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Implementation of Hardware for Detection of Saccadic Eye Movement

* Sampan N Shah

* M.E.(Applied Instrumentation),L.D. College of Engineering,Ahmedabad,Gujarat,India.

ABSTRACT

This paper describe the method and circuit diagram for detection of fast eye movements.The present work aimed to actual hardware circuit implementation of detection of fast horizontal eye movements.

Keywords : Saccade,Multisim,Electrodes.

I. INTRODUCTION

The eye movements have attracted many researchers in the past. A seminal review of major types of eye movements [1] illustrates the advantages and the disadvantages of various types of eye movement detection methods. To list a few, magnetic field search coil technique [2], Video Oculogra-phy (VOG) system and Infrared Oculography (IROG) are some of the commonly used eye movements' detection sys-tems [3]. However since the electro-oculography (EOG) pro-vides an effective, low cost and non-invasive method for de-tection of full range of eye movements it has been a frequently used system in ophthalmoscopy. It is commonly used in for the diagnosis and prognosis of several diseases such as best's disease [4] and multiple sclerosis [5]. Besides the clinical ap-plications of EOG, it has been the theme of research for devel-opment of assistive technologies by human-machine interface [6, 7].

II. HARDWARE

For Detecion of saccadic eye movement Ag/Agcl type elec-trode is used.The position of electrode is as per fig-1.Here preamplification then filter than amplification is done.First block is preamplification with gain=10.Then low pass filter and then 2nd stage amplification with gain 100.So,overall gain of the system is 1000.

The diagram in fig-2 shows a notch filter circuit using a single op amp . The circuit is often used to remove unwanted hum (50 Hz) from circuits. Values for a 50 Hz notch would be: C1, C2 = 47 nF, R1, R2 = 10 k, R3, R4 = 68 k Calculation of the value of the circuit is very straightforward.
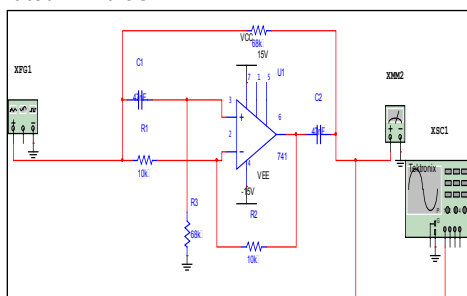
The formula to calculate the resistor and capacitor values for the notch filter circuit is: $f_{notch} = 1 / (2 \pi R C)$

R3 = R4 = 68KΩ, R1=R2=10KΩ C=C1=C2=47 nf, fnotch = centre frequency of the notch in Hertz R and C are the values of the resistors and capacitors in Ohms and Farads.
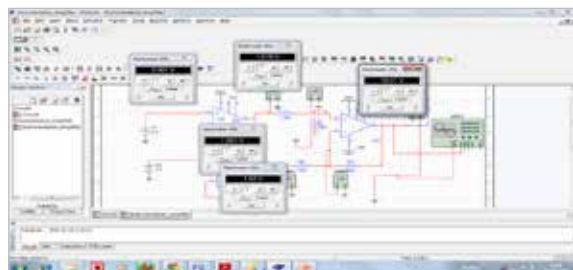
Fig. 1. Electrode position

Fig. 2. Opamp 50 Hz Notch filter Ciruit Diagram Simu-lated in Multisim

Fig 3. Instrumentation Amplifier Results in Multisim

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