Non-Invasive point of care ECG signal detection and analytics for cardiac diseases

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Measurement techniques, Electrocardiogram, Health Monitoring

*Abstract*— This paper discussed the about development of portable products based on non-invasive techniques to fetch multi leads ECG signals and analyzing them for detection of heart rates and various cardiac diseases like atrial fibrillation using machine learning. It involves anatomy and functioning of the heart and focused on electrolyte concentration gradient and generation of electric pulses over heart and interpretation of various ECG waves from different leads. It also deals about analysis of fluctuations on ECG signals, market statistics, economics, and case studies of various leading brands of ECG watches available in the market, dealing advantages and disadvantages of the products. Further paper dealt with development of device capable of acquiring an electrocardiogram (ECG, EKG) signal to be hosted by a typical Android smartphone and data collection processes.

Keywords—ECG; dipole; electrolyte; electrocardiogram; photoplethysmography, disease; denoising; anatomy; amplifier; heart; cardiovascular disease; cloud computing; machine learning

# Introduction

Ailments that impact the function of our hearts are referred to as heart disease. It could be caused by problems with the heart's blood supply, heart rate or rhythm, or defects in the cardiac artery's architecture. Heart disease kills more than 17.5 million people each year, according to the reports of World Health Organization (WHO). It is important to evaluate and recognize heart illness early in order to protect against sudden mortality as a result of heart attack or cardiac arrest. Cardiologists employ a sensor for the electrocardiogram (ECG) to quickly and without intervention detect abnormal heart rhythm and signs of likely heart disease.

The demand for value-added components has increased as smartphones and tablets have grown in popularity. The most common way to sell content for mobile devices has been through the sale of "apps" on online marketplaces. These are usually pure software add-ons that take advantage of the existing platform's hardware capabilities. These devices now come with high-resolution touch screens, accelerometers, GPS, and cellular and wireless data access as standard hardware. For general-purpose applications, these hardware interfaces provide a high-quality standard development environment. This set of hardware may not be sufficient for more specialized applications, but it does serve as a good user interface, recording platform and network uplink.

In today's environment, obtaining affordable healthcare is a challenge. As government organizations and private businesses look for ways to save money, there may be a market opportunity to take advantage of mobile device technology' widespread availability. In the future years, even emerging countries' capable low-end smartphone markets are likely to rise. There are a number of physiological data sets that could be useful to the health business. One might, for example, have persistent symptoms that are difficult to replicate in a therapeutic environment.

# Heart Anatomy

The heart is placed in the centre of our chest, between the lungs, behind and slightly to the left of our breastbone, in the middle of our chest (sternum). The pericardium is a double-layered membrane that surrounds and protects your heart, similar to a sac. Anterior pericardium is the outer layer of our heart's major blood vessels that covers the roots of our heart's major blood arteries and is related to the spinal column, diaphragm, and other areas of our body through ligaments.

The heart and blood arteries make up the cardiovascular system. The heart serves as a pump, delivering blood to all of the organs, tissues, and cells in your body. Blood carries nutrients and oxygen to all the cells of the body and also removes waste materials and carbon dioxide produced by the cells. Your heart is connected to the rest of your body via a complex network of arteries, arterioles, and capillaries that transport blood between organs. Venules and veins return blood to the heart.

There are four chambers in the heart. The top chambers of the heart are referred to as the left and right atria, while the bottom chambers are referred to as the left and right ventricles, respectively. The left and right atria, as well as the left and right ventricles, are separated by a muscular wall known as the septum. The left ventricle of the heart is the largest and most powerful chamber in the body. It is only about a half-inch thick, yet the chamber walls of the left ventricle are strong enough for blood to be forced through the aortic valve and into the rest of the body.

//heart ke struct baare me

# Conduction System of Heart

// SA node btp21Aug

The electrical impulses from the heart muscle cause the heart to contract (the myocardium). The source of this electrical signal is the sinoatrial (SA) node, which is located at the apex of the right atrium. In certain circles, the SA node is referred to as the heart's "natural pacemaker." An electrical impulse sent by this natural pacemaker travels through their muscle fibres, causing the atria and ventricles to contract. Despite the fact that the SA node sends electrical impulses at a set rate, your heart rate may vary according to physical demands, stress, or hormonal factors, among other things.

# Electrocardiogram

//Electric pluse kya hota

/SA node

//ECG stages

//Type of Waves

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# Methods of doing ecg

/Electrodes?

/Placement of Electrodes

//Conduction

# Detection of cardiac abnormalities

/Abnormalities

# Case study

/Apple Ecg Watch

//Mawabi Band

//AliveCor

# LIMITATIONS

/Limitaions

# Circuit diagram

# Economics

# Conclusion

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References

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