

# MACHINE VISION SYSTEM AS A YOGA TUTOR

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**Abstract** - Yoga is an ancient Indian art which helps to distress and purge the mind, body and soul. It is known to be a complete cure for various illnesses without the use of medicines. The paper aims to describe a project which is used to help naive users to perform this ancient Indian art correctly in order to maximize the benefits. It makes use of the SURF algorithm to detect the 'asana' that the user/practitioner is performing and compares it with a image of the same 'asana' performed by an expert. Thus, it helps to detect and eventually correct errors induced in practicing the art using only a webcam and an expert image as aides for the user.

**Key Words:** SURF (Speeded Up Robust Feature), Euclidean distance classifier.

## 1. INTRODUCTION

Yoga is a Sanskrit word derived from the Sanskrit root "yuj" which means to connect, join or balance. Yoga implies this connection with a knowledge that removes the impurities from our minds and bodies and helps us to purge our bodies from these evils. Yoga had its origins in India in the Sat Yuga, the Age of Gold, over 26,000 years ago. The Bhagwad Gita, a very widely known classical text on Yoga, gives various definitions of Yoga.

1. Yoga is equanimity of mind in success and failure.
2. Yoga is discretion in work.
3. Yoga is the remover of misery and destroyer of pain.

4. Yoga is the supreme secret of life.

5. Yoga is serenity.

Yoga is mainly composed of various forms of human poses and various techniques of attaining these poses. These movements are called 'asanas'. The project mainly aims to provide a tutor to master the 'asanas' through the use of visualization to enable the user to see if he is doing the 'asana' correctly. This is done by superimposing of two images which tell the user the difference between the 'asana' that the user is doing as opposed to the actual way of doing the 'asana'.

## 1. PROBLEM STATEMENT

To design a machine vision system as a yoga tutor

## 2. OBJECTIVE

- Capture image by using camera
- Preprocessing is done
- Interfacing voice processor to LPC 2148

## 3. METHODOLOGY

### 3.1 Grayscale

Each pixel is based on the RGB model of pixels which specify the intensity of the Red, Green and Blue color which define the color of the pixel as a combination of these three. Grayscale is a method which is used to maximize the efficiency of using the sensor and also to guard against round-off errors in computations.

### 3.2 Thresholding

Thresholding is one of the simplest forms of converting a grayscale image to a binary image. The technique involves setting a threshold value for pixels. Using this value, pixels are set as 'object' or 'background' pixels. All the pixels having a value higher than the threshold are set as object

pixels and all other pixels as background pixels. As a result, a grayscale image is converted into a binary image (having only white and black colors; white for background and black for object pixels).

### 3.3 Erosion and Dilation

The basic form of grayscale image dilation computes, for each image pixel, the maximum value of its neighboring pixels. Grayscale image erosion computes the minimum of each pixel's neighborhood. Erosion is also used for smoothening boundary noise in the image. Thus, this step is used for noise reduction.

### 3.4 Using SURF algorithm for comparing images (reference and actual/practitioner image)

The SURF algorithm is then used to compare the reference image with the practitioner image. First the SURF algorithm captures an image. It then picks a handful of pixels and throws them onto the image in the captured image. These pixels act as the keypoints for the reference image. The algorithm then searches for the same keypoints in the practitioner image. These keypoints in the reference image are then compared with the keypoints with those in the practitioner image. The keypoints in both image are shown by drawing lines between two keypoints of the same type in the images.

