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RAJSHAHI UNIVERSITY OF ENGINEERING AND TECHNOLOGY

Department Of Electrical & Computer Engineering

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Experiment No. 1

Study of ECG Signal Using Digital Electrocardiogram (ECG) Device

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Experiment No. 1

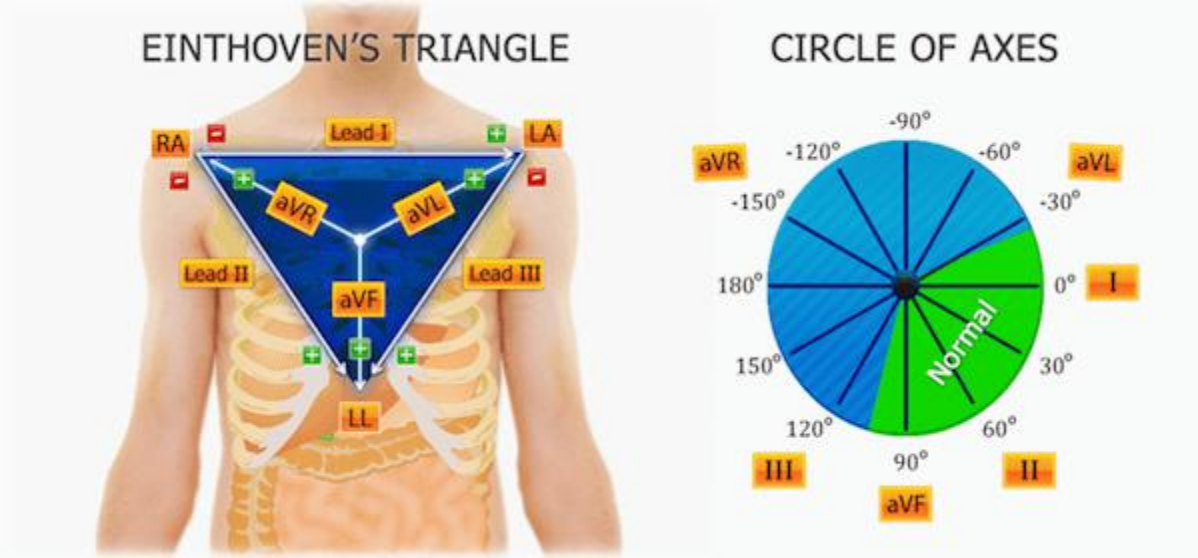
Name of the Experiment

Study of ECG Signal Using Digital Electrocardiogram (ECG) Device.

Objective

1. To capture and analyze human ECG signals using a 10-lead digital electrocardiograph system.
2. To identify and interpret the main components of the ECG waveform, such as the P wave, QRS complex, and T wave.

Theory



Electrocardiography is a non-invasive method used to measure the heart's electrical activity through electrodes placed on the skin. A standard clinical ECG setup utilizes 10 electrodes to produce 12 distinct leads, each representing a specific electrical axis of the heart. These leads provide insights into atrial and ventricular depolarization and repolarization patterns. The P wave, QRS complex, and T wave are key waveform components that reflect various stages of cardiac activity. Proper interpretation of these signals allows detection of cardiac abnormalities such as arrhythmias, ischemia, or conduction blocks. The precision of the readings is heavily dependent on correct electrode positioning and minimal external interference.

Lead Type	Lead Name	Electrode Placement
Limb Leads	Lead I	LA – RA
	Lead II	LL – RA
	Lead III	LL – LA

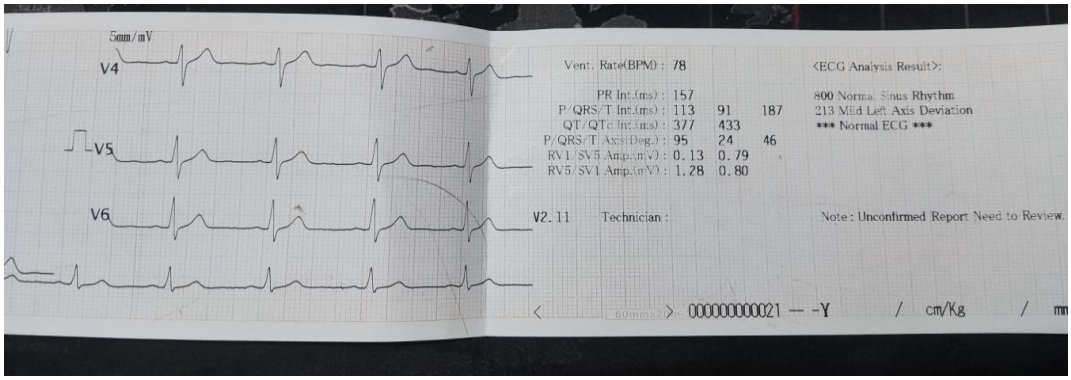
Augmented Leads	aVL	(lead I – lead III)/2
	-aVR	(lead I + lead II)/2
	aVF	(lead II + lead III)/2
Chest Leads	V1	4th intercostal space, right sternal border

Chest leads	V2	4th intercostal space, left sternal border
	V3	Between V2 and V4
	V4	5th intercostal space, midclavicular line
	V5	Same level as V4, anterior axillary line
	V6	Same level as V4, midaxillary line

Required Apparatus

1. 10 Lead Digital Electrocardiograph (HP 1300)
2. ECG leads and disposable electrodes
3. Human subject

Experimental Observation



During the experiment, the subject remained in a relaxed, supine position to minimize motion artifacts. The 10-lead digital ECG device accurately captured all 12 derived leads. Among them, Lead II presented the most distinguishable waveforms, making it suitable for analyzing heart rate and rhythm. The recorded signals displayed clear morphology of the P wave, QRS complex, and T wave, and the R-R interval was measured to verify heart rate regularity. The data showed no signs of abnormal patterns, confirming a normal sinus rhythm.

Discussion

This experiment reinforced the importance of precise electrode placement and patient positioning in acquiring high-fidelity ECG signals. The clarity of Lead II underlines its clinical utility for rhythm analysis. Using a digital ECG system allowed real-time observation of the waveforms, aiding in the identification of distinct cardiac events. Although the sensors used did not detect any anomalies, the process highlighted how small variances in waveforms could indicate critical health conditions. Overall, the practical exposure offered deeper understanding of ECG interpretation and its relevance in diagnostic cardiology.