

Quantification of Necrosis Cells in Heart Disease Diagnosis Using Image Processing

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Introduction

Hypertension, frequently asymptomatic, presents a global health concern that is characterized by a systolic blood pressure of 140mmHg or higher and a diastolic pressure of 90mmHg or higher. This condition, which is widespread without obvious symptoms, underscores the significance of regular monitoring of blood pressure. The present work emphasizes the importance of being aware of risk factors, including age, race, tobacco and alcohol consumption, inadequate intake of vitamin D and potassium, physical inactivity, and family history. A significant number of adults with hypertension are unaware of their condition and struggle to maintain their blood pressure below the recommended threshold of 140/90

Research objectives

- To develop an algorithm to perform accurate segmentation of Image to identify necrosis in medical images.
- To enhance the diagnostic efficacy of the system statistical characteristics (HR, FF, kurtosis, skewness, and LF/HF ratio) are extracted from ECG signal

Methods

Heart rate monitoring and identification of cardiac irregularities are accomplished employing LABVIEW, while advanced digital image processing for necrosis cell detection is carried out using MATLAB. For a detailed examination of physiological and pathological aspects of cardiovascular health, Nucleus Segmentation Using MATLAB is utilized

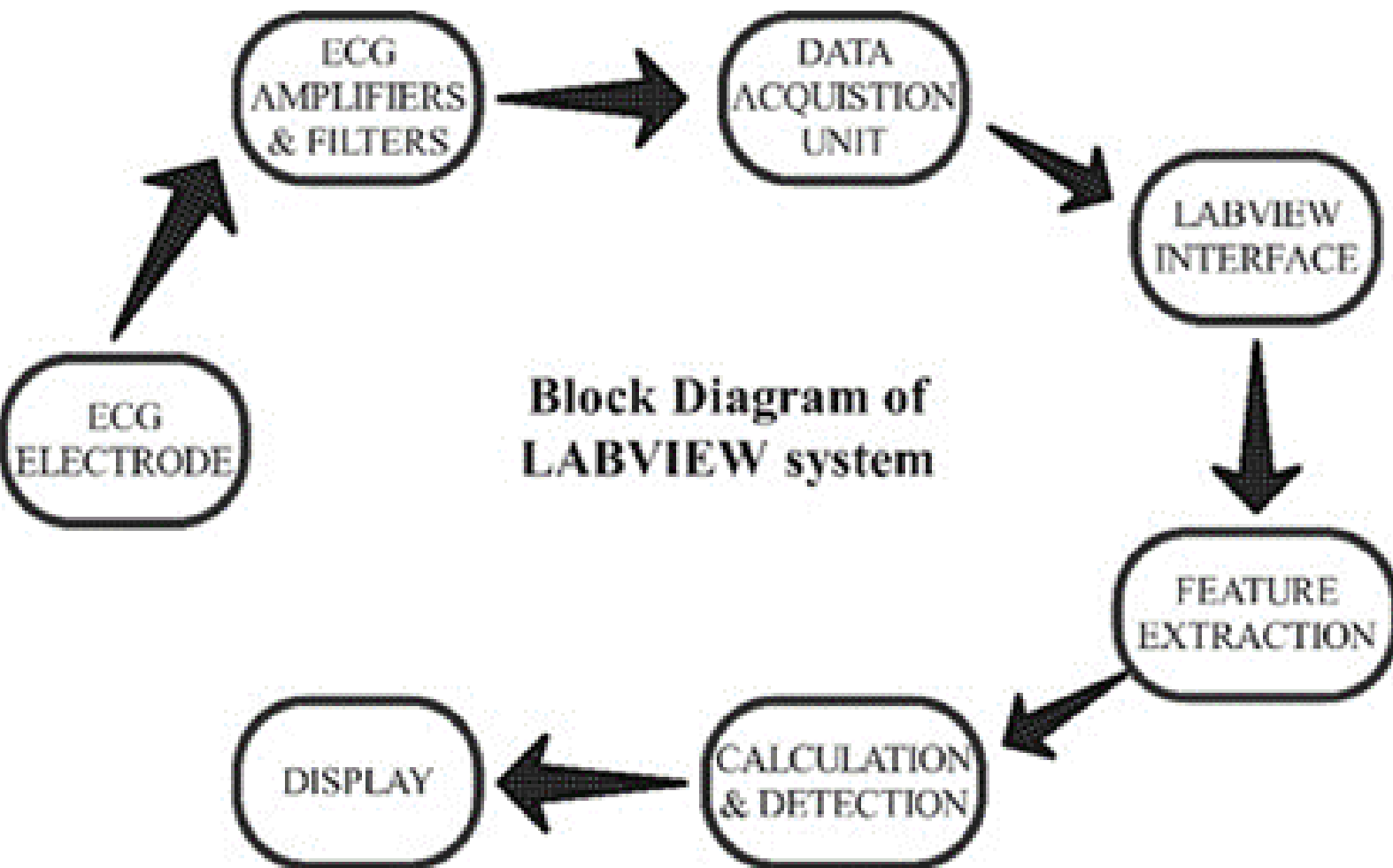


Figure 1. Block Diagram of the LABVIEW System

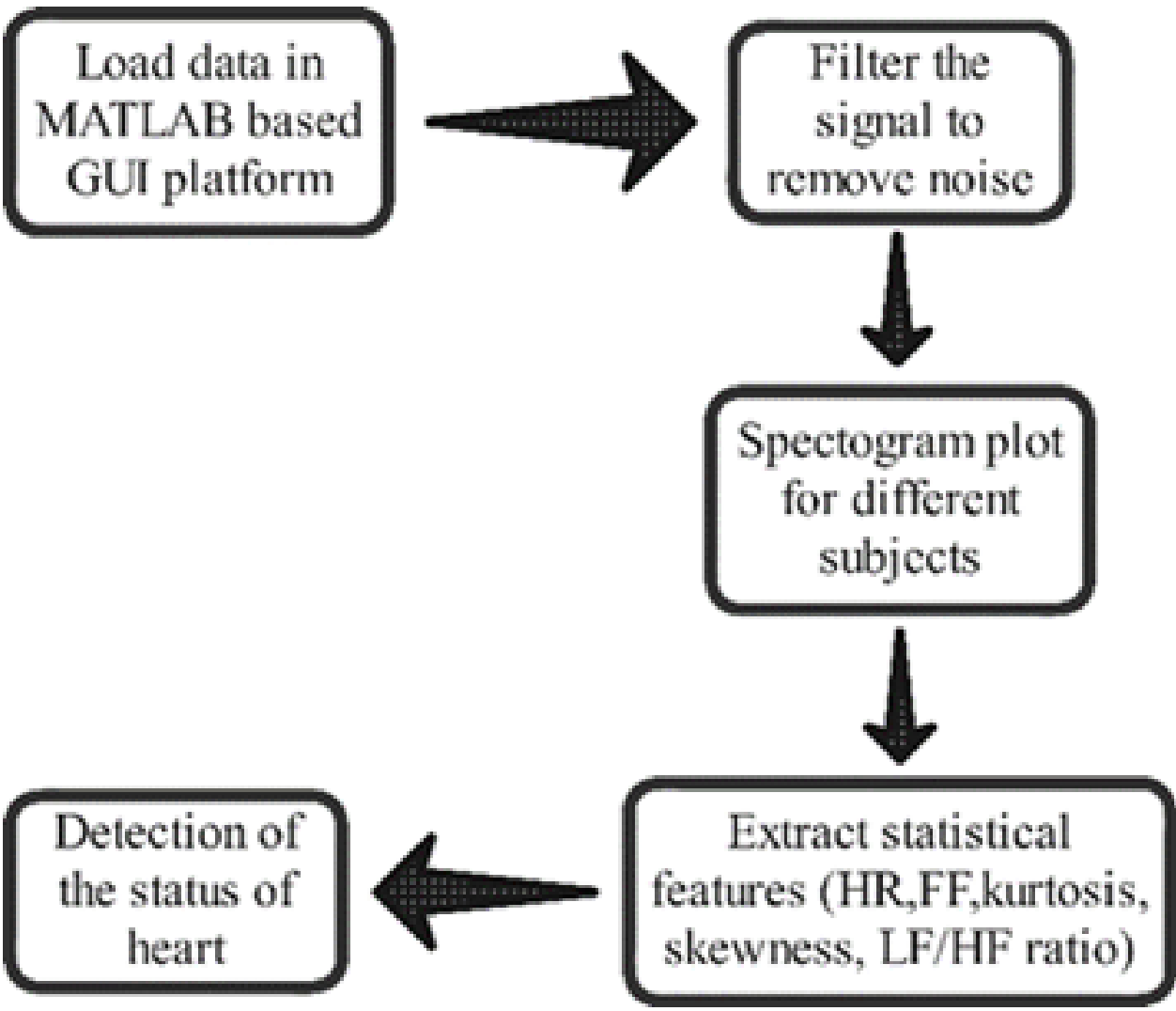


Figure 2. Block diagram of Methodology

Results

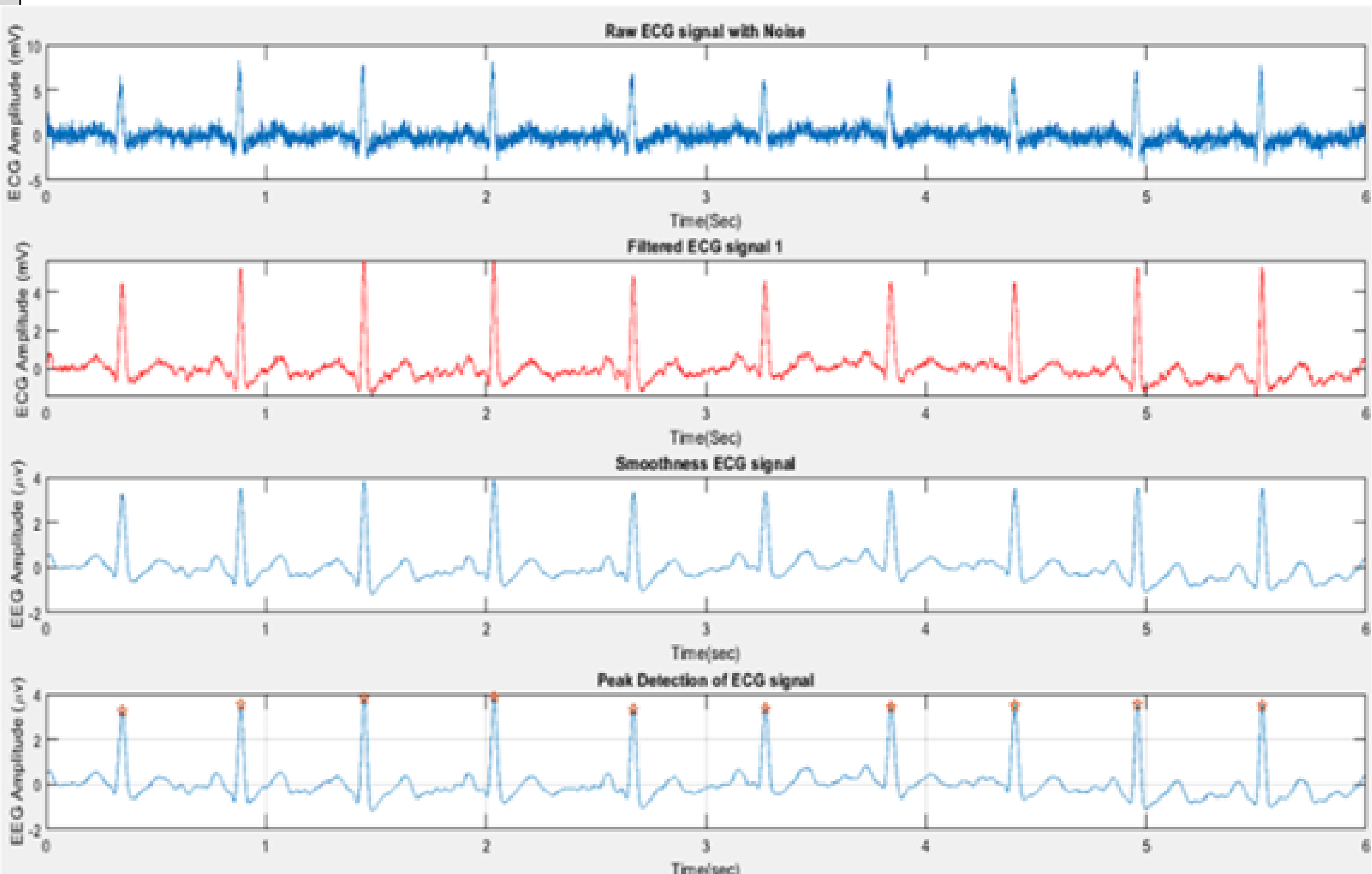


Figure 3. Raw ECG Signal and Peak Detection of ECG Signal

The integrated methodology of LABVIEW and MATLAB efficiently processes electrocardiogram signals, enabling the identification of sinus bradycardia, sinus tachycardia, supraventricular tachycardia, arrhythmia, and atrial flutter, among various heart abnormalities. This cost-effective and user-friendly solution encourages self-testing and early diagnosis of heart disease and hypertension.

