

Hybrid Algorithm for Food Recognition, Calorie Estimation & Dietary Enforcement

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Abstract:- Food is the fuel of human body & one of the basic necessities of human beings. Due to modern life style dietary habits of human being have changed which include consumption of ready made, packaged & fast food with the reduction of physical labour or exercise carried out by human beings. This kind of unbalanced diet is a high risks factor for diseases & ailments such as obesity, cardiac problems & a host of other diseases. Our work is aimed at determination or classification of food using image processing in conjunction with other intelligent algorithms, with the ultimate aim of determination/estimation of calorie intake our work acts as basis of modern computer assisted, remote dietary management systems. Our system comprises of segmentation of food in the image, then extracting image parameters such as area, major axis, minor axis convex area from the segmented food area, & then using an already trained artificial neural network to classify the food on basis of these parameters. Multiple methods have been combined using weighted averaging to achieve food segmentation, such as surface feature/ bag of features detection; background removed using HCV processing etc. High detection accuracy is obtained by combination of multiple image processing techniques with leven barg marquard function flitting neural network.

Keywords:- Food Recognition, SURF Based Bag of Features, HSV Background Elimination, Image Based Calorie Estimation, Leven Barg Marquard Neural Network.

I. INTRODUCTION

Human services sustenance and great practices in dietary patterns pull in individuals' consideration as of late. These days, innovation can enable clients to monitor their sustenance utilization and increment mindfulness in every day diet by observing nourishment propensities. As of late, various research papers have exhibited that machine learning strategies and PC vision procedures can help construct frameworks for programmed acknowledgment of various nourishment and gauge the measure of sustenance [1] - [5]. To be helpful for dietary observing, nourishment acknowledgment frameworks ought to likewise have the capacity to work in "wild" situations, for example, eateries, bottles, and so forth. Clearly, a reasonable examination of these frameworks requires the accessibility of satisfactory informational collections that really speak to the difficulties of the assignment of perceiving sustenance in unlimited conditions.

We propose another arrangement of information for surveying nourishment acknowledgment calculations that can be utilized in dietetic checking applications. Each image demonstrates a genuine plate of cafeteria with dishes and sustenance orchestrated in various ways. Every plate contains a few models of feed classes. The dataset contains 1027 plate for a sum of 3616 sustenance cases having a place with 73 classes of nourishment. The sustenance picture on the plate was physically portioned utilizing painstakingly planned polygons. We assessed the dataset by planning a programmed plate examination pipeline to take a plate picture as info, discover the locales of intrigue, and foresee the fitting nourishment review for every district. We have encountered three diverse arrangement methodologies utilizing much more visual descriptors. We acquire roughly 79% of the precision of nourishment and trap acknowledgment utilizing convolution-neural system based highlights. The informational collection and additionally the reference structure are accessible to the examination network.

II. LITERATURE REVIEW

As of late, it has been exhibited that visual acknowledgment and machine learning strategies can be utilized to create frameworks that keep tracks of human nourishment utilization. The real handiness of these framework intensely relies upon the capacity of perceiving sustenance in unconstrained conditions. In this paper, we proposed another dataset for the assessment of sustenance acknowledgment calculations. The pictures have been obtained in a genuine cafeteria and delineate a genuine cafeteria plate with sustenance masterminded in various ways. Every plate contains various occurrences of nourishment classes. We gathered an arrangement of 1027 plate for an aggregate of 3616 nourishment occurrences having a place with 73 sustenance classes. The plate pictures have been physically sectioned utilizing precisely drawn polygonal limits. We structured a reasonable programmed plate examination pipeline that takes a plate picture as input, finds the areas of intrigue, and predicts the relating nourishment class for every district. We assessed three distinctive arrangement techniques utilizing a few visual descriptors. The best execution has been gotten by utilizing CNNs-based features. The dataset, and also the benchmark system, are made accessible to the examination network. On account of the manner in which it has been commented on, this database alongside the UNIMIB2015 can be utilized for sustenance division, acknowledgment, and amount estimation.[1].

