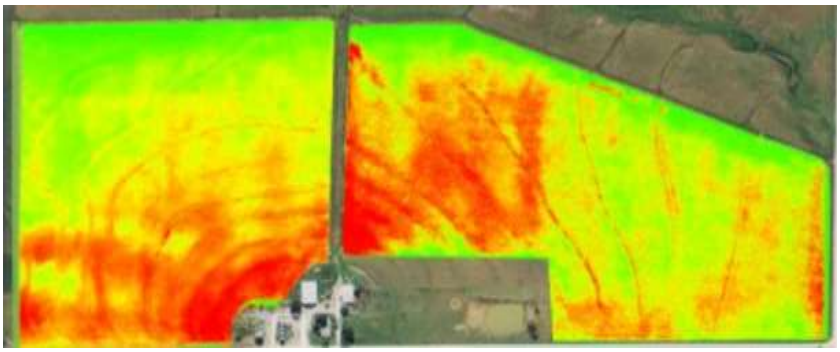

Fig.1.4.:-Result offieldusingNDVI

(Source:https://www.agritechtomorrow.com/article/2018/01/ndvi-vs-false-ndvi--what's-better-for-analyzing-crop-health/10434]

IV. CONCLUSION

The ability to gather data for the production of a vegetation index from images captured bymultispectralsensorsconnectedtoaUAVplatformisassessedinthiswork.Theacquireddata'sgreat spatial resolution offers incredibly precise information on the vegetation and can beutilized at the species level. Target-specific research examining biochemical and biophysicalfactors is required to develop UAV-based spectroscopy and provide more trustworthy data.Such field research on interesting species has previously has been done to support the use ofremote sensing method. However, it is conceivable to evaluate the sensor's potential in termsofitssensitivityforindicesthatrelatephysiologicalandecological elementsofthe canopyforafirst exploratoryexamination ofvegetation indexes. Moreover, it is noticed that vegetation indexes standardization is an important tool fordetection and monitoring in conservation areas and for the crops and forest management forbetter growth ofcropsand to knowthe greennessoftheforestareas.

V. REFERENCE

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