Pulse Detection System Using OpenCV

[1]D.Salma Faroze,[2]C.Nancy
[1]Assistant Professor,[2]Assistant Professor
[1]Computer Science & Engineering, Computer Science & Engineering
[1]CBIT Proddatur, AP,India.

Abstract : Plethysmographic signals were measured remotely (> 1m) using ambient light and a simple consumer level digital camera in movie mode. Heart and respiration rates could be quantified up to several harmonics. Although the green channel featuring the strongest plethysmographic signal, corresponding to an absorption peak by (oxy-) hemoglobin, the red and blue channels also contained plethysmographic information. The results show that ambient light photo-plethysmography may be useful for medical purposes such as characterization of vascular skin lesions (e.g., port wine stains) and remote sensing of signs (e.g., heart and respiration rates) for triage or sports purposes vital. This applicaton uses the opencv to find the location of the user's face, then isolate the forehead region.

IndexTerms – Plethysmographic, photo-plethysmography, pulse oxymetry

1.Introduction

Detection of the cardio-vascular pulse wave traveling through the body is referred to as Plethysmography ('Plethysmos' = increase in Greek) and can be done by means such as variations in air pressure, impedance, or strain. Photo-plethysmography (PPG), introduced in the 1930's uses light reflectance or transmission and is the least expensive method and simple to use. PPG is based on the principle that blood absorbs light more than surrounding tissue so variations in blood volume affect transmission or reflectance correspondingly. Applications of PPG include monitoring of oxygen saturation (pulse oxymetry), heart (HR) and respiration (RR) rates, blood pressure, cardiac output, assessment of autonomic functions and detection of peripheral vascular diseases. Remote, non-contact pulse oxymetry and PPG imaging have been explored only relatively recently . To our knowledge, PPG has always been performed with dedicated light sources and typically red and/or infra-red (IR) wavelengths. Due to the historical emphasis of PPG on pulse oxymetry and the associated need to sample relatively deep (e.g., 1 mm) veins and arteries, the visible spectrum (with a shallower penetration depth in skin) has often been ignored as a light source for PPG. Publications

describing non-red visible light sources for PPG (e.g. green) are either recent or relatively old, and, in all cases, contact probes were used. Ambient visible light is often considered a source of noise when using IR light sources and detectors sensitive for IR and visible light. In this communication, we show that PPG signals can be remotely (several m) measured on the human face with normal ambient light as the source and a simple digital, consumer level photo camera in movie mode. At distances of 1.5 m, signal to noise ratio (SNR) was such that up to four harmonics of the fundamental HR frequency can be measured, thus rendering not only the HR but also the shape of the waveform

2.System analysis

Existing system:

The pulse can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heart rate changes. The basic heart rate sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. There are several methods for measuring the HR, being the most common one the palpation method, which consists in pressuring with the index and the middle finger at a place where an artery can be compressed against a bone (such as at the wrist or the neck). Other standard techniques of measuring the HR are:

• Electrocardiogram devices (ECG), which can be seen attach electrodes or a chest strap to the outer surface of it in order to detect the electrical changes produced on the skin because of each heartbeat.

Disadvantages:

- standard devices can cause discomfort, irritation or pain.
- patients wear it for a long period of time.
- Ambient light influence.
- Sensitivity to changes in body and ambient temperatures.

Proposed system:

The pulse detection recent advances in contact free physiological signals open the door to many new types of application. This technology promises to measure heart rate and respiration using video.

Advantages:

- High sensitivity to pulse wave detection.

3.Implementation

Used Technologies

What is Python?

Python is an interpreter, high-level programming language for general-purpose programming by "Guido van Rossum" and first released in 1991, Python has a design philosophy that emphasizes code readability, and a syntax that allows programmers to express concepts in fewer lines of code, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object- oriented, imperative, functional, procedural, and has a large and comprehensive standard library.