In this paper, the various food recognition and classification methods have been discussed in brief. The problem statement, various parameters are chosen, various dataset etc., for the various models have also been defined. The motivation for the proposed work is to classify the Indian food snacks and achieve better classification accuracy than the previous work done is also explained. The applications of the proposed model is also mentioned which can be the future work of the proposed system. The model accuracy is expected about 95% which shall be the best classification accuracy achieved so far using the DCNN architecture by applying affine transformations to the available limited dataset, containing grayscale images. [2]

In this paper, we proposed a method to classify and to identify high calorie snacks (such as burger, pizza etc.) from the test image to measure the amount of calories has taken. In our experiment we apply CNN in PFID dataset that provides the accuracy 94% which is better than BOF. Also the false positive rate is not so high. People today are very conscious about their health. So, along with the patient, the health conscious person who has a major effect of food calories can be benefitted with this approach. In future, we will try to improve the accuracy by building a robust system which will identify all kinds of snacks more accurately [3]

This paper presents a dietary evaluation framework dependent on the proposed CSW-WLIFC based segmentation and WLM-NN classifier. The proposed model sections the nourishment things in the plate with the CSW-WLIFC based division. The CSW-WLIFC based division process uses the proposed CSW-based part work for the separation count. The highlights, for example, shading, shape, and surface were removed from the divided pictures to frame the element vector database. The WLMNN classifier orders the sectioned sustenance things from the plate picture and perceives every nourishment thing. The execution of the proposed dietary appraisal framework was broke down with the assessment measurements, for example, MAA, MSE, and SA. The nourishment picture used for the recreation procedure from the UNIMIB2016 database. The execution of the proposed dietary evaluation framework is contrasted and the current models, for example, WLI-FC with LM-NN, CSW-WLIFC with LM-NN, and WLI-FC with WLM-NN. The recreation results demonstrate that the proposed model with the CSW-WLIFC based division and WLM-NN classifier has the enhanced execution than the current models with the estimations of 0.999, 0.9643, 0.9627, and 0.0184 for the division exactness, MAA, SA, and MSE, separately [4].

Paper gives points of interest of customary dietary appraisal strategies and watched poor acknowledgment of these techniques. Diverse advanced cell based dietary evaluation application strategies with different division and arrangement systems for calorie estimation depicted in this paper. As nourishment acknowledgment is increasing more noteworthy in wellbeing related application so to accomplish this target calculations are created, refined and differed with dataset of single and blended sustenance pictures. An electronic gadget, for example, Smartphone

gives restrictive medium to social occasion dietary data which diminishes the weight on record attendants and perceive sustenance type within 5 seconds. From their survey adopted distinctive strategies and arrangements managing diverse models. Still there is extension to build up the framework that is easy to use and engaging all ages with various foundation. Additionally need to create answers for blended sustenance acknowledgment in complex meal and registering asset with expansive measure of information investigation to accomplish high exactness and less processing time. [5]

In this paper, we investigate viability of comparability learning for sustenance picture recovery. We tried three sorts of CNN and it was turned out that Triplet Network was the most intense system contrasted with others. We likewise demonstrated the execution of Triplet Network can be enhanced by consolidating order assignment. [6]

In this paper, we handled the testing keen home sustenance picture acknowledgment issue with various setups. For the restricted information issue, we proposed a super pixel based LDC low-level element based methodology which is reasonable for extremely constrained preparing information. We enhanced the LDC strategy by removing discriminative nourishment thing data dependent on the super pixels division. In the analyses on testing PFID sustenance picture database, our proposed super pixel based LDC approach indicates promising execution enhancement and strength against clamor and impediments. Likewise, the proposed superpixel based LDC approach essentially lessens the computational cost when contrasted and the first LDC approach. At the point when more information focuses are accessible, we proposed a mid-level nourishment picture parts based technique by growing the LDC's neighborhood include to-class separation to a mid-level sustenance parts-to-class remove mining approach and structured a straightforward and powerful nourishment parts choice plan. In the examinations on fair size database UEC Food 100, the proposed mid-level methodology altogether beats other single element based methodologies. At the point when joined with low-level component based methodology, the proposed mid-level methodology enhances characterization exactness from 66.12% to 70.84%, just beaten by DCNN approach in [3,6] which was prepared with one million pictures. [7].

