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SYSTEM APPLICATION PROCESSING BASED ON HUMAN BODY MOVEMENTS

Mr. K. Gopinath *Ms. G. Jayanthi* *Ms. D. Lakshmi*

Department of Computer Science,
Panimalar Institute of Technology,
Chennai, Tamilnadu, India.

Abstract— The Object tracking in three dimensional environments is an area of research that has concentrated currently, for its working which makes interaction between human and system. A human hand movement in real time, from video capturing, plays a significant role in the human-computer interaction and on the current digital image processing application, it is a difficult task. This paper gives a new method for human hand movement control in virtual environment, by eliminating the need of external device currently used for hand movements capture and conversion. A first step in this direction would be the detection of human hand, followed by the detection of movements and their use to control a virtual hand in a unique environment. The goal of this concept is to control the application by simple hand movements. Each hand movement controls each and every individual application.

Keywords— MEMS, ISOSOM, EMR.

I. INTRODUCTION

MEMS (Micro Electro Mechanical Systems) technology addresses and caters to the most innovative features required on the commercial applications to the innovative needs of the healthcare and automotive markets. Housed in ultra-compact packages that can even be placed on your finger, MEMS achieves a high level of movement-control analyzing, combining the most useful advanced operations and minimizing the power consumption.

The sensor technology has been chosen as the basis for the current system. The main aim of this system is to be able to control and perform some computer functions like starting the computer, closing, sending E-mails and opening various applications with required controls by just our finger movements (hand gestures). The system also targets to control any automobile with controls and also controls electronic home appliances like fan, light, TV etc. There are high possibilities to control all the things used in our day-to-day life by just our hand gestures. The universal control unit may be as a form of wearable one. With the sensors placed in the form of rings on our fingers, any motion made by a finger will be detected by these sensors and relayed to a control unit (through Radio Frequency) to take the required actions. The receiver unit would be interfaced with the computer, car control unit and electrical load control unit.

II. EXISISTING SYSTEM

The Sixth Sense prototype is comprised of a pocket projector, a mirror and a camera. The hardware components are coupled in a pendant like mobile wearable device. Both the projector and the camera are connected to the mobile computing device in the user's pocket. The projector projects visual information enabling surfaces, walls and physical objects around us to be used as interfaces; while the camera recognizes and tracks user's hand gestures and physical objects using computer-vision based techniques. The software program processes the video stream data captured by the camera and tracks thelocations of the colored markers (visual tracking fiducials) at the tip of the user'sfingers using simple computer-vision techniques. The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces. The maximum number of tracked fingers is only constrained by the number of unique fiducials, thus SixthSense also supports multi-touch and multi-user interaction.

The Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. The map application lets the user navigate a map displayed on a nearby surface using hand gestures, similar to gestures supported by Multi-Touch based systems, letting the user zoom in, zoom out or pan using intuitive hand movements. The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index finger. Sixth Sense also recognizes user's freehand gestures (postures). For example, the Sixth Sense system implements a gestural camera that takes photos of the scene the user is looking at by detecting the 'framing' gesture. The user can stop by any surface or wall and flick through the photos he/she has taken. Sixth Sense also lets the user draw icons or symbols in the air using the movement of the index finger and recognizes those symbols

as interaction instructions. For example, drawing a magnifying glass symbol takes the user to the map application or drawing an '@' symbol lets the user check his mail. The Sixth Sense system also augments physical objects the user is interacting with by projecting more information about these objects projected on them. For example, a newspaper can show live video news or dynamic information can be provided on a regular piece of paper. The gesture of drawing a circle on the user's wrist projects an analog watch.

