LAND USE /LAND COVER CLASSIFICATION OF SATELLITE IMAGES FOR RAIN WATER HARVESTING APPLICATION

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Abstract : In numerous nations where a measure of precipitation is restricted to particular period (monsoon season) and if not used, water turns into a startling asset. Because of this reason there is a massive need to make a legitimate usage of water and increment in ground water level by rain water harvesting methods. In this paper we are introducing an approach for deciding the water runoff from built-up region of satellite picture for rain water harvesting system. The built-up region is dictated by utilizing method called land use/land cover. This system incorporates grouping of satellite pictures into different locales like soil, grass, water, developed. The order is primarily done by utilizing unsupervised color picture segmentation(k-mean) process. In light of connection between built-up region and rainfall, water runoff is registered; which thus is utilized for the plan and advancement of rainwater harvesting system.

Index Terms **- Land use and Land cover classification, K-means, Image Segmentation, Water runoff, color image segmentation, water runoff.**

I. INTRODUCTION

In this day and age human dependably enjoyed war over the regular asset. In up and coming years this regular asset will be 'water'. As per Joined Country (UN) report, water utilize rate has been expanded at more than twice of populace increment in a century ago. In a similar report, they have evaluated that, by momentum rate of utilization, by 2025, 1800 million individuals will live in nations or locales with supreme water shortage, and two third of total populace could be under pressure conditions[1].

To feed the developing populace on the planet, more water system is required yet the amount of water system water is restricted. For this reason water harvesting strategy is utilized. Water harvesting is here characterized as the accumulation of surface run-off. Henceforth to handle this water issue we utilize unique but novel approach which is land use/land cover. Improvement in remote detecting satellite innovation leads in enormous advancement of land use and land cover. As of recently satellite pictures have been utilized as a part of functional applications, for example, urban land cover application [6] [3], urbane arranging [4], classification of urbanized regions inside sensitive beach front situations [6], to study forest dynamics [8].

In this paper, we are proposing a plan for registering the rainwater runoff from the built-up zone of picture with the end goal of water harvesting utilizing land cover order from satellite pictures. In this plan the districts in the satellite pictures are ordered utilizing unsupervised arrangement calculation i,e K-mean. From the classification built-up zones and zones like grass, soil and water are isolated and zones under every area are figured. In light of the built-up zone of this surface the water runoff is processed in light of the rain fall. This estimation can be utilized to outline rainwater harvesting plans for water recycle/reuse. An endeavor is additionally made to utilize this plan for Google earth pictures to make the errands less difficult.

II. Flowchart/Algorithm

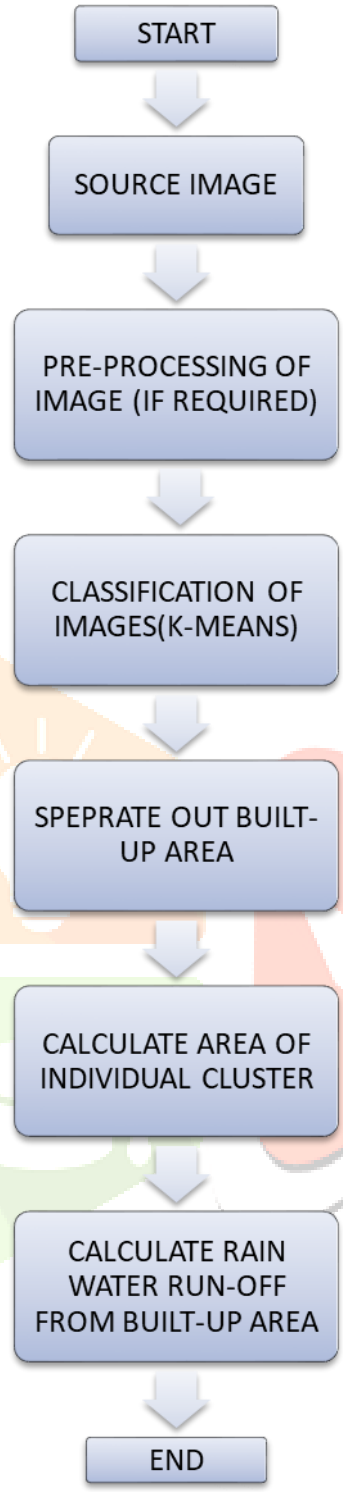

fig 1: Flowchart

III . Proposed Scheme

1. K-means algorithm-

K-mean is bunching calculation used to decide normal phantom gathering in given arrangement of information. K-mean is unsupervised grouping calculation which characterizes given arrangement of information into various classes. Grouping happens in light of natural separation between any two focuses from each other in informational index. Euclidean distance is being utilized as a part of the K-mean calculation. For every datum point its Euclidean distance from unique bunch is figured. On the off chance that that distance is low which implies information point is nearest to bunch at that point abandon it in that group as it were. On the off chance that that distance isn't nearest at that point move that information point to nearest bunch . This procedure is rehashed until and unless process lands at a point where no information point is being moved from one bunch to other group.

2. Area calculation-

After characterization of a picture, territory under each bunch is calculated. For that reason, add up to zone has been taken from Google picture utilizing 'scale' choice. At that point to figure singular group zone, number of pixels in each bunch has been calculated. Utilizing total number of pixels in a picture and pixels show in each clustered picture, percentage of each cluster in a picture has been processed. These percentage alongside the aggregate region under picture have been utilized to compute territory under each group.

