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Food Intake Recognition through Auto dietary System

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Abstract*—Nutrition and obesity related sicknesses are now emerging as dangerous to human health. Now people cross on dieting and not taking proper care in their health and meals consumption energy. To remedy these troubles a machine is evolved that's automatic dietary food intake reputation device by means of the use of wearable sensors. It consists of embedded gadget and sign processing system in which food consumption is sensed with the aid of excessive constancy microphone and signal is pre-processed by using embedded hardware part and through blue tooth it is despatched to smart telephone. Right here we've got used hidden markov models to understand chewing and swallowing events to extract time and frequency domain features in addition to volume and weight of meals in-take. Algorithm for selection is evolved for kinds of food reputation. For eg in weight loss plan manage patient affected by diabetes precisely reveal daily meals consumption. An utility on smart telephone is developed to expose the consequences of meals intake as well as supply storage for higher eating conduct and provide healthier suggestions on it. Also, doctor can monitor the patients food intake by storing his/her cell no in system application.

***Keywords*- recognition of food intake, sensors, signal giving out, decision tree, embedded gadget.**

I. INTRODUCTION

To preserve healthful existence may be very vital in our day by day life, for that day by day meals intake must be right and if any abnormalities takes locations due to imbalance ends in diseases like weight problems and many others.[1].if proper remedy isn't taken then severe disorders may additionally take vicinity. Here primary work efforts is to evaluate and screen daily vitamins and calorie balance [2]. Diverse methods are there to degree meals consumption however they are both not correct and some are not nicely present.

For this we endorse automated nutritional for meals consumption recognition machine wherein meals is understand via a wearable sensor. Gadget comprises of blocks. i) Embedded hardware block & ii) smartphone utility. Hardware collects and techniques meals intake statistics. A wearable sensor is in necklace shape which is wear round neck and picks up acoustic sound alerts. The fact that's collected is transmitted via Bluetooth module to phone.

Food type popularity includes diverse steps. The sound signals are first accumulated collectively and then they're processed by means of hidden Markov fashions to locate chew and swallow occasions thru fluid consumption [3] .thru this events we extract the time and frequency area capabilities as well as other features which are not linear. A delicate kind of choice tree is advanced to identify the type of food taken.

For this experiments are carried out for 4 distinct styles of meals. The accuracy is calculated and identified based on chewing and swallowing occasions which is sort of 86.6% .To perceive liquid and solid meals accuracy is 97.6% and 99.7%.

II. SYSTEM STRUCTURE

There are primary units in auto nutritional, one is embedded device using for audio records gaining& pre-giving out. Second is the application running on clever phone that implements food type popularity and gives us the information for users

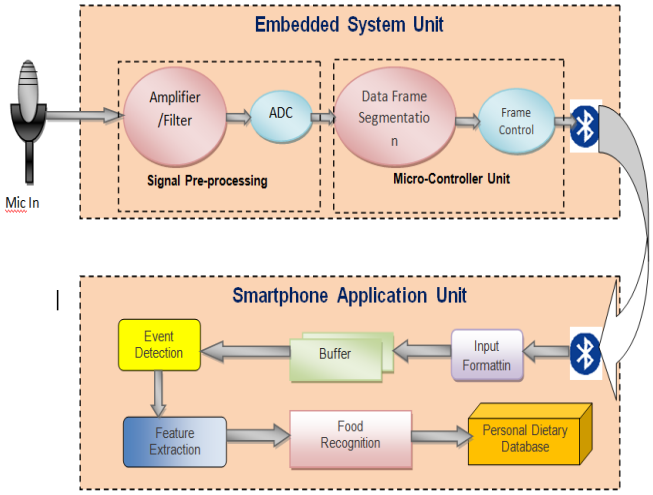

Fig 1: System structure of Auto Dietry [11]

A . Audio sensors

An excessive constancy & precise throat micro phones accumulate audio alerts at the time of ingesting. The wearable sensor called microphone is placed over the neck. It converts vibrations from the skin to acoustic signals it connects best high quality signals for the motive of computerized dietary machine by lowering interference of noise. It's far relaxed to put on. The throat microphone has frequency variety of 20Hz-20 KHz, which is suitable for amassing chunk& swallow sound

B. Hardware system

An embedded hardware device is truly evolved for information working and it is transmitted whilst collected from throat microphone. When facts are accumulated from throat micro Smartphone it is amplified and filtered for high exceptional indicators [4]. through analog to virtual converter alerts are converted into proper layout. those

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converted signals are ship to micro controller thru I2C .The sound signals are divided in to frames for further giving out. The micro controller frames raw alerts from throat micro-phones that is MSP430 microcontroller [4] . The records frames are ship to a Blue-enamel module & in addition ship to clever Smartphone. A lipo battery is brought to energies the hardware gadget.