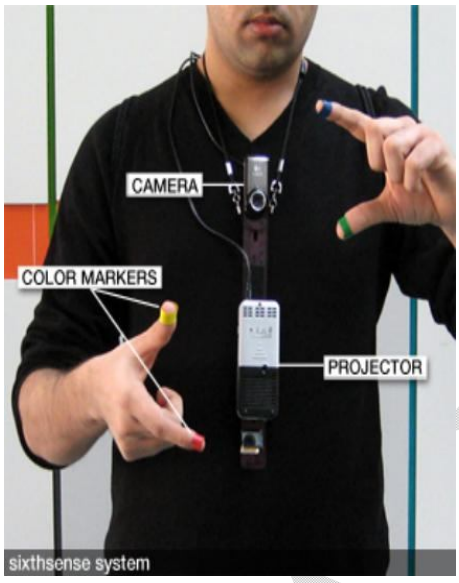
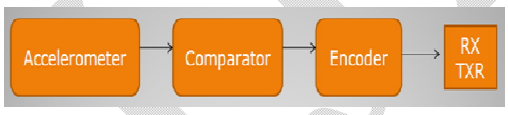


Fig 1.1 Relay Control Circuit

III. PROPOSED SYSTEM

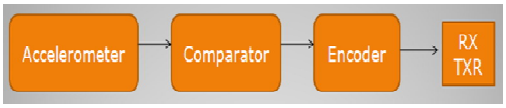
3.1. Base Design of the System



There are high possibilities to control all the things used in our day-today life by just our hand gestures. The universal control unit may be as a form of wearable one. With the sensors placed in the form of rings on our fingers, any motion made by a finger will be detected by these sensors and relayed to a control unit (through Radio Frequency) to take the required actions. The receiver unit would be interfaced with the computer.

3.2 MEMS (Micro Electromechanical System)

Combination of mechanical functions (sensing, moving, heating) and electrical functions (switching, deciding) on the same chip are used in micro fabrication technology. In MEMS the integrated circuits (ICs) are considered the thinking part of the system while MEMS provides active perception and control functions.



3.3 Hand Gesture Movement Detection

The position of finger is found using hand gesture movement detection. It is taking the mechanical angle according to finger as input and it converts that angle into binary. Thus the converting hand gestures into binary format which can be understood by machine. Then it is transmitting machine code to computer side block.

This is used to find the exact hand or finger position exactly by using accelerometer based on MEMS technology. ADI's broad MEMS-based accelerometer portfolio detects and measures motion in a wide range of I&I, healthcare, and automotive applications. These inertial sensing devices are available in various axis configurations, with analog or digital output, in low or high granges. Here the device number ADXL202 is used.

3.4 Electrical Switching Circuit

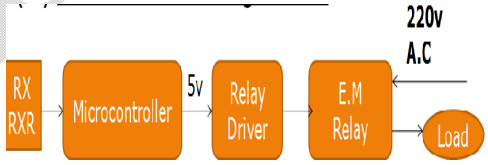


Fig 2 : Relay Control Circuit

This is basically designed to control loads. This is designed by transistor and an electromagnetic relay (EMR). EMR only takes main role in switching ON/OFF the electrical loads. This is used to turn ON or OFF the electrical loads when the microcontroller giving the commands. Electromagnetic relay is taking a main role. It is a device which works in electromagnetic principle.

A relay is an electrically operating switch. Electromagnetic relays are operate switching manually by using other operating principles. Relays control circuits in low power. In long distance telegraph circuits the first relay was used, repetition of signal transmission. Relays were used mostly in telephone exchanges and computers to perform logical operations. The EMR will be driven by transistor and the command for transistor will be given by the microcontroller

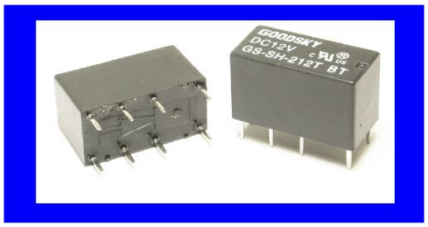


Fig 3 : Transistors

3.5 Automobile Control

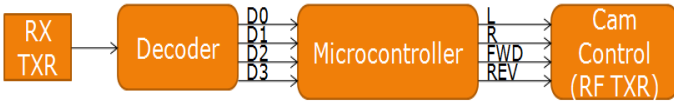


Fig 4 : Automobile Control Circuit

This Automobile software will show and store the red value from the serial port at the time when it arrives. The history records on the database when and where the vehicle moves anywhere with corresponding ID's with actions. Some of the actions are given below.

d1 - Vehicle Moves Forward
d2 – Vehicle Moves Backward
d3 – Vehicle Moves Forward Left
d4 – Vehicle Moves

In this the history is managed i.e., all the movements done by automobile will be stored in database and then on clicking the history button all the history will be displayed.

