

DAFTAR ISI

HALAMAN JUDUL	i
LEMBAR PENGESAHAN	ii
SELF DECLARATION AGAINST PLAGIARISM.....	iii
ABSTRAK.....	iv
ABSTRACT.....	v
KATA PENGANTAR	vi
UCAPAN TERIMA KASIH	vii
DAFTAR ISI.....	ix
DAFTAR GAMBAR.....	xiii
DAFTAR TABEL.....	xv
DAFTAR SINGKATAN	xvii

BAB I

PENDAHULUAN

1.1 Latar Belakang	1
1.2 Tujuan dan Manfaat.....	2
1.3 Rumusan Masalah	2
1.4 Batasan Masalah	3
1.5 Kontribusi Penelitian	3
1.6 Metodologi Penelitian	3

BAB II

DASAR TEORI

2.1 Sistem Kerja Jantung.....	4
2.2 <i>Electrocardiograph</i> (ECG)	5
2.3 Teknik Monitoring ECG	8
2.4 Sensor ECG	10
2.5 Mikrokontroler ATmega8	11

2.5.1	Konfigurasi Pin Atmega8.....	12
2.5.2	Komunikasi Serial pada ATmega 8.....	14
2.5.2.1	Clock Generator	15
2.5.2.2	USART <i>transmitter</i>	15
2.5.2.3	USART <i>receiver</i>	15
2.5.3	<i>Timer/Counter 0</i>	15
2.6	RF Data Transceiver	16
2.7	Metode Analisis <i>Heart Rate Variability</i> (HRV)	18
2.7.1	<i>Time Domain</i>	19
2.7.2	Frekuensi Analisis	21
2.7.2.1	<i>Wavelet</i>	22
2.7.2.2	Transformasi <i>Wavelet</i>	23
2.7.3	<i>Joint Time-Frequency Domain Analysis</i>	25
2.7.3	<i>Non Linear Methods</i>	25
2.8	Pemrosesan sinyal ECG menggunakan LabVIEW	27
2.8.1	<i>Preprocessing</i> Sinyal ECG.....	27
2.8.1.1	<i>Power Line Interference</i>	27
2.8.1.2	<i>Electrode Contact Noise</i>	28
2.8.1.3	<i>Motion Artifacts</i>	28
2.8.1.4	<i>Electromyographic Noise</i>	29
2.8.1.5	<i>Instrumentation Noise</i>	29
2.8.2	Penghapusan <i>Baseline Wandering</i>	30
2.8.3	Penghapusan <i>Wideband Noise</i>	30
2.8.4	Algoritma Deteksi QRS.....	30

BAB III

PERANCANGAN DAN SIMULASI *TELEMONITORING* SISTEM ECG

3.1.	Blok Diagram Sistem	33
3.1.1	Sensor ECG	34
3.1.2	Rangkaian Penguat dan Filter	34
3.1.3	Mikrokontroler	35

3.1.4	Modem YS1020UB	35
3.1.5	<i>Interface</i> RS232.....	35
3.1.6	Personal Komputer	35
3.2.	Perancangan Rangkaian Penguat dan Filter	35
3.2.1	Bagian Rangkaian Penguat Instrumentasi	36
3.2.2	Bagian Rangkaian <i>Filtering</i>	37
3.2.3	Bagian Rangkaian <i>DC Offset</i>	38
3.3.	Pengujian Rangkaian Penguat dan Filter	39
3.4.	Program <i>Noise Reduction</i> Berbasis <i>Wavelet</i> Menggunakan Pemrograman LabVIEW	40
3.4.1	Tahapan <i>Preprocessing</i>	41
3.4.2	<i>Feature Extraction</i>	47
3.5.	Skenario Pengujian	49

BAB IV

ANALISA DATA

4.1	Hasil Pengujian Performansi <i>Wavelet</i> terhadap <i>noise</i> AWGN	51
4.2	Hasil Pengujian Performansi <i>Wavelet</i> terhadap derau jala-jala 50 Hz.....	52
4.3	Pengujian Radio Frekuensi (Modul Radio YS 1020UB)	53
4.4	Akuisisi Data ECG	54
4.5	<i>Preprocessing</i>	55
4.5.1	<i>Plotting</i> Sinyal ECG.....	56
4.5.2	<i>Baseline wandering</i>	57
4.5.3	<i>Denoising</i>	57
4.6	<i>Feature Extraction</i>	58
4.6.1	Algoritma Pan-Tompkins	58
2.6.1.1	<i>Bandpass Filter</i>	58
2.6.1.2	<i>Derivative</i>	59
2.6.1.3	<i>Squaring Function</i>	60
2.6.1.4	<i>Moving Window Integrator</i>	60
4.6.2	<i>Extracting R Peaks dan Interval R-R s</i>	61

2.6.2.1	<i>Peak Detection</i>	61
2.6.2.2	<i>Adaptive Threshold</i>	61
2.6.2.3	<i>Interval R-R</i>	62
4.7	Analisa Hasil Pengukuran <i>Heart Rate</i> dan <i>Poincare Plot</i> Sinyal ECG	62
4.8	Analisa Hasil Perhitungan Simpangan <i>Heart Rate</i>	74

BAB V

KESIMPULAN DAN SARAN

5.1	Kesimpulan	75
5.2	Saran	76

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.2	Conclusion	77
5.2	Recommendation	78

DAFTAR PUSTAKA

Lampiran A. Rangkaian Penguat dan Filter Sistem ECG

Lampiran B. Rangkaian Lengkap Sistem ECG

Lampiran C. PCB Layout & Alat

Lampiran D. Daftar Pembelian Komponen

Lampiran E. Listing Program

Lampiran F. Front Panel Simulation System ECG

Lampiran G. Block Diagram Simulation System ECG

Lampiran H. Front Panel Telemonitoring Sistem ECG

Lampiran I. Block Diagram Telemonitoring Sistem ECG