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Mouse Control using Eye Tracking & Head Gesture for Armless Person

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Abstract-Our final project goes and operates a mouse cursor on a computer monitor by sensing where the user's eye-movements via infrared eye tracking information and a gyroscope. The inspiration for this development came from belief about a use of infrared light. We limit our invention down to head gesture and eye-tracking because it's likely help to the disabled and the not have of perfect economical eye-tracking devices out there.

Index Terms- Eye Mouse, Gyroscope, Mouse Controlling, head gesture system.

1. INTRODUCTION:

Following researching many eye tracking plans, we know that there was not have of cost-effective and un-inhibiting eye tracking plan.

1. Price - Most of the eye-trailer we research used a camera and signal processing tool to trail the reflection out of pupil. These systems usually cost thousands of Rupees. Therefore, we determined to go with phototransistors and infrared LEDs in its place of a camera. This process is much less demanding on our controller than processing image.

2. Variety Of activity - The eye-trailer we searched that did not use a camera we all used for many application, and as such, had the user mendacious down or placing their head into the mount. We necessary were making an eye trailer that did not redistrict movement of head and neck. Accordingly, we decided to mount LEDs on a couple of specs. This ensures the eye is always proportional to the head.

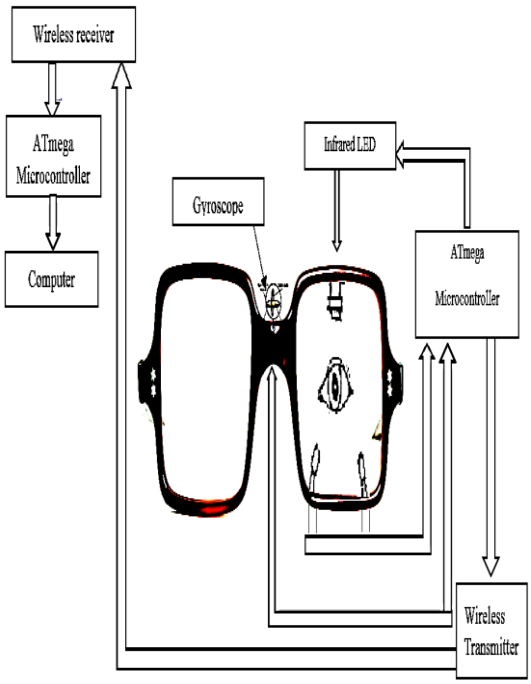
3. Visualization - Another concern was how good the client could see using our device. This intended that we have to be expected use a transparent lens. To get good sight, we would try to use as small modules as feasible.

2. CONSTRUCTION:

We have a couple of 3-D printed specs with artificial lens. These lens have holes drilled into them to build up thru-hole phototransistors and infrared LEDs. The transmitter is located over the eye and transmits IR light, which is get back rotten of the eye into the phototransistors lower than the eye. We also have a little gyroscope getaway board in the center of our specs above the link, which will sense head activities in three axis of spin. All of the glasses mounted mechanisms are connected to controller, which parses the gyroscope & LED data into Universal Synchronous Asynchronous Receiver Transmitter packets and goes it wirelessly. The packets are understood by a receiver on a distinct ATMega

2560, which changes the mouse pointer by a Java code based on the information acknowledged. The major security concern is with a radiation from an infrared LED injurious to operator's tissue of eye. We conclude that very with awareness and make definite to buy IR LEDs with wide profile and a low intensity. Our selected LED take an extreme radiant intensity we gives 5.0 V supply to infrared LEDs, Also serially connected to the 330 Ohms of resister. It can be flow 15.15 mA of current through it. The unique idea was to utilize an array of LEDs and phototransistors to decide the eye position, but due to complexity among which was to wire and test with, we sure to run tests using basically two phototransistors at earliest slightly than to run tests with so much mess. While we are testing an array intend, it actually designed time based agenda for blinking LED in an array.

2.1 BLOCK DIAGRAM:



2.2 HARDWARE:

2.2.1 LENS

The main idea of lens is to grip the infrared LEDs and phototransistors in face of the user eye. To decide we first determined where eyes were in family member to our specs by acquiring a part of acrylic we establish in lab to particular low-priced plastic frames that previously have. Coincidentally, the plastic previously holes in LEDs, so we made prototype and confirmed with a range that the phototransistors operated as we likely it to the next phase was acrylic & drilling certain holes to fit our phototransistors and LEDs. We use inexpensive acrylic and use a grinder in the shop to drill an array of holes equivalent to the operator's eye position.

2.2.2 SPECS

We designed our frames in durable works. This was a major part of mechanical design. Our main design concerns were the internal spaces to hold the lenses, small racks at the top to grip the wires from the gyroscope, infrared diodes, and phototransistors, and a slot in the midpoint to grip gyroscope.

2.2.3 PHOTOTRANSISTORS & LEDS

There are usually two arrangements used when tracking position of eye with reflection. One arrangement uses couples of phototransistors and LEDs While the other arrangement features a one LED to illuminate eye and many phototransistors to get reflected signals. We used the arrangement relies on the LED having a thin beam shape to ensure that light from one LED does not delay with many phototransistors. The LEDs we could find that had a thin enough beam shape were the LEDs, which are too bulky for our design to have many fit through period eye. We used to find 1.8 or 3 mm sized lenses LEDs along fine beam shape, but we will not search right one. Then, we decided

to buy small, wide-angle Light emitting diode for illuminating the whole eye. We finished up going with the small LEDs 1900 MCD because of it is nearly spherical beam shape and tiny size (1.8mm). For these design, the phototransistors have a sharp beam shape for better directional detection. Luckily, the phototransistors offered in many shop, the LTR4208, both are small sufficient and have thin sufficient finding profile for these project.