3.6 Data Read Write through Com-1

There are many kinds of computers unlikely that you'd find yourself running on a desktop computer without serial communication, but you might find that there is only one and it's already in use by another program. Or you might want a parallel port and find that the computer has only serial ports.

3.6.1 Setting up and opening a serial port :.

1. Get the name and CommPortIdentifier which you can do using my PortChooser class.

2. Call the CommPortIdentifier's open() method, cast the result in CommPort object to a Serial Port object this cast will fail if the user chose a parallel port!.

3. Set the serial communications parameters as baud rate, parity bit, stop bits either individually or all at once using the convenience routing setSerialPortParams().

4. Call the getInputStream() and getOutputStream() methods of the Serial Port object, and construct any additional Stream or Writer objects. This program shows you how to use the static CommPortIdentifier method getPortIdentifiers().

3.7 Wireless Communication

Fig 5 : Communication Control Circuit

The term wireless is normally used to refer to any type of electrical or electronic operation which is accomplished without the use of a hard wired connection. Wireless communication is the transmission of information over a distance without the use of electrical conductors or wires. The distances involved may be short, a few meters as in television remote control, or very long like thousands or even millions of kilometers for radio communications. Wireless communications is generally considered to be a group of telecommunications.

3.8 *System Booting / Shutdown*

Fig 6 : System Control Circuit

This is designed for computer applications, MEMS can be used in this field. In this module the computer applications are controlled like shutdown and booting by just moving the hand.

IV. IMPLEMENTATION

The system is implemented using ISOSOM algorithm through video stream (camera).

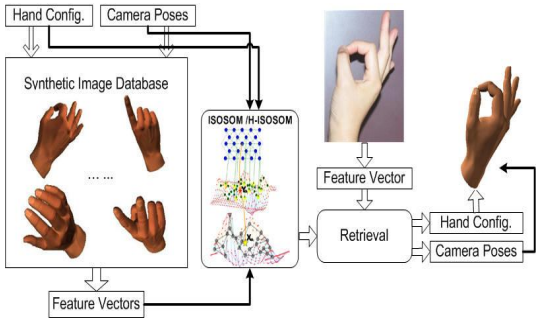


Fig 7 : ISOSOM Algorithm

4.1 ISOSOM Algorithm

In this research, we take an image retrieval approach based on analysis by synthesis method. It utilizes a 3D realistic hand model and renders it from different viewpoints to generate synthetic hand images. A set of possible candidates is found by comparing the real hand image with the synthesis images. The ground truth labels of the retrieved matches are used as hand pose candidates.

The hand is modeled as a 3D articulated object with 21 DOF of the joint angles (hand configuration) and 6 DOF of global rotation and translations. A hand pose is defined by a hand configuration augmented by the 3 DOF global rotation parameters. The main problem of analysis by synthesis is the complexity in such a high dimension space. The size of the synthesis database grows exponentially with respect to the parameter's accuracy. Even though the articulation of the hand is highly constrained, the complexity is still intractable for both database processing and image retrieval.

Here formulate hand pose reconstruction as a nonlinear mapping problem between the angle vectors (hand configurations) and the images. Generally, such mapping is a many-to-many mapping in high dimension space. Due to occlusions, different hand poses could be rendered to the same images. On the other hand, the same pose is rendered from the different viewpoints and generates many images. To simplify the problem, the eliminate the second case by augmenting the hand configuration vector with the 3 global rotation parameters. The mapping from the images to the augmented hand configurations becomes a one-to-many mapping problem between the image space and the augmented hand configuration space (the hand pose space). The one-to-many mapping between the feature space and the hand pose space with the ISOSOM algorithm. The experimental result shows that our algorithm is better than traditional image retrieval algorithms.

