Perimetry:-A Technique to Measure Visual Field of Eye

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Abstract : The purpose of this work was to develop a new family of test algorithms for computerized static threshold perimetry which significantly reduces test time without any reduction of data quality. A comprehensive visual field model constructed from available knowledge of normal and glaucomatous visual fields is continuously updated during testing. The model produces threshold estimates and additionally estimates of the knowledge to which the threshold is known at each purpose. Testing is interrupted at every test location at planned levels of threshold certainty. New time-saving methods area unit used for estimation of false answers, and take a look at pacing is optimized. When completion of the take a look at, all threshold estimates area unit re computed, taking under consideration the entire body of patient responses. Laptop simulations were wont to optimize the various parameters of the new algorithms, to evaluate the relative importance of these parameters, and to evaluate the performance of the algorithmic program as an entire in comparison with a regular algorithm. The main components of the system are push button, PIC microcontroller, Bluetooth module, android phone to display output results. Android app mainly consist of number of screens which contain patient data, test selection according to age group, 76 led glow randomly & output screen.

Index Terms - **Glaucoma, Standard automated perimetry, SITA, Visual Field(VF).**

I. INTRODUCTION

Recent developments in electronic technology square measure creating it potential to home monitor the sensitivity of the central field of vision victimized transportable devices. We have a tendency to used simulation to analyze whether or not the upper test frequency afforded by home watching improves the first detection speedy field of vision loss in eye disease & how any advantages may well be suffering from imperfect compliance or multiplied variability within the home monitoring test. It is doable that various ways may be accustomed increase the frequency with that a patient's field of regard is assessed. Ancient field of regard testing devices, equivalent to the Humphery field instrument (HFA) require patient to attend a clinic to possess their field of regard measured. Many devices recently are developed that could enable field of regard assessments from clinical setting & probably may be performed while not direct supervision of a trained practitioner [1].

Apart from the danger of developing eye diseases there's additionally the danger that it's not detected & irreversible loss of vision ensues. Some studies of ways of eye diseases designation have examined the results of instrument based examinations with nice if not complete reliance on objective finding in incoming at a designation. The terribly valuable advance in eye disease detection instrument technologies, & apparent increasing dependence on them, may have LED to reduced though of knowledge on the market from a patient history in those studies. Dependence on objective proof of glaucomatous pathology might scale back the likelihood of detection eye diseases suspects or patients in danger for turning into eye disease suspects. A valid positive case history of eye disease is extremely valuable info. However negative family histories can usually be unreliable thanks to massive number of eye disease cases being unknown. No evidence of case history is suitable instead of no case history. Additionally the undependableness of negative case history is accumulated once patient with eye disease fail to tell their family member. A finding of no case history will solely be explicit as no glorious case history [2].

Timely detection of eye disease progression is crucial within the delivery of glaucoma care. Clinical judgment is also accustomed build this assessment, however comparatively modest agreement among practitioner support the utilization of complementary strategies. Event based analysis take under consideration expected localized test retest variability 'sin sensitivity & trend based analysis area unit useful for curical & predicting overall visual operate. Landmark clinical trials have used numerous fields of regard progression criteria as finish points with variable performances. Short & long fluctuation additionally as inadequate testing frequency area unit limitations in field of regard analysis for glaucomatous progression. Current enhancement in applied math technique additionally as incorporation of purposeful & structural measures into one model possible can result in an increased ability to observe glaucomatous progression & can yield a lot of timely & acceptable medical care [3].

Fig.1. Glaucoma tree

Visual field testing has contended an important role within the diagnosing & management of eye disease for every century. Strategies to look at the field of regard are refined from early kinetic perimetry to current common place machine controlled perimetry (SAP). Clinicians currently use SAP for the diagnosing & management of eye diseases throughout the globe. Numerous testing paradigms & analytic strategies are developed to change the diagnosing of eye diseases & also the interpretation of progression. Moreover the ways are enforced to boost patient expertise with field of regard testing & to extend dependableness. Objective practical test, cherish electro retinography give an alternate to subjective field of regard testing however don't seem to be nonetheless prepared for widespread adoption. Common place machine controlled perimetry is being tailored & improved perpetually. New devices might permit patient to complete field of regard tests reception that may relieve patient & clinicians from in office testing & permit for additional frequent examination. Eye disease detection & progression analysis area unit are also incorporating progressively increasingly more & additional more data can be improved as deep learning ways are applied. Finally perimetric & structural testing doubtless can become additional closely tangled as testing platforms & progression analysis incorporate each of those measures. Field of regard testing can still have a very important role within the diagnosing & management of eye disease [4].