## 4. SPECIFICATIONS

### 4.1 Hardware Specifications:

- Camera
- ARM 7 LPC 2138
- Voice processor APR33A3

### 4.2 Software Specifications :

MATLAB

## 5. BLOCK DIAGRAM

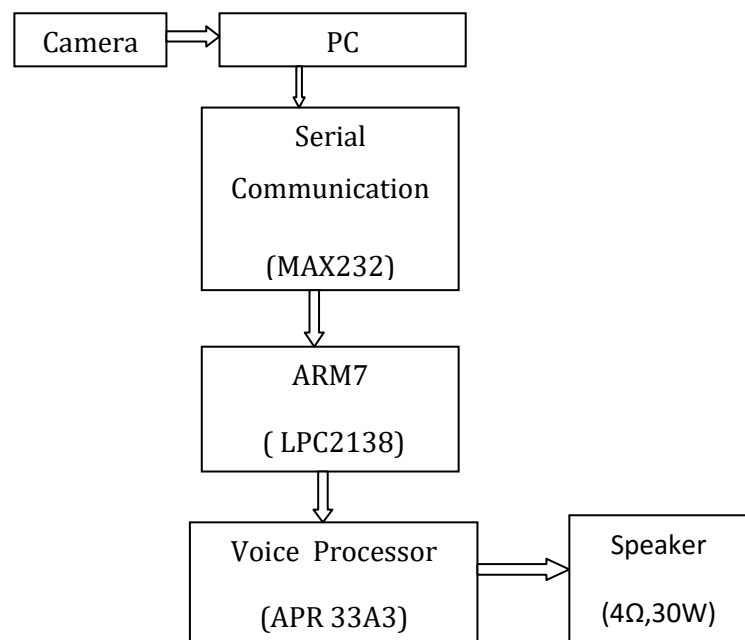


Fig. 1 block diagram of machine vision system as a yoga tutor

## 6. STEPS IN PREPROCESSING

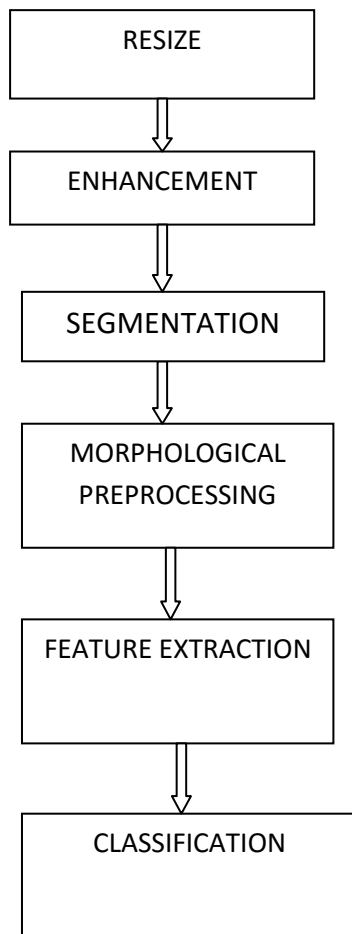


Fig.2 steps in preprocessing

## 7. Block Diagram Description

### 7.1 Web Camera:

Webcam is used for taking the live image of person we are using “ROBO 351 i-boll” Web Cam after observing its specification it capture the image and sent it to PC through USB data cable. It require +5v , 0.35 amp (max) voltage and current for its operation.

### 7.2 Serial interface:

RS-232 is a serial communications standard that provides asynchronous and synchronous communication capabilities, such as hardware flow control, software flow control, and parity check. It has

been widely used for decades. The typical transmission speed of an RS-232 connection is 9600 bps over a maximum distance of 15 meters

### 7.4 LPC2138

Due to their tiny size and low power consumption, these microcontrollers are ideal or applications where miniaturization is a key requirement, such as access control and point-of-sale. With a wide range of serial communications interfaces and on-chip SRAM options of 8/16/32 kB, they are very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit 8 channel ADC(s), 10-bit DAC, PWM channels and 47 GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

### 7.5 APR33A3

Features:

- Total 11 minutes of recording time each channel(M0 to M7) having 1.3 minutes of recording time.
- Single chip, high quality voice recording and playback solution.
- User friendly and easy to use operation.
- Non-Volatile flash memory technology, no battery backup required.
- Audio output to drive a speaker or audio out for public address system.

- Can record voice with the help of on-board microphone

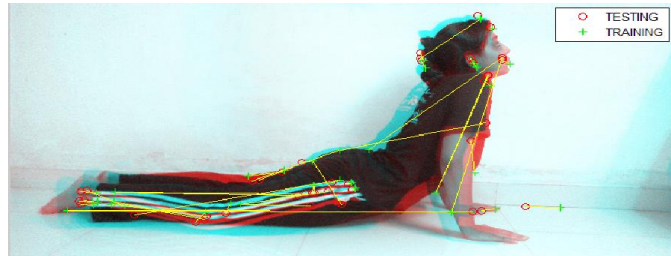


Fig.3 final output image for *bhujangasana*

## 8. CONCLUSION

This project helps a new user to perform yoga correctly, without the help of experts and gives the output in the form of audio. The image for which maximum number of keypoints are matched is taken as output.

## 9. REFERENCE

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