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An Advance Mouse for Human-Computer Interaction by Using Matlab

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***Abstract*- Human-Computer Interaction (HCI) is a field in which the developer makes a user friendly system. A real-time Human-Computer Interaction based on the hand data glove gesture recognition is proposed. HCI is becoming more and more natural and intuitive to be used. The important part of body that is hand is most frequently used as interaction in digital environment and thus complexity and flexibility of motion of hand is a research topic. Physical gestures as intuitive expressions will greatly ease the interaction process and enable humans to more naturally command computers or machines. To recognize hand gesture accurately and successfully data glove is used. By moving the hand, the cursor can move accordingly. The results show that glove used for interaction is better than normal static keyboard and mouse as the interaction process is more accurate and natural. Also it enhances the user's interaction and immersion feeling. A web cam is used to capture the hand movement. In addition to movement of pointer, selection is possible by using an eye blink sensor. This will make the user to interact with the Pc or machines in high speed. Each blink of the eye is detected by an infrared sensor, which is mounted on dummy spectacle frames. The eye blink switch can be set up to operate on either eye and maybe worn over normal glasses. The sensitivity of the switch can be adjusted to the user needs and involuntary blinks are ignored. The sensor is connected to a hand-held control unit with a rechargeable battery.**

Keywords- ***ARM, sensors, camera, PC , mat lab***

I. INTRODUCTION

We employ gestures in our daily life to convey messages, and display emotions. They can also be used to express commands. With rapid advancement in the field of Human Computer Interaction (HCI), it has become possible to gain easy access and control of computer applications using gestures. Using computer vision techniques, it is possible to capture gestures and make interpretations in the form of commands. Efforts have also been made to recognize American Sign Language (ASL) using gesture recognition .In this Paper, we propose a simple yet fast gesture recognition algorithm for a single user to gain easy access to applications such as web browsing, menu-based multimedia control, etc

Block Diagram:

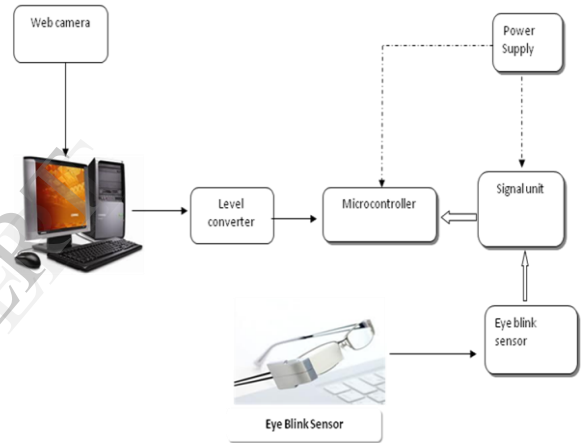


Figure 1: Block Diagram

II. ARM 7 FAMILY

The ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications.

The ARM7TDMI-S core is the synthesizable version of the ARM7TDMI core, available in both VERILOG and VHDL, ready for compilation into processes supported by in-house or commercially available synthesis libraries. Optimized for flexibility and featuring an identical feature set to the hard macro cell, it improves time-to-market by reducing development time while allowing for increased design flexibility, and enabling >>98% fault coverage. The ARM720T hard macro cell contains the ARM7TDMI core,

8kb unified cache, and a Memory Management Unit (MMU) that allows the use of protected execution spaces and virtual memory. This macro cell is compatible with leading operating systems including Windows CE, Linux, palm OS, and SYMBIAN OS.

The ARM7EJ-S processor is a synthesizable core that provides all the benefits of the ARM7TDMI – low power consumption, small size, and the thumb instruction set – while also incorporating ARM's latest DSP extensions and Jazelle technology, enabling acceleration of java-based applications. Compatible with the ARM9™, ARM9E™, and ARM10™ families, and Strong-Arm® architecture software written for the ARM7TDMI processor is 100% binary-compatible with other members of the ARM7 family and forwards-compatible with the ARM9, ARM9E, and ARM10 families, as well as products in Intel's Strong ARM and xscale architectures. This gives designers a choice of software-compatible processors with strong price-performance points. Support for the ARM architecture today includes:

- Operating systems such as Windows CE, Linux, palm OS and SYMBIAN OS
- More than 40 real-time operating systems like qnx, wind river's vx works.