Instead of representing each synthesis image by an isolated item in the database, cluster the similar vectors generated by similar poses together and use the ground-truth samples to generate an organized structure in low dimension space. With such structure, interpolate the intermediate vector. This will greatly reduce the complexity. Based on Kohonen's Self-Organizing Map (SOM) and Tenenbaum's ISOMAP algorithm, an ISOmetric Self-Organizing Mapping algorithm (ISOSOM). Instead of organizing the samples in the 2D grids by Euclidian distance, it utilizes the topological graph and geometric distance of the samples' manifold to define the metric relationships between samples and enable the SOM to follow better the topology of the underlying data set. The ISOSOM algorithm compresses information and automatically clusters the training samples in a low dimension space efficiently. Figure 1 gives an intuitive depiction of the ISOSOM map.

V. APPLICATIONS

This multi-functional portable device for better human – computer interaction using hand posture can be applied in the following.

Replace the mouse as a more convenient and natural interaction peripheral.
• Interacting with 3D objects on computer screen.
• Easy control of Robots, Robotic Arms and Human Controlled Automation
• Easy Home Automation
• Effective Teaching / Animation / Design Aid
• Control of Machines for High-Precision Jobs
• Easy accessibility tool for people with disabilities
• Dedicated algorithms, when coupled with this technology, can be used to replace the keyboard as well.
• When used with other inertial sensors (e.g.gyros) the glove can be used to manipulate objects in 3 dimensions.
• Control over distant actuators connected via a PC interface.
• It can be used extensively in the gaming industry for remote location manipulation.

VI. CONCLUSION AND FUTURE WORK

We look forward to facilitate rich interactive features which would enable the users to interact and take portability to the next level. Use of smaller packages of the integrated circuits will scale down the size of the device to that of a watch, thereby improving the portability. To achieve further interactivity with appliances, we plan to build interfaces (hardware and software) to act as intermediaries between our device and the appliance these interfaces will be user customizable in terms of hand gestures and resulting actions enabling control of appliances.

References

[1] Kenneth Ayala, 2007,"The 8051 Microcontroller", Third edition.
[2] "Atmelflash commands" 'www.atmel.com' for hardware components

[3] www. ieeexplore.ieee.org' Pu Zhang Kogure, Y. Matsuoka, H. 'A Remote Patient Monitoring System Using a Java-enabled 3G Mobile Phone'.'Engineering in Medicine and Biology Society, 2007, EMBS 2007.29th Annual International Conference of IEEE'.

[4]"Component Need in system operation" http://datasheetarchive. com /for description about the components.

[5] Michelle Clifford and Leticia Gomez ,"Measuring Tile with Low-g Accelerometers", FreescaleSemiconductor, Application Note AN3107

[6] Surfacehttp://www.microsoft.com/SURFACE/Default.aspx

[7] "Advances in visual computing" ,First International Symposium, ISVC 2005, Lake Tahoe, NV, USA, December 5-7, 2005. Proceedings

[8] Theodore S. Rappaport " Wireless Communications : Principles and Practice" Second Edition , 2002 Published by Prentice Hall

[9] S. Zhang, C. Yuan, and V. Zhang(2008) "Handwritten character recognition using orientation quantization based on 3-D accelerometer," presented at the5th Annu. Int. Conf. Ubiquitous Systems.

[10] D. H. Rubine(1991), "The Automatic Recognition of Gesture," Ph.Ddissertation,ComputerScience Dept., Carnegie MellonUniv., Pittsburgh, PA.

[11] K. S. Fu, "Syntactic Recognition in Character Recognition". New York: Academic, 1974, 112,Mathematics in Science and Engineering.

[12]RuizeXu, Shengli Zhou, and Wen J. Li(2012), "MEMS accelerometer based nonspecific-userhandgesturerecognition" IEEE Sensors journal,12, 5,pp.1166-1173