Python interpreters are available for many operating systems. Python, the reference implementation of Python, is open source software and has a community-based development

Python is a general purpose, dynamic, high level and interpreted programming language. It supports object-oriented programming approach to develop applications. It is simple and easy to learn and provides lots of high level data structures.

- Windows XP
- Python Programming
- Open source libraries: Pandas, NumPy, SciPy, matplotlib, OpenCV

4.TESTING

Testing Objectives

- To make sure whether system meets user requirements or not.
- To make sure that during the operation, incorrect input, processing and output will be detected.
- To see that when correct inputs are fed to the system the outputs are correct.
- To verify that the controls incorporated in the same system as intended.

White-box and black-box testing

- White box and black box testing are terms used to describe the point of view a test engineer takes when designing test cases. Black box being an external view of the test object and white box being an internal view. Software testing is partly intuitive, but largely systematic. Good testing involves much more than just running the program a few times to see whether it works.

- Validation: Are we doing the right job?
- Verification: Are we doing the job right?
- In order to achieve consistency in the Testing style, it is imperative to have and follow a set of testing principles. This enhances the efficiency of testing within SQA team members and thus contributes to increased productivity. The purpose of this document is to provide overview of the testing, plus the techniques.
- At SDEI, 3 levels of software testing is done at various SDLC phases:

Unit Testing

- In which each unit (basic component) of the software is tested to verify that the detailed design for the unit has been correctly implemented

Integration testing

- In which progressively larger groups of tested software components corresponding to elements of the architectural design are integrated and tested until the software works as a whole.
- System testing: In which the software is integrated to the overall product and tested to
- show that all requirements are met
- A further level of testing is also done, in accordance with requirements

Acceptance testing

- Upon which the acceptance of the complete software is based. The
- clients often do this.

Regression testing

- Is used to refer the repetition of the earlier successful tests to ensure
- that changes made in the software have not introduced new bugs/side effects.

Test Cases

- To make sure whether system meets user requirements or not.
- To make sure that during the operation, incorrect input, processing and output will be detected.
- To see that when correct inputs are fed to the system the outputs are correct.
- To verify that the controls incorporated in the same system as intended.

Positive Test Cases

- Positive testing determines the application works as expected. If an error is
- Encountered during positive testing, the test fails.
- The positive flow of the functionality must be considered.
- Must have the positive perception to verify whether the requirements are
- Justified.
- By using this application, security can be easily provided in many sectors.

Negative Test Cases

- Negative testing ensures the application can gracefully handle invalid input or
- Unexpected user behaviour.
- For example, if a user tries to type a letter in a numeric field, the correct behaviour in this
- Case would be to display the "Incorrect data type, please enter a number" message.
- The purpose of negative testing is to detect such situations and prevent applications from

5.Results

After performing testing we get certain results. The results obtained from testing as

shown below. Results of the system can be expressed and evaluated in terms of output screen.

The output screen can be used to show the objectives set at the beginning are achieved at the end.

6.Conclusion

The measurement of the pulse rate using the ordinary webcam is simpler and has got many applications. This device can be used in analysing the problems like suffering from high blood pressure and also used in the pulse oximetry. The advantages of this monitoring apparatus are:

- ➔ Sports and triage training.
- ➔ Measuring the physiological parameters like heart/respiratory rate, tissue blood perfusion and arterial oxygen saturation distributions.
- ➔ Demonstrate a strong correlation in between the parameters derived from webcam recordings and standard reference sensor

7.Future enhancement

Several topics for future work have been mentioned in the discussion. One of them is improving the face detection location accuracy. Viola-Jones eye detection could possibly increase the position accuracy and compensate for small rotations in the face. An alternative is using the KLT feature tracker, which can easily

correct for rotations as well as increasing the position accuracy. Another topic for future work is the PPG signal identification, which can possibly be improved by training a classifier of different measures and using that to identify the correct ICA component. Finally the relationship between the blood pressure and the PTTD could be explored further with a larger dataset.