III. LPC2148 MICROCONTROLLER

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue.

The key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI-S processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code. Thumb code is able to provide up to 65% of the code size of ARM, and 160% of the performance of an equivalent ARM processor connected to a 16-bit memory system

Figure 2: Kit Demonstration

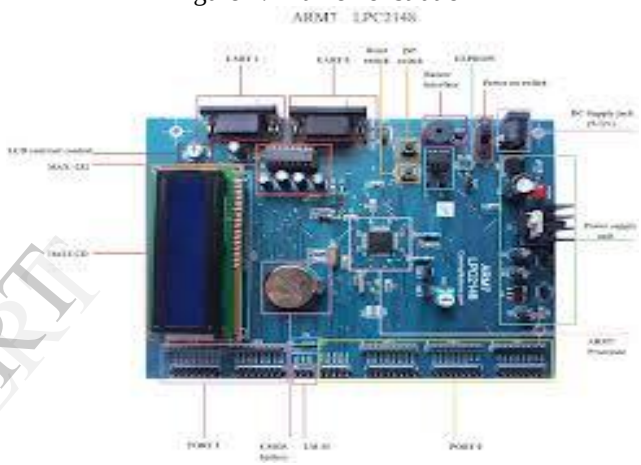


Figure 3: ARM7TDMI PCB board

IV. MATLAB

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java.

You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

V. EYE BLINK SENSOR

This switch is activated when the user blinks their eye. It allows individuals to operate equipments like communication aids and environmental controls hands-free. Each blink of the eye is detected by an infrared sensor, which is mounted on dummy spectacle frames. The eye blink switch can be set up to operate on either eye and maybe worn over normal glasses. The sensitivity of the switch can be adjusted to the user's needs and involuntary blinks are ignored. The sensor is connected to a hand-held control unit with a rechargeable battery.

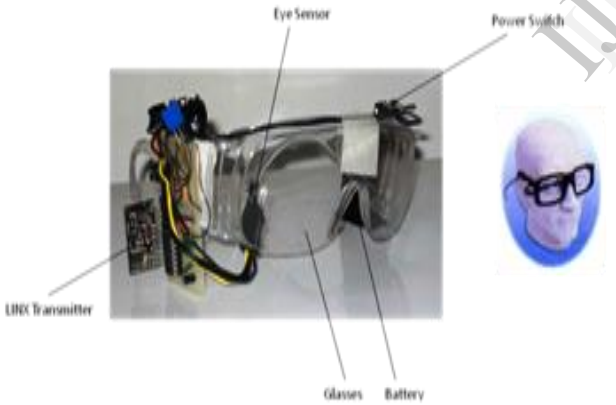


Figure 6: Eye Blink Sensor

IR LED at 900nm-GaAlAs Infrared Light Emitting Diode-
Shines invisible IR light on the user's eye

IR 900nm sensor

-Light Detector
-Detects reflected IR light

We decided to use blinking as we wanted the device to be functional for non-vocal or ventilated users (blowing or sucking was another option). Our first idea, and the one we implemented, was to use a led/photodiode pair to reflect light off the eye. We found that Optec Inc. makes a round receiver, consisting of a LED and aphoto transistor mounted on the same unit. This detected a strong increase in signal upon blinking. We were worried about detecting the difference between normal and intentional blinks, but we found that for most users the intentional blinks produced a much stronger signal, and they were always much longer the ~300ms normal blink duration

VI. SIGNAL CONDITIONER

A signal conditioner is a device that converts one type of electronic signal into another type of signal. Its primary use is to convert a signal that may be difficult to read by conventional instrumentation into a more easily read format. In performing this conversion a number of functions may take place.

