



Pallavi Patil

# Real time ECG on internet using Raspberry Pi

Pallavi Patil  
Kalyani Bhole

Department of Instrumentation & Control Engineering,  
College of Engineering, Pune



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What is ECG  
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# Outline

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# What is ECG ?

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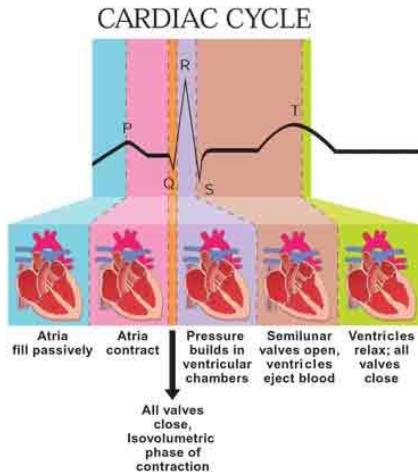


Figure: 1 ECG waveform



# Abnormalities in ECG Pattern

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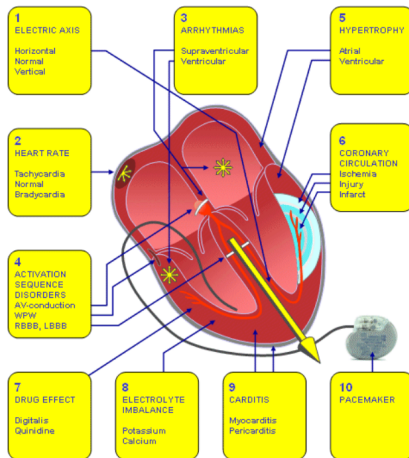


Figure: 2 Different anomalies in ECG



# Diseases diagnosed from ECG

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- Myocardial Infarction
- Myocardial Ischemia
- Cardiac tumor
- Subarachnoid hemorrhage
- Stroke
- Hyperkalemia
- Cocaine toxicity
- Post carotid endarterectomy



# Present Scenario

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- Approximately 40 million heart patients in India
- Studies estimate 17.5 million people die each year in India from cardiovascular diseases
- Quick and automated analysis from ECG signal aids doctors in diagnosis of cardiac diseases
- Development of warning and alarm systems alerts doctors preventing loss of life



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- IoT- network of physical sensors embedded with electronics, software and INTERNET connectivity
- The IoT allows objects to be sensed or controlled remotely resulting in improved efficiency, reduced human intervention
- IoT, continuous monitoring of biomedical signals will no longer be restricted to the home environment
- With the help of INTERNET, data visible on the web at any time at any place.
- Secure transform of data on web



# Aim

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- To develop an ECG monitoring system that displays real time signal on internet using Raspberry PI





# Block Diagram

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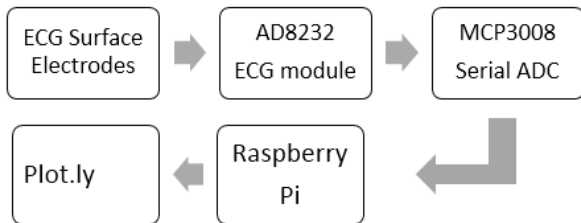


Figure: 3 block diagram



# Proposed Methodology

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- ECG monitoring system in which the hearts electric signal (i.e ECG) is acquitized using AD8232 ECG module
- The analog signal is digitally converted using serial ADC MCP3008
- ADC embedded to raspberry pi and the signal is communicated via Hardware SPI
- Communicated signal is transferred to plotly via python code
- The signal is plotted on Plot.ly - an online graphics tool
- Signal can be viewed by anyone using the user id and password of the programmer



# Experimetal Setup

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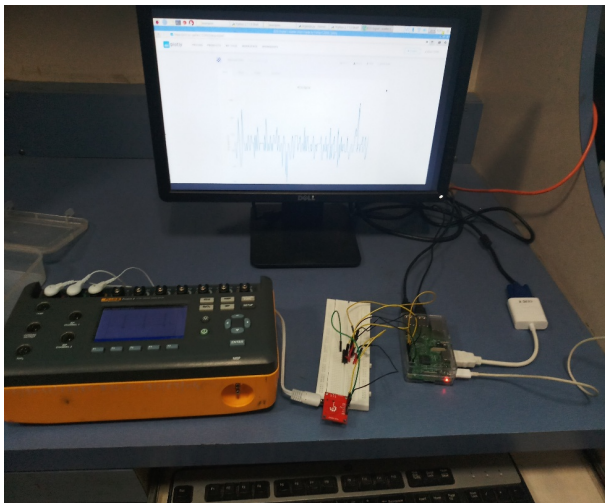