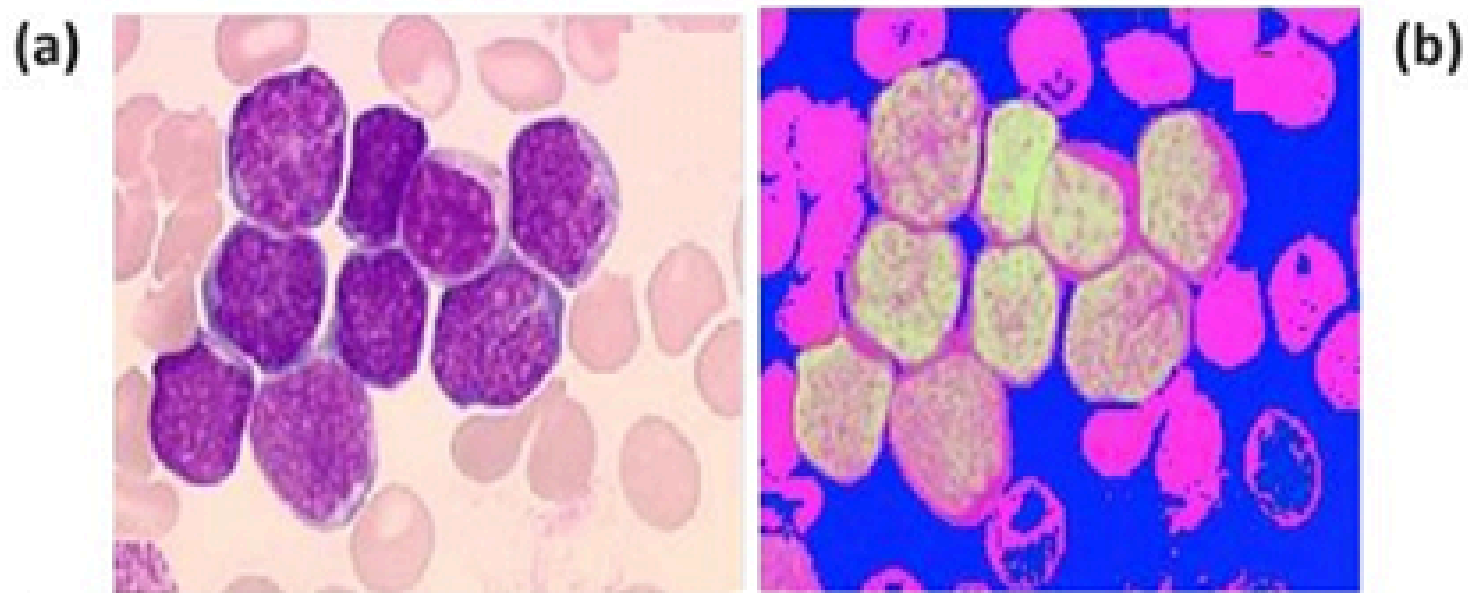


Figure 4. (a) original image, (b) RGB2 HSV colour model, (c) linear contrast (L), (d) histogram equalisation image (H), (e) Otsu thresholding method, (f) removal of small particles.

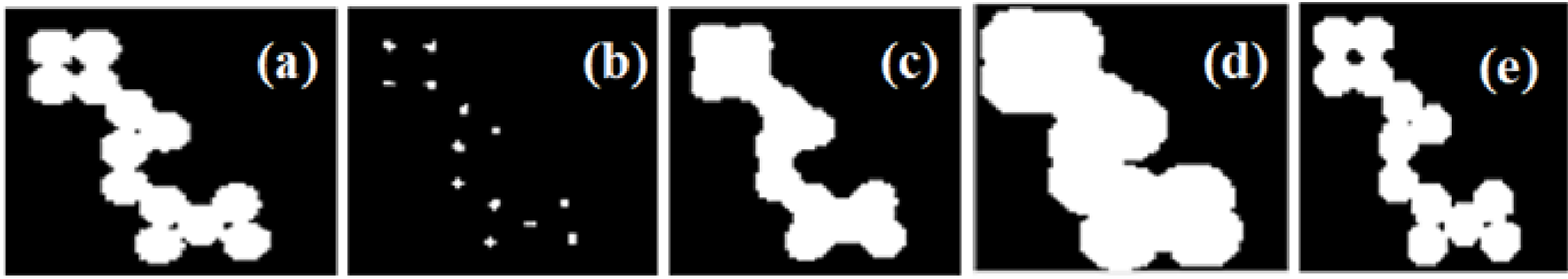


Figure 5. Cell shapes: (a) Binary image, (b) Dilation, (c) Erosion, (d) Opening, (e) Closing.