In this paper we examined different picture examination strategies utilized in horticultural area to recognize and order the red gram seeds. The framework dependent on highlight extraction and order for separate the great seed from deserted seed is likewise created. Regarding this, critical stages, for example, picture obtaining, pre-handling, division, include extraction and picture arrangement are broke down. Here picture is gained by computerized camera then pre-prepared utilizing different commotion evacuation channels. Pre-handled pictures are additionally used to recognize edges utilizing different edge recognition administrators, for example, sobel, shrewd, LoG and prevett. At last, edge and locale developing constructed division procedures are connected in light of edge

distinguished seed pictures. We removed the highlights, for example, shading, shape, and surface from the divided pictures for further order. One can stretch out this work to create most huge component vectors for productive and exact grouping. [8]

In the execution of sustenance acknowledgment framework dependent on picture handling the near investigation of different programming plan is finished. we proposed an estimation strategy that gauges the measure of calories from a sustenance's picture by estimating the zone of the nourishment partitions from the picture and utilizing wholesome certainties tables to quantify the measure of calorie and nourishment in the sustenance. Also, calorie is appeared in definite outcomes with rough esteem. In this way the paper is intended to help dieticians for the treatment of stout or overweight individuals, albeit typical individuals can likewise profit by our framework by controlling all the more intently their day by day eating without stressing over gorging and weight gain This is straightforward and simple to utilize. Subsequently this framework is critical in the field of biomedical, the real program is clear and simple to understand.[9]

This paper demonstrates a procedure of assessing a client's regular vitality use utilizing a 3-axis estimating instrument of a nomad telephone. we tend to starting derive the client's stance upheld the increasing speed gadget perusing and ascertain METS worth, that is considered as a live to evaluate calorie utilization for every day exercises. The exploratory outcome demonstrates that our application is as right as a kind of perspective gadget. [10]

Nourishment is a standout amongst the most essential issues for human wellbeing. With the end goal to deal with the solid dietary life, we will build up an auto nourishment log record framework, which depends on auto sustenance acknowledgment innovations. To understand this framework, we plan to propose a separated sustenance picture portrayal that can perform viable distinguishing proof of nourishment pictures in this paper. The customary picture portrayal primarily incorporates shading and surface conveyances (histogram), which are the factual data dependent on consistently quantized shading or surface levels. In any case, these ordinary systems utilizing uniform quantization of the available shading and surface in the picture lead much data misfortune for dependably building the picture. Along these lines, this investigation proposes to portray the shading and surface data by joining the technique of fix based pack of highlights display. This method can adaptively take in the delegate shading or surface (models) from the nourishment pictures for sustenance acknowledgment, and it is conceivable to recuperate a more solid picture utilizing the educated models. The examinations utilizing our proposed methodologies demonstrate that the acknowledgment rate can be incredibly enhanced contrasted and the traditional method. [11]

The need to have a system that measures daily fruit intake for healthy diet is crucial due to the insufficient knowledge of diet and calorie requirements. In addition,

correct fruit recognition is considered challenge. Hence, we proposed a measurement method to estimate the amount of calories from five fruit images by measuring the features of the fruit portions from the image. To reach our goal, we used phone camera or web cam. The designed system is robustness in nature, execution time is approximately 35 seconds as compared to other designed systems by the researchers. The system has ease of use to the user as it have the facility of automatic and manual measurement method. Accuracy of the system is up to the mark. We have successfully implemented a robust system for the correct identification of the fruit, now in future researchers can further work upon various diseases that occur in fruits, also can determine raw, ripen and rotten fruit category, that will differentiate the value of calorie. Unhealthy fruits at the end is hazardous for our life.[12]

In the system, a method for measuring the calories and nutrition of the food object is carried out. The system helps people by closely controlling their daily food intake. We focused on identifying food items in an image using image processing and food classification is done for identifying healthy foods. The proposed system identifies nutrients individually in the food according to which the classification is done using Artificial Neural Network. This system also works towards improving the accuracy of identifying the mixed foods.[13]

Given the number of categories of food items and intra class variations within each class, food recognition is a challenging task. With the increase in popularity of fitness applications and advancements of wearable devices such as Google Glass, exploration of food recognition methods are growing. While we do not claim that the methods presented here are state of the art, we achieved significant improvement over the baseline methods. However, food recognition using statistics of pair wise local features [5]. In future work, we plan to extend our work to: (1) use object bank approach for food item classification, (2) port the trained model to mobile devices for real-time recognition purpose.[14]

In this paper, we have displayed Auto Dietary, an exhaustive and fundamental answer for sustenance consumption acknowledgment in day by day life. We built up an implanted equipment to gather sustenance consumption sensor information, which is featured by a throat receiver easily worn regarding the matters neck to correctly record acoustic signs amid eating in a non-intrusive manner.[15]

