

Diet Aid Weight Machine

Etukala Jhansi

PG Scholar,

Dept of ECE,

Vignan Institute of Technology and Science,
Hyderabad, TS, India.

N.Dinesh Kumar

Professor,

Dept of ECE,

Vignan Institute of Technology and Science,
Hyderabad, TS, India.

Abstract:

This project entails the development of a microcontroller board and PC graphical user interface that together comprise a prototype of the “DANI” (Dynamic Automated Nutrition Innovations) weight scale, a portion control and diet aid scale. Obesity in the United States is on the rise – according to data from the Centers for Disease Control and Prevention, in 2009, all states but Colorado and the District of Columbia had obesity rates of 20% or more. To help curtail this trend, a team of Cornell students have been designing a revolutionary diet aid: a weight scale that reports the nutritional value of the weighed item and transmits it wirelessly to a smart phone or computer for viewing and logging. This project entails the development of a complete prototype of the “DANI” (Dynamic Automated Nutrition Innovations) weight scale. The goal of the weight scale is to measure the nutritional intake of a person in as simple and non-intrusive a manner as possible and to report the measured data so that the person using the scale becomes aware of exactly how many calories and other nutrients they are consuming over the course of a day. Because the weight scale reports very detailed nutritional data, including the amount of vitamins and minerals ingested, it can double as a nutritional assistant in addition to being a diet aid.

Keywords: Graphical user interface, DANI (dynamic automated nutrition innovations), weight sensor.

I. INTRODUCTION:

1.1 Introduction:

The main aim of the project is to detect the calories from the food image because obesity in adults has become a serious problem.

Recent studies have shown that obese people are more likely to have serious conditions such as hypertension, heart attack, type II diabetes, high cholesterol, and breathing disorders. And the main cause of obesity is the imbalance between the amount of food intake and energy consumed by the individuals. So, in order to lose weight in a healthy way, as well as to maintain a healthy weight for normal people, the daily food intake must be measured. The goal of the weight scale is to measure the nutritional intake of a person in as simple and non-intrusive a manner as possible and to report the measured data so that the person using the scale becomes aware of exactly how many calories and other nutrients they are consuming over the course of a day. Because the weight scale reports very detailed nutritional data, it can double as a nutritional assistant in addition to being a diet aid.

1.2 Implementation procedure:

Some of the important health problems faced by Indians include chronic degenerative diseases such as diabetes, hypertension, cardio-vascular disease and complications arising from any of these conditions. In fact, Asian Indian immigrants have a significantly higher risk of CVD (cardiovascular disease) with heart disease rates estimated to be one and one half to four times greater than Whites. In addition to the genetic susceptibility in developing Type 2 diabetes and cardiovascular disease, risk factors such as abnormal lipid levels, increased abdominal fat, diets high in fat, saturated and trans-fats, simple carbohydrates and sedentary lifestyles contribute to the development of chronic diseases. To avoid all these diseases there should be a diet plan. There will be a diet plan for every individual based on their height and weight. Doctor will suggest based on all these details.

Number of calories needed for a particular person per day will be considered as a diet chart. Dietitians create healthy eating plans while integrating a person's individual food preferences. Every individual should have an idea of intake of his food calories to build a healthy life. In our project we designed a system to know the calorie of each and every individual food item using MATLAB. Here one can measure the weight of food item using weight sensor. This weight and product name can be entered manually using keyboard to MATLAB software, which will calculate the number of calories. In the PC itself it will display the calories. Here we are also using LPC2148 as our controller for the purpose of LCD display. This project uses regulated 3.3V, 1A power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

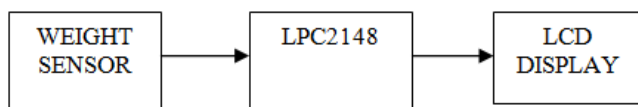


Fig 1.1 Block Diagram

II.LITERATURE SURVEY:

A. World Health Organization, Geneva, Switzerland [1]:

As people across the globe are becoming more interested in watching their weight, eating healthier and avoiding obesity, a system that can measure calories and nutrition in every day meals can be very useful. In this paper, we propose a food calorie and nutrition measurement system that can help patients and dieticians to measure and manage daily food intake. Our results show that the accuracy of our system is acceptable and it will greatly improve and facilitate current manual calorie measurement techniques. Here the food calorie and nutrition measurement system that can help patients and dieticians to measure daily food intake is very simple and is of cost effective.