3. Calculation of water runoff from built up area

To calculate water runoff from built up area we have used following equation:

$$Q = \frac{K \times i \times A}{36} \qquad \text{---(1)}$$

Where,

Q = Peak flow in Cumec.

i = Rainfall intensity in cm/hr.

A = Catchment area in hectares.

K = runoff coefficient. [10]

Now using rainfall intensity and built up area that has been already calculated; water runoff has been computed using given formula.

IV. Result

For study purpose we take one Google image from Google earth . This image cover all areas like grass, water, soil, built-up.

fig 2. Orignal Image

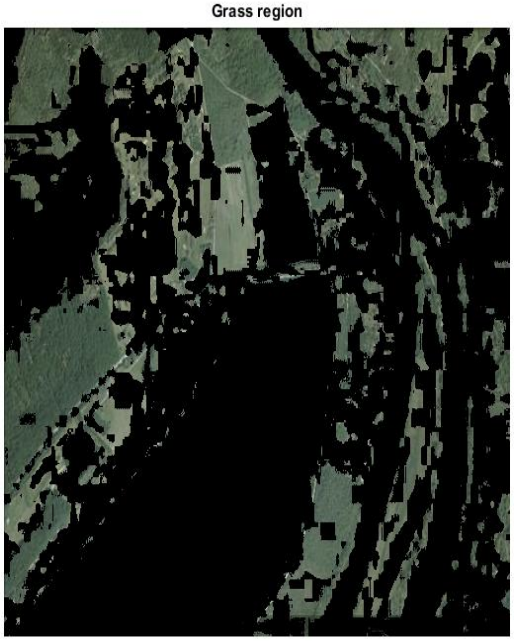

fig 3. Grass Region

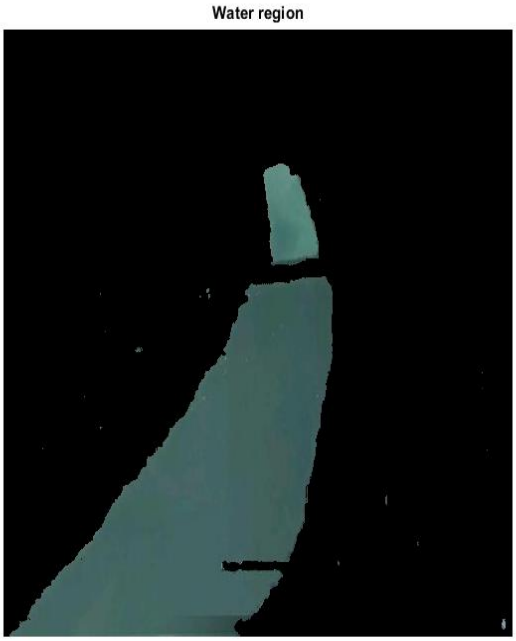

fig 4. Water Region

Fig 5. Built-up Region

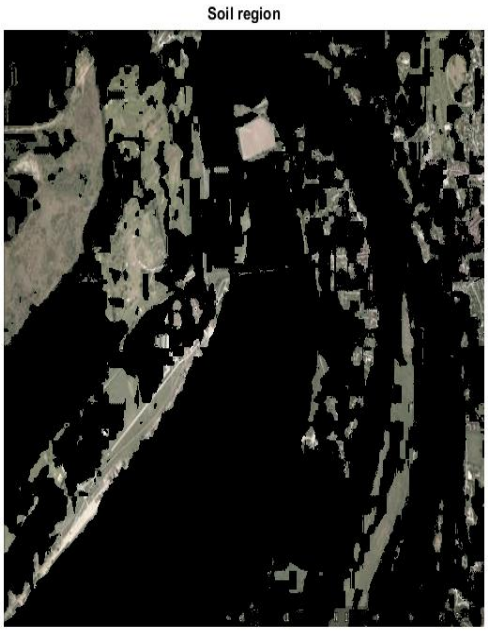

Fig 6. Soil Region

From the above results we can say that K-mean algorithm has successfully classified all the regions i.e. soil, water grass and built-up areas.

Now for area calculation the parameters of given Google images are

Length - 810 meter

Breadth - 515 meter

Latitude - 49º 03’ 37.90’’ N

Longitude - 1º 41’ 07.54’’ E

Elevation - 12 meter

Eye altitude - 2043 meter

Using Length and Breadth we have calculated total area. Then using that area and percent of pixels for each cluster present in image we have calculated area under each cluster.

Table 1. Result

Class	Area (meters2)
Total Area	417150
Area under Soil Region	63583.61
Area under Grass Region	128368.66
Area under Built-up Region	225197.73

- Water runoff calculation:

Now to calculate water runoff using equation (1), we have,
K = 0.65
A = 225197.73 meters
i = 0.1 cm/hr (assumed)
Thus water runoff (Q) is 0.04 cubic meter per second. Which means when 0.1 cm/hr rain will fall on study area; water runoff of 0.04 cubic meters per second will take place.

- Software and Image details:

For this project we are using MATLAB version R2012a as software for computation of algorithm. As specified over, this algorithm works for a wide range of satellite pictures, we are utilizing Google Earth Picture in our undertaking.

V. Conclusion

This proposed conspire presents a model for figuring of water overflow utilizing land cover grouping of satellite pictures. In the process K-mean calculation has been utilized for order of satellite pictures, which was picked due to its phenomenal exactness. When classification of satellite picture was performed region under built-up area is registered and utilizing that region and rainfall ; water runoff is calculated.
Thusly proposed scheme gives us an approach to figure water runoff utilizing procedures of picture handling which thus is utilized for improvement of rainwater harvesting system.

VII. References

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