Sustenance consumption appraisal is a building square of numerous medicines to general medical issues, particularly for stoutness control. In this paper, we introduced a programmed sustenance acknowledgment strategy named Diet Cam. Exceptionally intended to address the fluctuation issue of nourishment appearances, we built up another sustenance fixing locator and a multi-see multi-bit based SVM to characterize sustenance things. In light of the test on the created sustenance database of 15262 nourishment pictures, Diet Cam exhibited promising execution as contrasted and ordinarily utilized nourishment

characterization strategies. The proposed technique can possibly be executed on cell phones, for example, PDAs for helpful day by day use.[16]

Heftiness is the significant reason for overweight this prompts the sort II diabetes, coronary illness and malignancy. Estimating the sustenance is essential for an effective solid eating routine. Estimating calorie and nourishment in every day sustenance is one of the test strategies. Cell phone assumes a fundamental job in the present mechanical world utilizing this method will improve the issue in admission of dietary utilization .In this venture a nourishment picture acknowledgment framework for estimating the calorie and sustenance esteems was created .the client needs to take the image of the sustenance picture this framework will order the picture to distinguish the sort of nourishment and part measure and the acknowledgment data will gauge the quantity of calories in the nourishment. In this framework the nourishment region, size and volume will be utilized to ascertain the calorie and sustenance in exact way. [17].

In this work, we proposed presenting DCNN highlights which are extricated from the pre-prepared DCNN with the ILSVRC 1000-class dataset into sustenance photograph acknowledgment. In the exploratory outcomes, we have accomplished the best characterization precision, 72.26%, for the UEC-FOOD100 dataset, which demonstrated that that DCNN highlights can helped the grouping execution by incorporating it with the ordinary highlights. For future work, we will execute the proposed structure on cell phones. To do that, it is expected to diminish the measure of the pre-prepared DCNN parameters which comprise of around 60 million gliding esteems. [18]

PC vision-based nourishment acknowledgment could be utilized to assess a supper's sugar content for diabetic patients. This investigation proposes an approach for programmed sustenance acknowledgment, in light of the sack of-highlights (BoF) demonstrate. A broad specialized examination was led for the distinguishing proof and streamlining of the best performing segments associated with the BoF design, and also the estimation of the relating parameters. For the plan and assessment of the model framework, a visual dataset with about 5000 nourishment pictures was made and sorted out into 11 classes. The improved framework processes thick nearby highlights, utilizing the scale-invariant component change on the HSV shading space, manufactures a visual lexicon of 10000 visual words by utilizing the various leveled k-implies bunching lastly orders the sustenance pictures with a straight help vector machine classifier. The framework accomplished grouping precision of the request of 78%, along these lines demonstrating the attainability of the proposed methodology in an exceptionally difficult picture dataset. [19]

The Quality of the nourishment materials are distinguished utilizing the PC supported framework. The key thought of the proposed technique is to distinguish the abandoned parts of nourishment materials. The proposed system gives the correlation of different channels and the

half and half middle channel was chosen as the channel with the high PSNR esteems and was utilized in the pre-preparing stage. Picture division process in particular Color based double Image division and Particle swarm streamlining systems were looked at then their parameters, for example, exactness, specificity, affectability were estimated and discovered that the shading based paired picture division were appropriate for picture division. At last the absconded parts were being portioned from the first picture. The future work depends on highlight characterization and highlight choice of nourishment items by Artificial Neural Networks to order the nature of sustenance as acknowledged, rejected and premium. [20]

It is affirmed that Vegetable vision is an option in contrast to problematic manual arranging of Vegetables. The framework can be utilized for vegetables reviewing by the outside characteristics of size, shape, shading and surface. The Vegetable vision framework can be produced to measure quality properties of different vegetables, for example, mangoes, cucumbers, tomatoes, potatoes, peaches and mushrooms.[21]

III. METHODOLOGY

In this process 1st we take the input image of food then by using image processing operation we are detect the boundary of the food. Then we compute these parameters of food: Area, Major Axis, Eccentricity, Orientation, Convex Area, Filled Area, Euler Number, Solidity, Equivalent Diameter, Extent, Perimeter. Then the pre trend Artificial neural network (ANN) predict the food.