B.An identification approach for 2-Dautoregressive models in describing textures

A technique for identification of the autoregressive components is developed to describe textural regions of digital images by a general class of two-dimensional autoregressive model. Since for such modelling the feature spaces for different classes are different, a classifier and a recognition scheme using the parameters of such models are presented. Examples with synthetic textures are presented to illustrate that the model identification is appropriate. The classification scheme is illustrated with real periodic and a periodic textures. The overall misclassification rate is about 2.4%.

III HARDWARE IMLEMENTATION:

Some of the important health problems faced by Indians include chronic degenerative diseases such as diabetes, hypertension, cardio-vascular disease and complications arising from any of these conditions. In fact, Asian Indian immigrants have a significantly higher risk of CVD (cardiovascular disease) with heart disease rates estimated to be one and one half to four times greater than Whites. To avoid all these diseases there should be a diet plan. There will be a diet plan for every individual based on their height and weight. Doctor will suggest based on all these details. Number of calories needed for a particular person per day will be considered as a diet chart. Dietitians create healthy eating plans while integrating a person's individual food preferences.

ARM ARCHITECTURE:

The LPC2148 is based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty.

With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT, PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

ARM PROCESSOR:

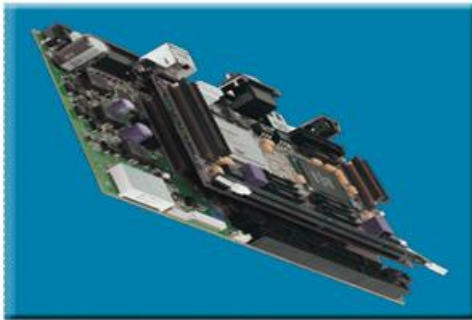


Figure: ARM7 board

SERIAL COMMUNICATION:

Serial communication is basically the transmission or reception of data one bit at a time. Today's computers generally address data in bytes or some multiple thereof. A byte contains 8 bits. A bit is basically either a logical 1 or zero. Every character on this page is actually expressed internally as one byte. The serial port is used to convert each byte to a stream of ones and zeroes as well as to convert a stream of ones and zeroes to bytes. The serial port contains a electronic chip called a Universal Asynchronous Receiver/Transmitter (UART) that actually does the conversion. The serial port has many pins. We will discuss the transmit and receive pin first. Electrically speaking, whenever the serial port sends a logical one (1) a negative voltage is effected on the transmit pin. Whenever the serial port sends a logical zero (0) a positive voltage is affected. When no data is being sent, the serial port's transmit pin's voltage is negative (1) and is said to be in a MARK state.

Note that the serial port can also be forced to keep the transmit pin at a positive voltage (0) and is said to be the SPACE or BREAK state. (The terms MARK and SPACE are also used to simply denote a negative voltage (1) or a positive voltage (0) at the transmit pin respectively). When transmitting a byte, the UART (serial port) first sends a START BIT which is a positive voltage (0), followed by the data (general 8 bits, but could be 5, 6, 7, or 8 bits) followed by one or two STOP Bits which is a negative(1) voltage. The sequence is repeated for each byte sent. Figure 1 shows a diagram of what a byte transmission would look like.

RS232:

When we look at the connector pin out of the RS232 port, we see two pins which are certainly used for flow control. These two pins are **RTS**, request to send and **CTS**, clear to send. With **DTE/DCE** communication (i.e. a computer communicating with a modem device) **RTS** is an output on the **DTE** and input on the **DCE**. **CTS** are the answering signal coming from the **DCE**. Fig.3.6 weighing scale. Before sending a character, the **DTE** asks permission by setting its **RTS** output. No information will be sent until the **DCE** grants permission by using the **CTS** line.