II. RELATED WORK

Ron Chibel et.al [5], To assess sight view (VF) detects and retinal perform objectively in healthy participants and patient with redness pigmentosa (RP) employing a chromatic multifocal pupillometer. Pupil responses to red and blue light-weight (peak, 485 and 625 nm, respectively) bestowed by seventy six light-emitting diodes, 1.8-mm spot size at totally different locations of a sixteen. 2 degree VF were recorded. Subjective VFs of RP patients were determined mistreatment chromatic dark-adapted Goldman VFs (CDA-GFAs). Six healthy participants underwent pair of pupillometer examinations to se test-retest irresponsibleness.

Kazunori Hirasawa et.al [6], This prospective study aimed to judge the input rate for automatic kinetic perimetry supported the check length, the kinetic sensitivity, and therefore the variability of kinetic sensitivity in thirty one eyes of thirty one young healthy participants. Automatic kinetic perimetry was performed victimization associate degree Octopus 900 perimetry with Goldman stimuli III4e, I4e, I3e, I2e, I1e. The two 3, 4, 5, and 10/s; every rate was tested twice. The check length, Kinetic sensitivity, and variability of kinetic sensitivity were compared among the input velocities. Twenty-nine eye from twenty nine participants were analyzed, and 2 participants were excluded. The check duration at the velocities of two, 3, 4, 5 and 10/s were negatively related to with the input rate (p<zero.01). The variability of the kinetic sensitivities didn't considerably disagree among the input velocities. The kinetic sensitivities at a pair of and 3/s didn't disagree considerably for all stimuli. However, those at 4/s diminished for III4e, I4e, and I1e (p<zero.05), and people at five and 10/s decreased for all stimuli (p<zero.05) compared with those at a pair of or 3/s. Through the check durations for every stimulus rate were negatively related to with the input velocities, a input rate of three and 4/s might be counseled for automatic kinetic perimetry supported the changes within the kinetic sensitivity. As this study enclosed solely young participants, more studies in older participants may be necessary.

George L. Spaeth et.al [7], imaging completely at the guts of designation and caring for patients with or suspected of having eye disease. After all, eye disease may be a "characteristic progressive optic pathology," so "seeing" the nerve I clearly vital. Imaging, however, comes in many alternative forms, and the question is what kind is most acceptable and the way usually and the way ought to its interpreted? We are going to not discuss interpretation, however can approach the topic from a broader perspective. We tend to believe that imaging of the point is a necessary a part of the analysis of the patient with or suspected of getting eye disease. Getting a legitimate, quantitative history, however, is probably the foremost vital a part of patient encounters, because it is thru the physician obtains info regarding the way to perceive, related to, and advise patients. Every patient is totally different, and understanding every patient's considerations and desires, additionally as symptoms, is essential. Also, clearly, different aspects that relate to design action associated examination area unit a part of an appropriate analysis.

Addepalli U. Kumar et.al [8], There ought to be a stress on a comprehensive ocular examination together with gonioscopy for correct case detection and treatment of primary angle closure unwellness (PACD). Characteristics and differentiating the kind of eye disease supported gonioscopy and optic disk assessment needs sound clinical expertise. There's a pressing want for eye care professionals at the community level because the medical specialist to population magnitude relation. Practice coaching in Bharat involves three years of theory categories and a year of clinical berth in a very tertiary eye care centre.

Christoph et.al [9], Intraocular pressure (IOP) remains the foremost vital risk issue for associate degree untreated glaucomatous eye to achieve a lot of severe stage of the illness. because the main risk issue at intervals therapeutic reach, IOP and its applicable activity be our current interest. Not solely has our understanding of eye disease modified however conjointly our approach to the activity of the IOP force per unit area (IOP) is that the results of a equilibrium between humor formation and outflow, that area unit nearly equal beneath traditional conditions. Liquid formation (2ml/min) has 2 parts: a fluid mechanics component, made by

passive outflow of fluid from the blood, and a liquid body substance part, ensuing from the transport of metal and different ions by the ciliary epithelial tissue.

D.B. Henson et.al [10], Perimetry, or campimetry, is that the technique accustomed live the extent of the field of regard or to assess the sensitivity of the sensory system to stimuli conferred among the field of regard (IPS standards). Tate and Lynn outlined the fiend of regard as "all the area that one eye will see at any given instant," it ordinarily extends from the fixation axis: 60 degree up, 75 degree don, 100 degree temporally, and 60 degree nasally. The superior and nasal field's area unit restricted by facial contours. Perimetry contains two techniques i.e. kinetic perimetry & static perimetry. In kinetic perimetry stimuls is moving from non seeing area of eye. In static perimetry stimuls is constant.