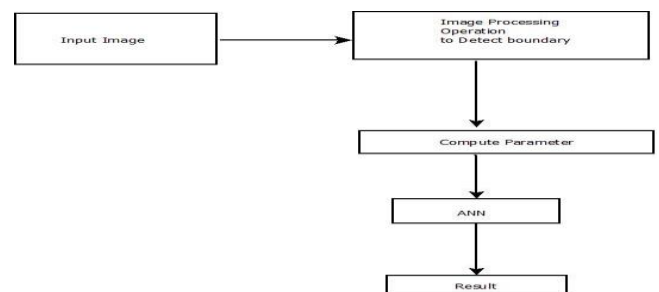


Fig 1: System Block Diagram

IV. RESULTS

In this process 1st we run the main code then the GUI will display. In this we see input image and other options. Then we select the input image. Then the output will be displayed.



Fig 1:- Burger

➤ *Image Parameters:*

In this process 1st we take the input image of food. After selection of input image a command window will be open. This window shows the parameters of food. Then we

follow this process for different- different food image and the resultant parameters are given in the table 1 which is given below.

S.No	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	1.jpg	a	27362	284.09	166.29	0.81	-5.42	39292	29425	-26	0.6964	186.65	0.57	2106.70

Table 1:- Specification of Images

A=Image Name, B=Food Type, C=Area, D=Major Axis, E=Minor Axis, F= Eccentricity=Orientation, H=Convex Area, I=Filled Area, J=Euler Number, K=Solidity, L=Equivalent Diameter, M=Extent, N=Parameter.

VI. FUTURE SCOPE

Food recognition & dietary intake estimation using computer vision is an emerging field of computer engineering. Our system has demonstrated identification or classification of food from food image using image processing & artificial neural network our system has demonstrated, decent accuracy in recognition of food. As automated food classification is an rapidly emerging field the techniques & systems have to adopt to the pace of development & improvement & add-ons to the system are sought. One of the most sought improvements is the addition of automatic calorie estimation depending upon the food type. Other improvement can be advent of a total dietary management system based upon proposed technique which can aid in selection of food types, nutrient cycles & can comment on food selection according to physio medical requirements.

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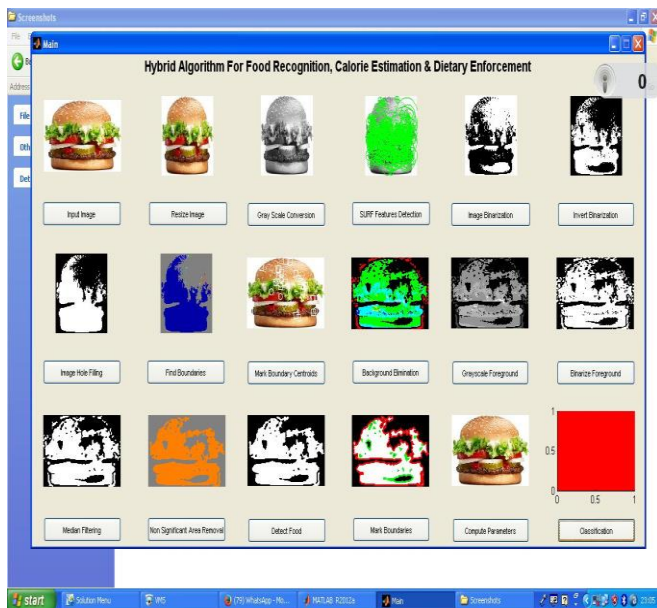


Fig 2:- Displayed Output

V. CONCLUSION

As these enormous variety in food categories & classes of food items, & Hough intra class variations within every classes, automated food recognition using computer vision is on emerging challenge. With the advent of fitness devices & application & advancements in wearable devices, food recognition research is gaining pace. The proposed system is an image processing based food recognition system with high accuracy & repetitive performance. Image processing is employed to segment the food position of the image & extract the food containing part of the image & then various image parameters of the region of interest are computed. The parameter matrix is fed to a trained artificial neural network which classified the food in a particular type. Multiple methods such as surface feature extraction, Bag of shapes & HSV background elimination have been employed for food area segmentation. Morphology & binary image labelling have been used to obtain the various image parameters. Levenberg marquardt function fitting neural network is used to approximate or classify the food type. Combination of the above techniques yield higher accuracy as compared to previous methods.

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