

Laptop operation using sensors for the physically challenged

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Abstract:

We all know that India is working towards providing best service to the common people in all aspects especially towards bringing forward the physically handicapped. The various schemes passed by the government for the upliftment of such physically challenged people, like reservation quotas in all medical and engineering colleges under government concern stand as a testimony for this statement. It has been decided by the government that the reservations in Group 'C' and 'D' posts/services to be filled by direct recruitment for the physically handicapped persons.

But some departments are considered not suitable for the handicapped people due to the nature of the work, and hence jobs in such departments are partly or completely exempted from such reservations. This could be made better by enabling and increasing the employability of physically challenged by providing certain physical aids such as the one we have designed for laptop operation, thereby increasing their job opportunities in the IT field.

So we as citizens of India, have taken an effort to make it much more adoring for this cause by enabling the physically challenged to operate laptops at an easier way, with less effort needed. This is achieved by using spectacles fitted with light sensors, which could operate the cursor of laptop using a suitably programmed micro processor. This is aimed at achieving maximum comfort for the physically challenged so that they could utilise and explore the use of internet through laptops so that they could update their knowledge about the technical world and keep updates.

I. Introduction

This project aims at providing a mouse like interface using light sensors and a micro controller (major tools). The user can use eye movements to control the cursor. This enables physically disabled to use computing machines with the help of their eyes. Two sets of sensors are taken. Each of these consists of large number of sensors (light detecting surfaces) connected together in a rectangular shape. Each of these light detecting surfaces are connected to a set of pixels (on the laptop screen) through a micro controller circuit. The set of pixels ($a*b$, $a>b$) depends on the screen resolution. Now, the micro controller circuit receives information from the sensor, processes it and sends the information to the laptop. Thus with the help of this

system, laptop operation for the physically challenged people has been made much simpler so that they become more capable for job opportunities in the society. The system could be implemented in a much larger scale using sufficient funds to educate and equip those handicapped people who are deserving. It may receive huge acceptance among them once the system starts getting implemented.

II. System Design

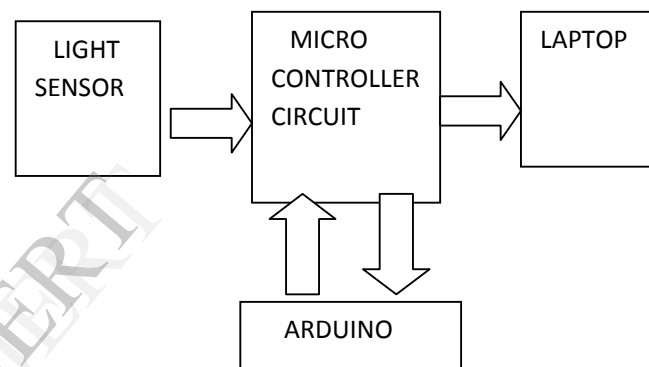


FIG. 1 .Shows the basic functioning of our light sensing system.

The system mainly consists of three stages of working.

A. Stage I

On the spectacle which is fitted with sets of light sensors, each single sensor is connected to a small set of pixels on the laptop screen. The sensors on the left eye lens are concerned with the pixels on the left half of the screen and the sensors on the right lens are concerned with the right half of the screen. The user will however find it easier as he sees the laptop screen from off the spectacles frame, using the view part of the frame only for operating the laptop.

B. Stage II

The second stage consists of the micro controller circuits. It is programmed in such a way so as to produce specific operations and tasks based on the input signals it receives. Whenever the user concentrates on a particular sensor on the spectacles frame, the cursor on the laptop is moved accordingly.

Whenever the user shutters or blinks his left eye once as he concentrates on a pixel, the item on that location gets selected. If he double clicks his left eye as he concentrates on a particular sensor, that item or window will get opened. Similarly for the case of right eye ,similar operation happens. So based on these signals received by the micro controller circuit and arduino,from the sensors, the operations are performed accordingly

C. Stage III

The signals from the micro controller circuit are processed and based on the processed result, specified operations are performed on the laptop screen. The outputs from the arduino circuit are connected to the left button, right button and motion sensor screen of the laptop, to move the cursor

III . Working

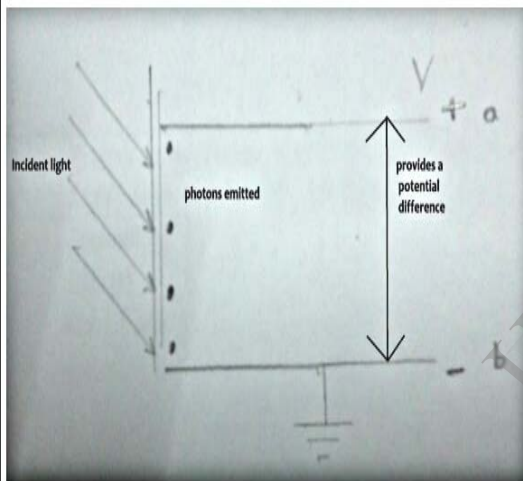


FIG.3. Showing the production of small current (electrons) from incidence of photons on sensors

Whenever the user focuses on a particular sensor (and winks once or twice with sufficient time interval so as to differentiate between cursor movement and single or double click, with the other eye open), photons are emitted from the surface. These incident photons produce electrons by photo electric effect producing a small current in the light sensor. This small current when passes through the specific value of resistor assigned to the particular sensor, it provides a potential difference to the light sensor.