Amplification

When a signal is amplified, the overall magnitude of the signal is increased. Converting a 0-10mV signal to a 0 -10V signal is an example of amplification.

Electrical Isolation

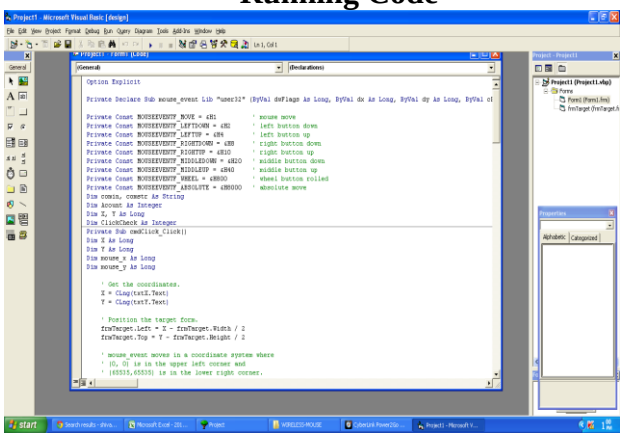
Electrical isolation breaks the galvanic path between the input and output signal. That is there is no physical wiring between the input and output. The input is normally transferred to the output by converting it to an optical or magnetic signal then it is reconstructed on the output. By breaking the galvanic path between input and output, unwanted signals on the input line are prevented from passing through to the output. Isolation is required when a measurement must be made on a surface with a voltage potential far above ground. Isolation is also used to prevent ground loops

Linearization

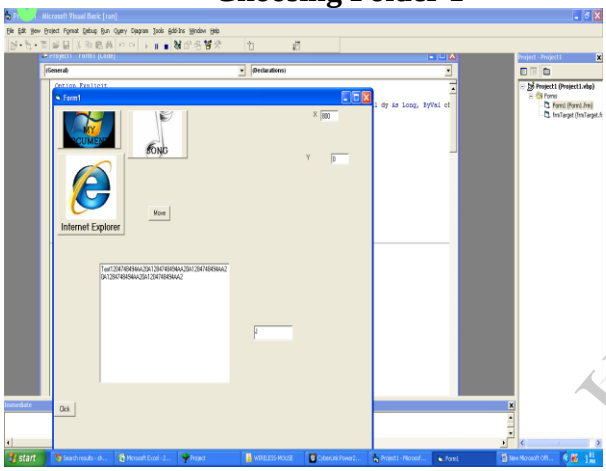
Converting a non-linear input signal to a linear output signal is called Linearization. This is common for thermocouple signals. Many sensors require some form of excitation for them to operate. Strain gages and RTDs are two common examples. The signal conditioning unit accepts input signals from the analog sensors and gives a conditioned output of 0-5V DC corresponding to the entire range of each parameter.