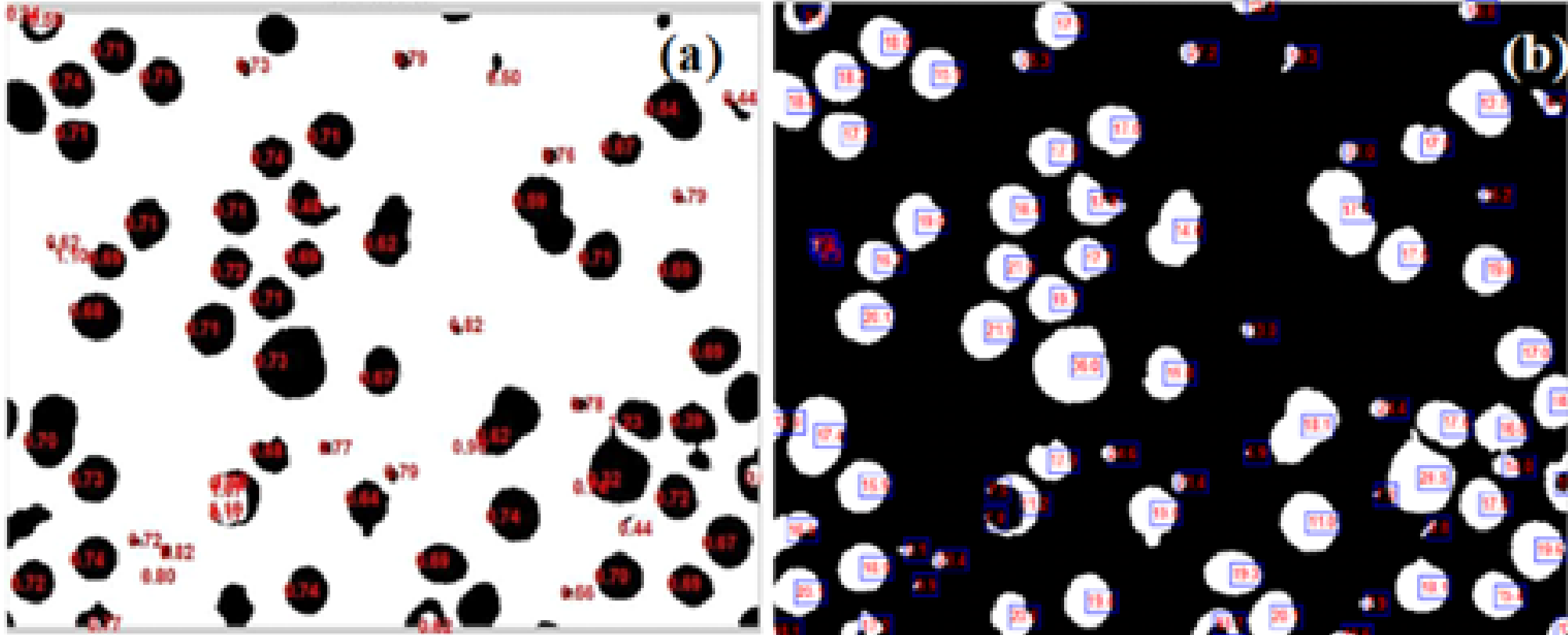


Figure 6. (a) Roundness of cell, (b) Standard Deviation of Regions.

The subsequent stage of the methodology employs MATLAB to detect necrosis cells through advanced digital image processing techniques. A multi-step process incorporating watershed transform, K Means Clustering Technique, and Histogram Equalization with Linear Contrast Stretching ensures the precise identification and counting of necrosis-affected cells, consequently crucial in the early detection of heart disease

Conclusions

- The proposed methodology presents a meticulous and multifaceted strategy for evaluating cardiovascular health utilizing LABVIEW and MATLAB in distinct stages
- The LABVIEW component concentrates on processing ECG signals, surpassing individual arrhythmias to include a wider range of anomalies This intuitive solution holds potential for self-diagnosis and prompt identification of hypertension and heart ailments
- MATLAB algorithm facilitate the identification and quantification of diseased cells affected by necrosis
- The assessment of cardiovascular wellbeing is thoroughly illustrated by using a methodical blend of signal processing and image analysis methods

Future Scope

- the versatility of the suggested system is apparent in its potential for alteration, specifically in augmenting the number of channels. Through an increase in the number of channels, the system would be able to offer a more thorough and detailed comprehension of diverse physiological parameters, thereby improving its diagnostic proficiency

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