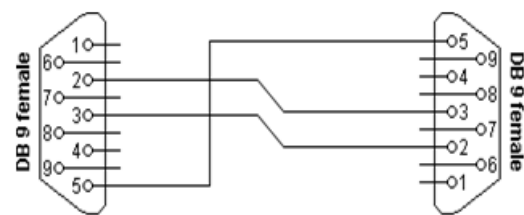


Fig RS232

Connector 1	Connector 2	Function
2	3	Rx ← TX
3	2	TX → Rx
5	5	Signal ground

Fig RS232 Interconnections

WEIGHING SCALE:

Weighing scales (or weigh scales or scales) are devices to measure weight or calculate mass. Spring balances or spring scales measure weight (force) by balancing the force due to gravity against the force on a spring, whereas a balance or pair of scales using a balance beam compares masses by balancing the weight due to the mass of an object against the weight of a known mass or masses. Either type can be calibrated to read in units of force such as newtons, or in units of mass such as kilograms, but the balance or pair of scales using a traditional balance beam to compare masses will read correctly for mass even if moved to a place with a different (non-zero) gravitational field strength (but would then not read correctly if calibrated in units of force), while the spring balance would read correctly in force in a different gravitational field strength (but would not read correctly if calibrated in units of mass).



Fig weighing scale

WEBCAMERA:

A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops. The term "webcam" (a clipped compound) may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet.

Some of them, for example, those used as online traffic cameras, are expensive, rugged professional video cameras. A webcam is a compact digital camera you can hook up to your computer to broadcast video images in real time (as they happen). Just like a digital camera, it captures light through a small lens at the front using a tiny grid of microscopic light-detectors built into an image-sensing microchip (either a charge-coupled device (CCD) or, more likely these days, a CMOS image sensor). As we'll see in a moment, the image sensor and its circuitry converts the picture in front of the camera into digital format—a string of zeros and ones that a computer knows how to handle. Unlike a digital camera, a webcam has no built-in memory chip or flash memory card: it doesn't need to "remember" pictures because it's designed to capture and transmit them immediately to a computer.



Fig. web camera

IV. SOFTWARE

C. SOFTWARE STRUCTURE:

TYPES OF TOOLS:

- KEIL C
- MATLAB

KEIL C:

Keil software is the leading vendor for 8/16-bit development tools (ranked at first position in the 2004 embedded market study of the embedded system and EE times magazine). Keil software is represented worldwide in more than 40 countries, since the market introduction in 1988; the keil C51 compiler is the de facto industry standard and supports more than 500 current 8051 device variants.

Now, keil software offers development tools for ARM. Keil software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for 8051, 251, ARM and XC16x/C16x/ST10 microcontroller families. The Keil C51 C Compiler for the 8051 microcontroller is the most popular 8051 C compiler in the world. It provides more features than any other 8051 C compiler available today. The C51 Compiler allows you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the C51 Compiler give you full access to all resources of the 8051. The C51 Compiler translates C source files into relocatable object modules which contain full symbolic information for debugging with the μ Vision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference.

- Nine basic data types, including 32-bit IEEE floating-point,
- Flexible variable allocation with bit, data, bdata, idata, xdata, and pdata memory types,
- Interrupt functions may be written in C,
- Full use of the 8051 register banks,
- Complete symbol and type information for source-level debugging,
- Use of AJMP and ACALL instructions,
- Bit-addressable data objects,
- Built-in interface for the RTX51 real time kernels,
- Support for the Philips 8xC750, 8xC751, and 8xC752 limited instruction sets,
- Support for the Infineon 80C517 arithmetic unit. device to execute code at the end of the ISP operation.

MATLAB:

The goal of this tutorial is to give a brief introduction to the mathematical software MATLAB. After completing the worksheet you should know how to start MATLAB, how to use the elementary functions in MATLAB and how to use MATLAB to plot functions. MATLAB is widely used in all areas of applied mathematics, in education and research at universities, and in the industry. MATLAB stands for MATrix LABoratory and the software is built up around vectors and matrices. This makes the software particularly useful for linear algebra but MATLAB is also a great tool for solving algebraic and differential equations and for numerical integration. MATLAB has powerful graphic tools and can produce nice pictures in both 2D and 3D. It is also a programming language, and is one of the easiest programming languages for writing mathematical programs. MATLAB also has some tool boxes useful for signal processing, image processing, optimization, etc.