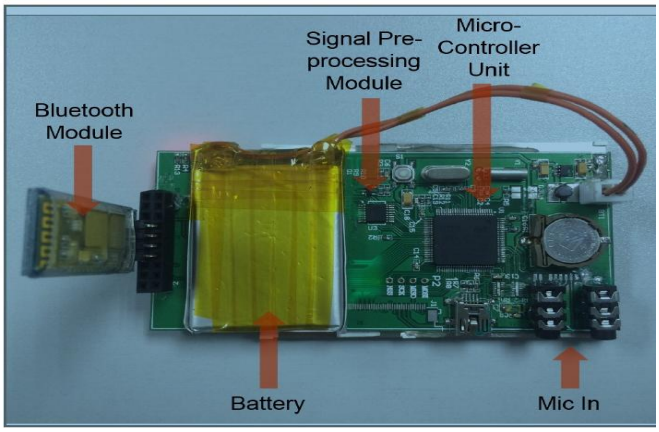
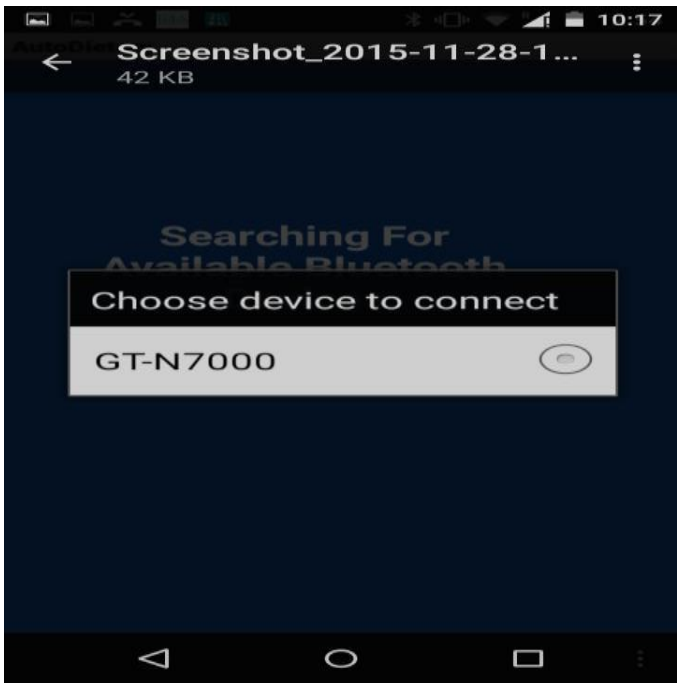


Fig 2: Hardware Board [11]

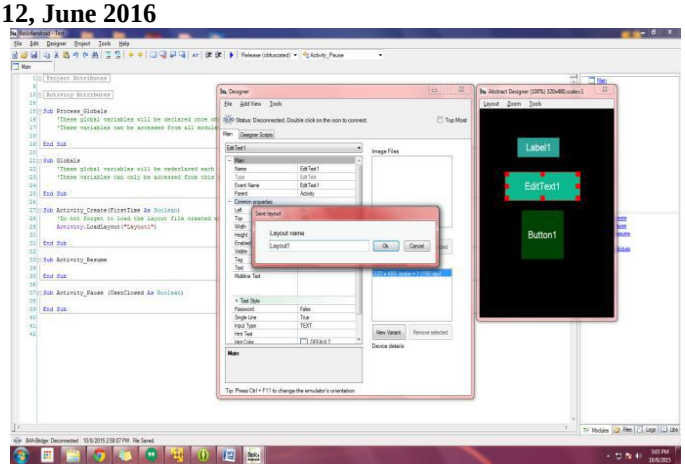
C. cell phone utility

Application on smart telephone works with two roles. First is it works on meals kind popularity & 2nd, it plays as statistics manger & affords to interface to users .whilst users begins to eat, gadget will apprehend the food type and keep the facts in information base.

The consumer assessments the data & receives hints on wholesome consuming conduct by analyzing information



The user checks the records & gets suggestions on healthy eating habits by analyzing data.



(b)Screen shots of developing activity layout in smart phone application

The suggestions include alerts on chewing speed, hydration intake, excessive food, intervals between meals.

III. DATA FLOW OF FOOD RECOGNITION

In three steps meals is diagnosed. In the beginning sound frames are accumulated throughout consuming system which encompass chew and swallow trials. Secondly it includes hidden markov models which discover bite and swallow occasions from sound frames. In closing step every trial are computed to pull out functions and identify diverse meals sorts. Also, those values are evaluated with our simple selection tree to calculate the food kind. [5][6][7].

