

DSP projects

Create Graphical User Interface (GUI) for your project.

Part 1 mandatory: 3 marks.

Implement the following operations using signals of sound and image [1]:

Sound Signal:

1. Generate beep sound.
2. Generate random white noise.
3. Read an audio file and play it.
4. Add noise to an audio file.
5. Record audio signal and write it on your disk.
6. Increase/decrease volume.
7. Increase/decrease speed without change pitch.
8. Change speaker voice (female\male).
9. Cut part (segment) from the audio.
10. Echo the audio.
11. Plot the audio signal in (time, frequency, time and frequency) domains. Use subplot
12. Remove noise from audio file.

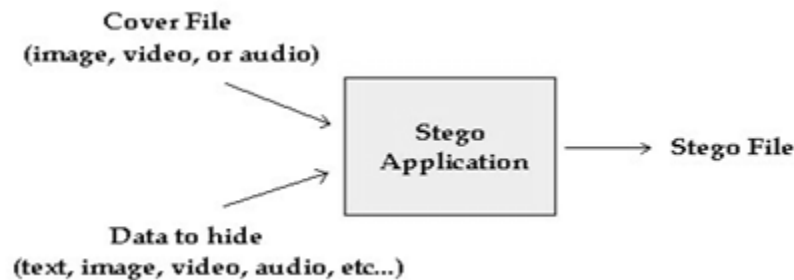
Image Signal:

1. Read image then display.
2. Extract one layer(R, G, B) and write it on your disk.
3. Rotate the image.
4. Convert it to gray scale.
5. Cut part from it.

Part 2 select one the following projects: 7 marks.

➤ Audio Steganography:

Information hiding is a part of information security. Steganography is a technique of information hiding that focuses on hiding the existence of secret messages [2],[3].



Steganography can be one of many types depending on the type of data encryption being done. Here, we are using audio signal processing using MATLAB as a Stego application for audio steganography. Audio signal processing is a subfield of signal processing that is concerned with the electronic manipulation of audio signals. As audio signals may be represented in either digital or analog format, processing may occur in either domain.

The Required task:

- You should allow the user to **input text data (the secret message)** and an **audio file**.
- Implement the audio steganography to hide the message into the audio file. (note: the **output** will be an **audio file** that looks like the input)
- Then try to extract the secret message from the output audio file of step (b). It should be the same as in (a).

➤ ECG Project:

Electrocardiography is the interpretation of the electrical activity of the heart over a period of time, as detected by electrodes attached to the surface of the skin and recorded by a device external to the body. The recording produced by this noninvasive procedure is an electrocardiogram (ECG) [4], [5].

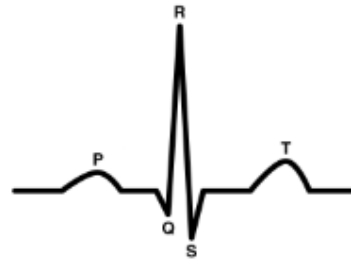


Figure 1.1: A typical ECG tracing of the cardiac cycle consists of a P wave, a QRS complex, a T wave and a U wave.

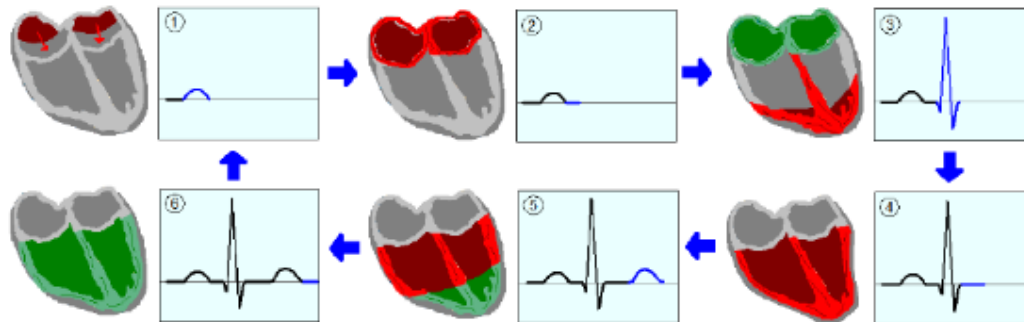


Figure 1.2: Electrical activity in myocardium

As heartbeat is a vital parameter, it is important to observe its activity in many pathologies. An ECG is the best way to measure and diagnose abnormal rhythms of the heart. For example, in myocardial infarction (MI), the ECG can identify if the heart muscle has been damaged in specific areas, though not all areas of the heart are covered.

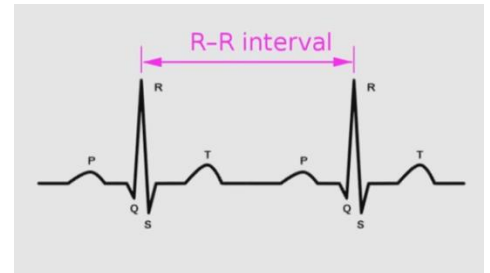
The Required task:

- a) You should allow the user to **input ecg.mat file**.
- b) Calculate the heart beat rate.

Note:

Heart Beat Rate in (beats/seconds) can be calculated by the formula=

Rate=60*sampling rate/(R-R interval) [6], [7].



References:

1. <https://github.com/SamarShabanCS/DSP>
2. https://github.com/singhishita/Audio_Steganography_in_MATLAB
3. <http://ijsetr.com/uploads/315462IJSETR15790-1100.pdf>
4. <http://www.librow.com/articles/article-13>
5. <https://en.wikipedia.org/wiki/Electrocardiography>
6. <https://www.youtube.com/watch?app=desktop&v=S3jtQehfZsw>
7. <https://www.wikihow.com/Calculate-Heart-Rate-from-ECG>