4.1.1 Usage of Matlab in the Project:

In the project the matlab software is used for the area where I see most concern is where images are processed using proprietary software, for example Photoshop, where the implementation details of any image processing algorithm are inaccessible. Some algorithms are quite complex and the results may be sensitive to subtleties in the implementation. An image that has been extensively processed using proprietary software may well be challenged in court. Refuting that challenge will be difficult if one does not have access to the source code. Another area of difficulty is recording all the steps used in the image enhancement process. Some applications such as Photoshop provide an extensive 'history' recording process. However, this sort of facility is designed primarily with the aim of being able to undo processes, or revert back to an earlier step in the sequence of processes. The history recording may not allow access to particular parameter values used in any individual step. Image Acquisition Toolbox provides functions and blocks that enable you to connect industrial and scientific cameras to MATLAB and Simulink.

It includes a MATLAB app that lets you interactively detect and configure hardware properties. The toolbox enables acquisition modes such as processing in-the-loop, hardware triggering, background acquisition, and synchronizing acquisition across multiple devices. Image Acquisition Toolbox supports all major standards and hardware vendors, including USB3 Vision, GigE Vision, and GenICam GenTL. You can connect to 3D depth cameras, machine vision cameras, and frame grabbers, as well as high-end scientific and industrial devices. MATLAB provides many functions for image processing and other tasks. Most of these functions are written in the MATLAB language and are publicly readable as plain text files.

Thus the implementation details of these functions are accessible and open to scrutiny. The defense can examine the processing used in complete detail, and any challenges raised can be responded to in an informed way by the prosecution. This makes MATLAB very different from applications, such as Photoshop. It should be noted that some MATLAB functions cannot be viewed. These are generally lower level functions that are computationally expensive and are hence provided as 'builtin' functions running as native code. These functions are heavily used and tested and can be relied on with considerable confidence.

A graphical user interface provides the user with a familiar environment in which to work. This environment contains pushbuttons, toggle buttons, lists, menus, text boxes, and so forth, all of which are already familiar to the user, so that he or she can concentrate on using the application rather than on the mechanics involved in doing things. However, GUIs are harder for the programmer because a GUI-based program must be prepared for mouse clicks (or possibly keyboard input) for any GUI element at any time. Such inputs are known as events, and a program that responds to events is said to be event driven. The three principal elements required to create a MATLAB Graphical User Interface are

1. Components. Each item on a MATLAB GUI (pushbuttons, labels, edit boxes, etc.) is a graphical component. The types of components include graphical controls (pushbuttons, edit boxes, lists, sliders, etc.), static elements (frames and text strings), menus, and axes. Graphical controls and static elements are created by the function `uicontrol`, and menus are created by the functions `uimenu` and `uicontxtmenu`. Axes, which are used to display graphical data, are created by the function `axes`.
2. Figures. The components of a GUI must be arranged within a figure, which is a window on the computer screen. In the past, figures have been created automatically whenever we have plotted data. However, empty figures can be created with the function `figure` and can be used to hold any combination of components.

The Chart for the Calories:

Food name	measure	weight	calories
apple	1	140	80
Banana	1	120	108
orange	1	110	62
egg	1	150	17
5star chocolate	1	26	117k
almonds	1	100	576
cashews	1	100	553
Potato, boil	1	135	216
Tomatoes ,raw	1	123	30

Applications:

The main application of our system is used in medical purpose and is designed to aid dieticians for the treatment of obese or overweight people, although normal people can also benefit from our system by controlling more closely their daily eating without worrying about overeating and weight gain

- General purpose in the home for self analysis of Diet . since
- Medical application

ADVANTAGES:

- Small device
- Lower Power Consumption
- Simple decoding
- Higher performance
- Easy to implement an effective pipelined structure

FUTURESCOPE:

- a) Better estimation of the area of each food portion, which can be improved using more accurate segmentation methods
- b) A better approach to measure the depth of the food more accurately, instead of assuming that the depth is uniform throughout the food portion's area, which is what we assume now

CONCLUSION:

A measurement method that estimates the amount of calories from a food's image by measuring the volume of the food portions and using nutritional facts tables to measure the amount of calorie and nutrition in the food. This system is designed to aid dieticians for the treatment of obese or overweight people, although normal people can also benefit from this system by controlling more closely their daily eating without worrying about overeating and weight gain. This paper focussed on identifying food items in an image using image segmentation and classification and measures volume and calorie based on food portion mass and nutritional tables. Results of this paper indicate the reasonable accuracy in area measurement, and subsequently volume and calorie measurement

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