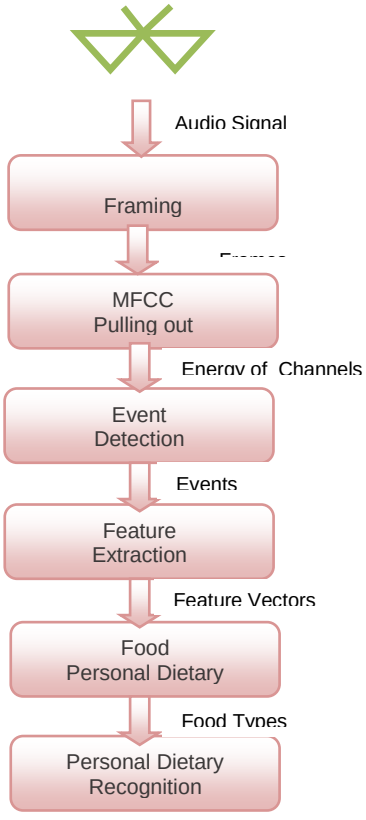


Fig. 3 food intake sign giving out information

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IV. SORTING OF DIVERSE MEALS & ITS REPUTATION

Here on this technique varieties of foods are analogous to chew and swallow occasions that can be done thru calculated feature and time values based totally on previous learning's or information. Here we've included easy decision tree to pick out diverse foods that allows you to also test the text type in addition to its behaviour pastime. Right here that simple tree used is a massive piece of complete tree to recognize apple and milk as shown in fig 5.To determine those two ingredients first we have extract it characteristic values ie (max peak is calculated) and division satisfies that is taken, once more re system is began to get higher function values inside the processing. Finally once a leaf node is reached, a final choice at the food kind is returned.[8][9][10].

V. RESULTS

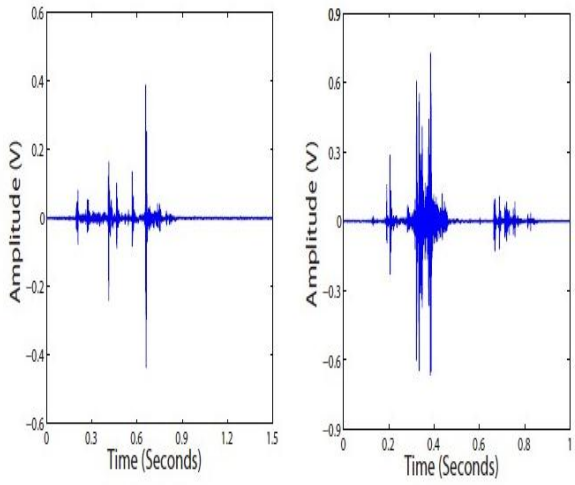

Fig 4: Time area or field sorts for food consumption occasions (a) Apple (b) Milk

TABLE I. TIME DOMAIN FEATURES

Features	Descriptions
High Peak	Maximum value of a event
Low Peak	Minimum value of a event
Mean	Average value of a event
Variance	The square of Std_variance
std_variance	Measure of spreadness of event
ZCR	Measure related with frequency
Skewness	The degree of asymmetry of the data distribution
Kurtosis	whether signal is peaked or flat relative to a normal distribution
Interquartile	Measure of statistical dispersion

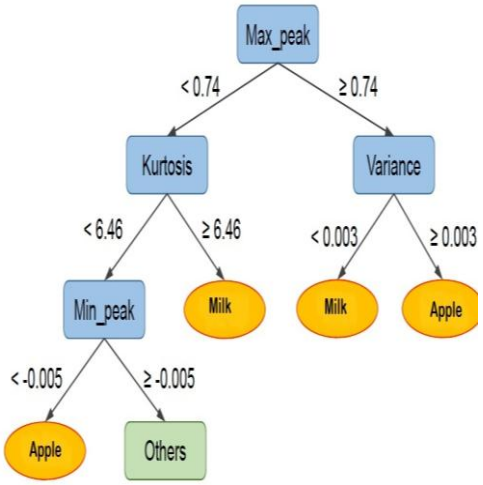

Fig 5: A part of the selection tree to realize apple and milk

VI.CONCLUSION & FUTURE WORK

On this paper, we've provided the automated meals nutritional in complete way for meals intake reputation. We prepared the embedded hardware and clever cell phone utility to acquire various ingredients that is sensed via signal information thru a throat microphone positioned on neck to report audio signals throughout ingesting. Here we have used hidden markov fashions to discover swallow and chunk moves and then they may be processed to attract the time and frequency domain or area capabilities. We developed smartphone apps which now not only includes meals popularity outcomes however also shows for healthier consuming conduct.

The automated food dietary have performance in food recognition especially in recognizing stable meals from liquid meals. The primary cause in the back of that is excessive fidelity &v particular throat microphone which guaranties excessive best signals with the aid of lowering noise. This modern-day layout of automated meals dietary applicable via maximum customers. it could be beneficial for disabled & sick people for those daily that involves every day meals consumption tracking.

Within the destiny we made idea to improve automatic food dietary in various approaches first, we advise to feature special techniques to the gadget including inclusive of quantity & weight of meals intake, second to decrease the size of device that's weared on neck & embedded hardware unit so that consumer can worn like necklace pendent & put in to the chest pocket as well because it ought to work as a bio monitoring tool.

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