In the FIG. 2, resistances R_1, R_2, \dots provide a potential drop from the one produced by the corresponding sensor (right set of sensors) in the primary mode.

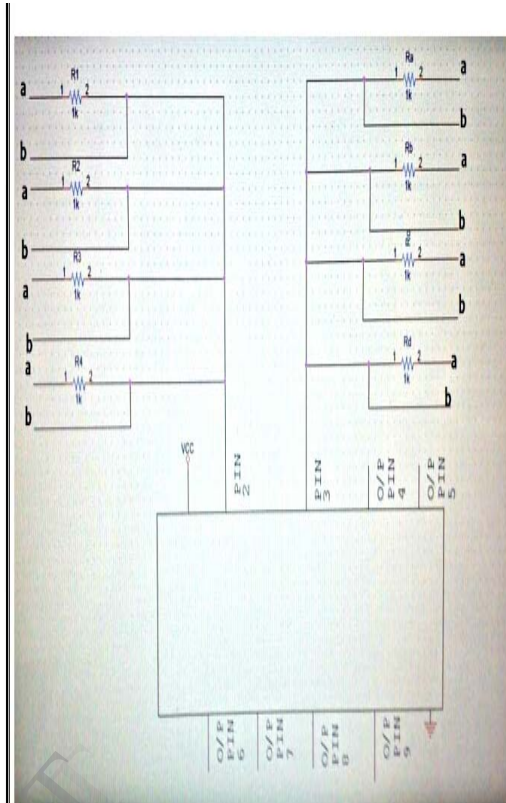


FIG.4. shows the different resistor values connected to different sensors to get different voltage values.

Similarly resistances R_a, R_b, R_c, \dots provide a potential drop from the one produced by the corresponding sensor (left set of sensors), in the secondary mode (wink with right eye open).

Different values of resistances are connected with different sensors so that when a particular sensor is excited or activated, the particular value of resistance thereby a particular voltage value can be produced so as to differentiate which sensor is activated, for the micro controller.

The micro controller is connected to some variable resistors to provide these resistances (for minimum number of components in the circuit).

The potential drop indicates the group of pixels (depending on the resolution of the screen) it must correspond to, on the screen.

Since each sensor produces a different potential drop (since different resistances), each sensor corresponds to a different group of pixels.

Thus the micro controller circuit selects the sensor which is switched on. Two pins in the micro controller circuit

determine the status of left and right sensors(set).Four other pins are used to determine the positioning of the pointer on the screen.

The 6 outputs are connected to the mouse micro controller circuit,and from there on to the mouse card of mouse pad.The mouse card sends information (states of the buttons and the positions of the pointer)to the laptop,which depends on the interface.

Single click or double click or dragging depends on the number of winks(once or twice or time extent),via the micro controller programming.

IV . Advantages and Disadvantages

Advantages:

- This system provides an interface between the physically challenged user and the laptop ,enabling him to operate the laptop without the need of limbs.
- The user need not depend upon any one to fulfill his need to operate and surf the internet.
- It provides atleast ease to user so that he needs to only use his eye movements to perform any kind of operation on laptop.
- This system could provide employment so as to help the upliftment of the physically handicapped people.
- Their employablity rate could be much increased in a developing country like ours.

Disadvantages :

Implimentation of the system would be cost consuming. Acceptance of this system among the common people could be achieved only after training and educating them .

V . Discussions

These type of systems can help the physically disabled people to independently do their tasks without the need to expect other people to fulfill their tasks.So even the people who have lost their limbs or dnt have them by birth can increase their employablity in this manner.They need not get depressed that they are not able to work. Also the present day statistics show that job opportunities are more in IT industries and networking .So such people can find a job for themselves even in IT industries with the help of this system.In future,the government can take efforts to impliment this system on a large scale and prvide for the handicapped people at a lower cost.This could be

implimented throughout the country thereby more man power resource could be achieved so as to help the developing nation while providing job for the needy people.

VI . Conclusion

Thus with the help of light sensors we have designed a system for mouse operation to move the cursr on the laptop screen without the use of the mouse pad so as to enable those people without their fore limbs.

VII . Acknowledgement

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VIII . Reference

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