2.4.4 GYROSCOPE

We used gyroscope breakout board from any electronics shop. We want to buy this kit because of its tiny size, 3-axis output, and comfort of assembly. Gyroscope use I2C interface with microcontroller.

2.3 WIRELESS TRANSMITTER & RECEIVER CIRCUITS

Taking motivation from previous peoples, we used the RCT-433-AS transmitter & RCR-433-RP receiver. We have receiver and transmitter libraries. We took motivation from USB Wireless Tilt Mouse.

The capacitor-inductor network is efficiently low-pass filter which remove voltage ripples from supply. Inductor is connected in series with supply attenuate high frequency noise, while capacitor avoids that noise. We cannot use 10 uH inductors, so we find 15 uH inductors in its place. The greater value the inductor, decrease cutoff frequency of the filter so 15 uH inductor would be superior to the 10 uH inductor at smoothing.

The pins ANT used for receiving and transmitting antennas. We linked a long portion of wire to both, but receiver get up clean signals irrespective of the occurrence of a transmitting antenna.

3 SOFTWARE:

3.1 PROGRAM DETAILS:

We broke this software in three main components: transmitter code for head-mounted device, receiver code for the base station wireless, and Java interface to control the mouse.

3.2 USER EDGE

The gyroscope is use as a control for y-axis, and the eye tracking is using our x-axis. We conclude this policy due to aware comfort with which a operator can lower or lift his head & modification the mouse. After testing the gyroscope, we able to acquire very instinctive y-axis resolution with nodding the head. Since we have on a couple of phototransistors, we thought that eye tracking would at best use for x-axis resolution.

3.3 ABSTRACTION LAYER

One of the problems with this project had to agree the lines of abstraction within software. Where did we want to use networking layer code? How we need to connection between networking layers and application layer? This step of the data handover would actually need to understand these values and change them in some kind of helpful control signal for mouse? In what stage in software idea would we able to require all of parts for accurate mouse movement? These questions were fairly unclear, and each choice we make along the way help out impact the next result. We are in progress by determining to most of data analysis at the collection/transceiver side of things. This let us form the network layer packet along with simply the two deduced phototransistor values and gyro x, y, z values. Here, receiver then take out the data just repackaged it and serial output to COM. Java cover s application code by changing the control signals into a movement of mouse for particular monitor resolution.

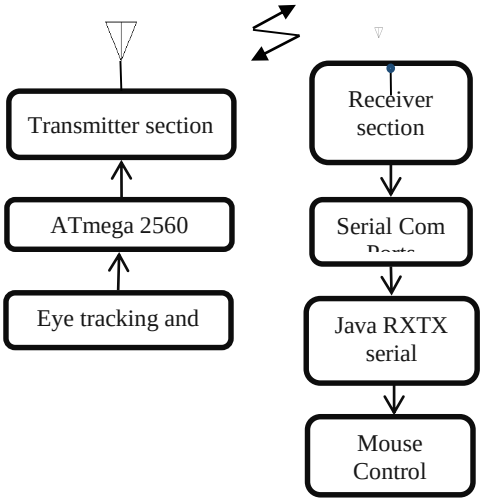
3.4 SPEED OF MOUSE CONTROL

One of our aims was implement mouse such that motions of the head can increase speed along with which the mouse changes in specific way. We sensed that this would allow user to have more perceptive sense for invention. Because we are unable to implements magnificently due to the restrictions of eye tracking with couple of phototransistors, we use acceleration established movement of mouse.

3.5 JAVA

We selected to usage Java for our controlling the mouse because it would we were ultimately able to transmission packets smoothly into the Java.

4 RESULT:



A user could wear specs, gaze at various points on a computer monitor, and the mouse pointer would move right or left based on coordinates at center of monitor which are used as reference In totaling, the user could tilt her head down and up, and the cursor also track the gesture of head subject on the rapidity at which operator moved her or his head. However, we cannot get both features employed at the same time; when we have LED eye-tracking output correct, our tracking of gyroscope was not practical, and we had working of gyroscope, the results from eye-tracking were slanted to the left. The system is moderately exact with respects to LED x-axis identifying and detection of head tilt, and further enhancements could be made. As defined in the background we have followed to the safety standards defined in ANSI Z136.1 standards. There are several factors we want to study. Some safety concerns relating to human being usage have radiation inserted into the head using infrared LEDs, a durability of specs that grip the eye tracking device & replication of the fixing lens back into the eye. The most famous organizations that have recommendations with observe to optical radiation exposure restrictions for the skin and eye.

5 CONCLUSION:

Our on the whole project met mainly basic vision. We capable to become certain mouse feeling on the x directional axis based on eye movements. At this point, we can shift eyes mouse will just follow along on screen. Likewise, a head movement (down or up) would direct to mouse following in these way as well. While the demonstration, we are unable to prove full contact of eye movements' causes mouse to move, it was convention of my prospects at a former point in period. The many simple prospects remained to become eye tracking sensitive to user's eyes, to get a wireless system working such that a 3-D couple of LEDs with specs on it can be damaged by the operator. We sensed that is highly fruitful. Here are various belongings we like to inversely for following period. In specific, we want to repeat on our phototransistor/LED project more such that we get a extra precise sensor values. Likewise, currently we take had more soldering practice, we would probably not have as many of the hardware errors as we had previously. Thus, we want to re solder some of the hardware PCBs that we built. In terms of actual eye tracking, we would like to fix certain testing on a variation of many people

because this is sanction us to get well data & recognize that kind of eye tracking system people will in reality use. From tradeoffs segment, we scheduled some additional improvement we will like to do.

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