III. Working

Push button can be a switch mechanism for dominant one face of a machine or a method. Pic microcontroller to program switch. 5v power supply provides is given to Pic microcontroller. Bluetooth device is employed to transfer information from Pic microcontroller to mobile phone. The conventional perimetry carries with it large perimetry machine. Patient aren't sung with these take a look at conducted as a result of they need to sight down straight while not moving focus continuous while not blinking of lid. Thus to avoid this standard perimetry issues new system is developed. Rather than whole large machine a straight forward user friendly app is ready which can conduct taking a look at. Recent home watching contains the electronic technology that measures the sensitivity of the central field of regards of victimization simulation. In simulation the upper frequency take a look at are tested to boost the first detection of field of regard of loss in eye disease. The sensible phone desires a specially designed app to retort to the sensible perimetry & monitor the reading of patient. The patient initial got to get him registered to the app before undergoing the testing procedure. When this stage the patient will precede with the take a look acing procedure & the test results would be displayed on the sensible phone in PDF format. If patient wish to perform take a look at second time then they need to enter their information an extra time. By this fashion the doctor are going to be able to read the previous take a look at result& compare it with these results.
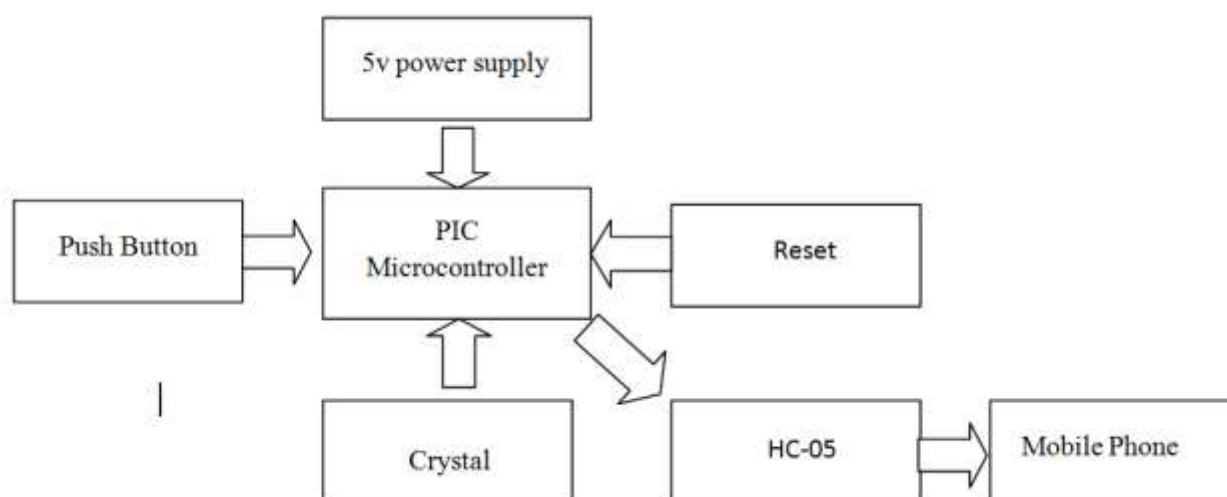

Fig. 2. Block diagram of system

IV. RESULT & DISSCUSION

The results of the patient are stored in a pdf format file. The result contains report of tested eye. In this the left eye is tested. The result contains red and green color format red indicate patient doesn't seen the test location and green indicates number of test locations seen In first section there are three graphs of different intensity. The second graph contains the locations of these test points from pupil i.e one to one mapping takes place between mobile screen where test is performed and the pupil. Atlast there is a table which contains distance and angle made by test points which aren't seen by the patient. The distance between pupil mobile screens is fixed. When we get distance of test points then by similar triangle formula the distance is calculated of test point not seen. The main disadvantage of this test is patient corporation fixed distance, pupil size is assumed. So to increase the accuracy the distance between cornea and retina.
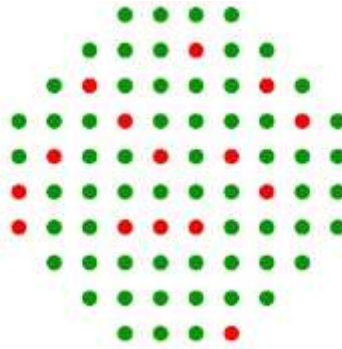
Fig. 3. Output of system in the form of seen & unseen leds.

As we see in fig.3 76 leds will glow in a gap of three seconds. To calculate the distance between two leds a mathematical formula is used.

hspacing = screen_width - (sidemargin * 2 + radius * maxhleds * 2)

hspacing = hspacing / (maxhleds - 1)

Whereas,
hspacing=Horizontal spacing
screen width=Mobile screen width
maxleds=10

By using this formula we can calculate the distance between two leds. The screen width of mobile phone is in the form inch so we have to convert it into pixel.

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