VII. OUTPUT SCREENS

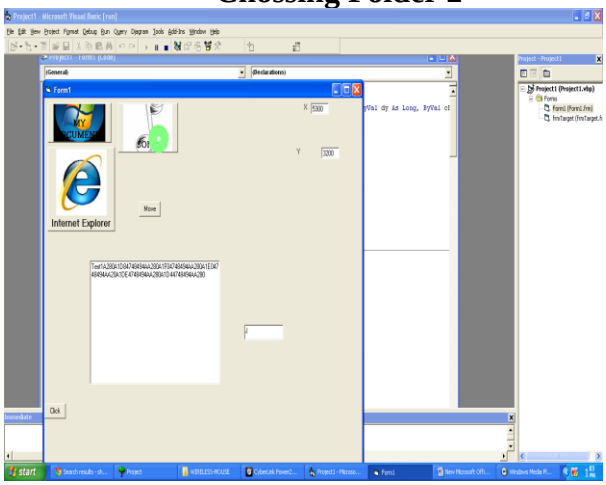
Running Code



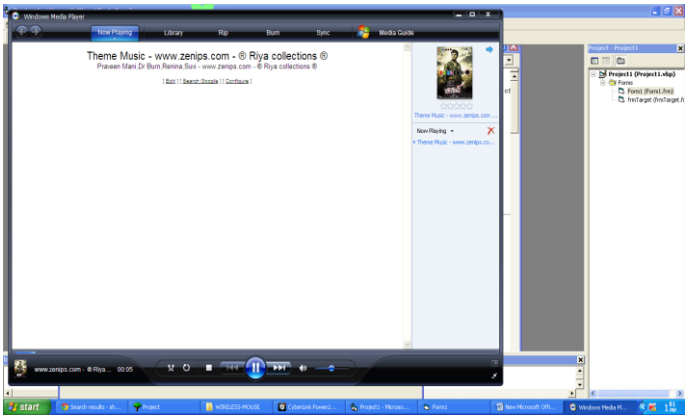
Choosing Folder 1



Chossing Folder 2



Opening Folder



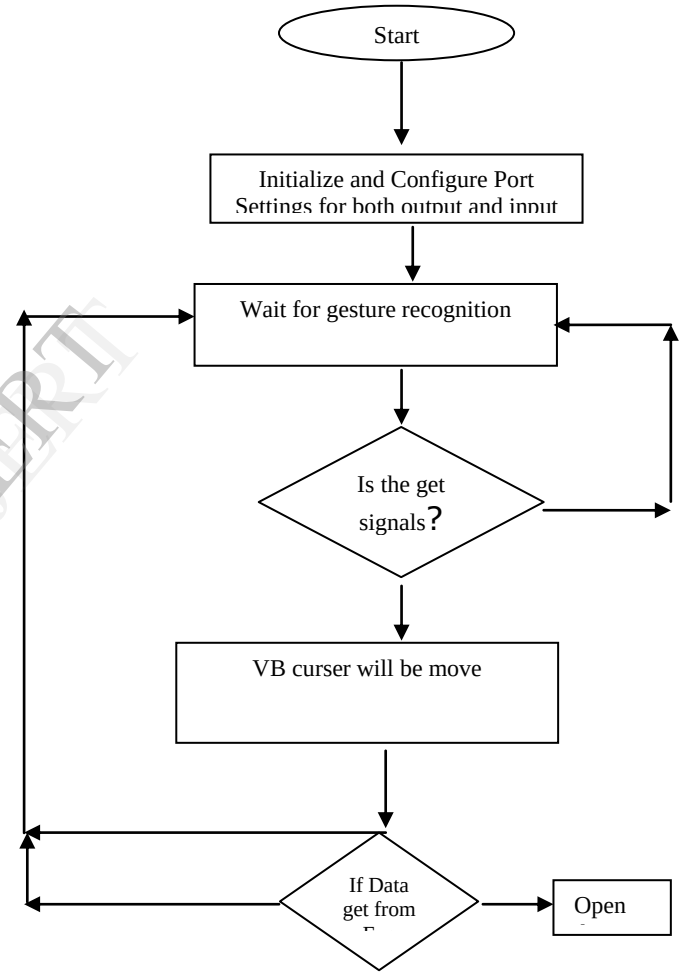


Figure 7: Flow chart

VIII. CONCLUSION

In this paper, a real-time Human-Computer Interaction based on the hand data glove gesture recognition is proposed to recognize hand gesture accurately and successfully data glove is used. By moving the hand, the cursor can move accordingly. The results show that glove used for interaction is better than normal static keyboard and mouse as the interaction process is more accurate and natural. Also it enhances the user's interaction and immersion feeling. A web cam is used to capture the hand movement.

In addition to movement of pointer, selection is possible by using an eye blink sensor. This will make the user to interact with the Pc or machines in high speed. Each blink of the eye is detected by an infrared sensor, which is mounted on dummy spectacle frames. The eye blink switch can be set up to operate on either eye and maybe worn over normal glasses. The sensor is connected to a hand-held control the opening the folders.

To show to our visible eyes we are using the visual basic software to write the program and demonstrate.

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