Figure: 4 Experimental Setup



# Experimental Procedure-1

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- The ECG electrodes are connected to the patients left arm, right arm and left leg to form Eithovens triangle such that heart is apt the centre of triangle
- The output connector of ECG electrode is connected to the ECG module AD8232 which is used for ECG signal acquisition
- The output of AD8232 is connected to the channel 0 of MCP3008. The clock , data in, data out , supply , grounds are connected to GPIO pins of Raspberry Pi
- After installing plot.ly in raspberry pi, execute the python code by the run command or in the terminal by the sudo python codename.py and add the unique API key ,username and stream token in the code



# Experimental Procedure-2

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- After the successful execution of code, the shell will show a message showing that the data is being transferred on the plotly website
- The code gets redirected to plot.ly url, where the real time ECG graph is streaming
- Once the graph is obtained, it can be studied for various changes in ECG aberrancy



# Code Execution

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```
ecgraspi.py - /home/pi/Adafruit_PyT_008/examples/ecgraspi.py (2.7.13)
File Edit Format Run Options Window Help
# Simple example of reading the MCP3008 analog input channels and printing
# them all out.
# Author: Tony DiCola
# License: Public Domain
import plotly.plotly as py
from plotly.graph_objs import Scatter, Layout, Figure
import time
import datetime

# Import SPI library (for hardware SPI) and MCP3008 library.
import Adafruit_GPIO.SPI as SPI
import Adafruit_MCP3008

# Software SPI configuration:
# CLK = 18
# MISO = 23
# MOSI = 24
# CS = 25
mcp = Adafruit_MCP3008.MCP3008(clk=CLK, cs=CS, miso=MISO, mosi=MOSI)

# Hardware SPI configuration:
SPI_PORT = 0
SPI_DEVICE = 0
mcp = Adafruit_MCP3008.MCP3008(spi=SPI.SpiDev(SPI_PORT, SPI_DEVICE))

username = 'pallavi12345'
api_key = '9a2vP7hioC2IDxSeX6r'
stream_token = '810f20xu9l'

py.sign_in(username, api_key)

trace1 = Scatter(
    x=[],
    y=[],
    stream=dict(
        token=stream_token,
        maxpoints=200
    )
)
```

Python 2.7.13 (default, Nov 24 2017, 17:33:09)  
[GCC 6.3.0 20170516] on linux2  
Type "copyright", "credits" or "license()" for more information.  
>>>  
===== RESTART: /home/pi/Adafruit\_Python\_MCP3008/examples/ecgraspi.py =====  
High five! You successfully sent some data to your account on plotly. View your  
plot in your browser at <https://plot.ly/~pallavi12345/0> or inside your plot.ly a  
ccount where it is named 'Raspberry Pi Streaming Example Values'  
<https://plot.ly/~pallavi12345/0>  
|

Figure: 5 Python Shell Terminal



# Result

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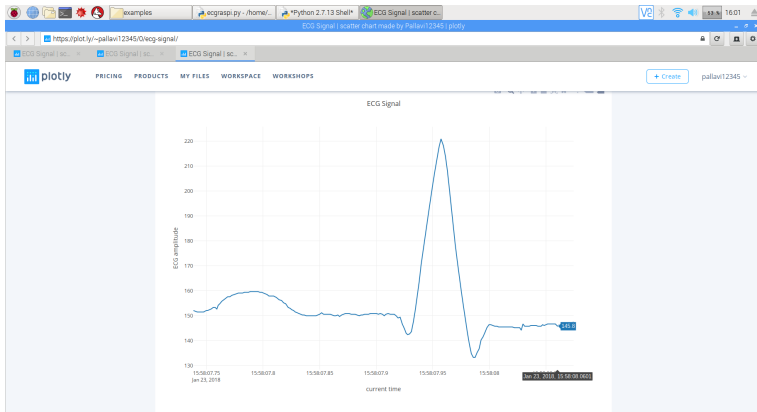


Figure: 6 Result



# Discussion

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- The ECG waveform is plotted against current time at an interval of 5ms.
- The PORS waveform is visible with smooth QRS peak
- The above graph can be viewed on any device connected to internet via login credentials : pallavi12345 and password





# Conclusion

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The system proposed is a small application towards integrating health care with INTERNET of things. The availability of patients live streaming data anywhere anytime allows doctor to take fast and efficient decision. In long time this can help in saving patients life because of the quick diagnosis .



# Future work

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- If the ECG leads are replaced by wearable chest electrodes , the monitoring wont require the patient to be constrained to his static position.
- If the ECG signal can be used to calculate and display heart rate of the patient simultaneously
- After including experts advertise, the diagnosis of the ECG can be included along with graph display.



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# Continued..

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# THANK YOU