ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Human Control of Robots Using Gesture Recognition



N.Mounica
Chaitanya Bharathi Institute of Technology, JNTUA, Anantapuram.

Y.Pavan Kumar Reddy
M.Tech, Assistant Professor,
Chaitanya Bharathi Institute of Technology, JNTUA, Anantapuram.

K.Chandra Sekhar
M.Tech, Assistant Professor,
Chaitanya Bharathi Institute of Technology, JNTUA, Anantapuram.

Abstract:

This project work discuss about controlling a device such as Robot based Non-contact free air motion signature. Lot of domestic appliances are used in households, industries and offices. These devices are mostly controlled by human hand with manual switches. This work is focusing on study of electric field (E-field) for advanced proximity sensing which are distorted through hand movements in detecting movements. While compared to the other systems this technology can be employed unobtrusively, work through various materials and do not have a high computational burden also. In this project we have analyzed the signal from the gesture pad and using RF transmission Robot movement control has been controlled. Classification of the user's hand or finger motion in free space seems to be a challengeable and will make device control eco-friendly

Keywords: ARM, Gesture Pad, RF module

I.INTRODUCTION:

Portable Sensor based touch less solutions become more popular after the recent success of touch screen technology. Presently Gestures are not often used to control domestic appliances in a modern infrastructure. This project discuss on the current use of gestures in domestic appliances and possible usage for various other domains. In recent years, several remote hand-gesture control systems for home-media systems have become commercially available. These include Microsoft Kinect, Nintendo Wii, and the camera Magic-Wand. Such systems aim to augment the living-room media experience and enhance user enjoyment. In this regard, scenarios that call for user identification include interface customization (i.e., facilitating a personalized gesture vocabulary), content adaptation, and parental control.

Traditionally, TV-remote content adaptation and parental control are facilitated by the use of numerical passwords. To meet security and media-control needs of gesture-based home-media systems, we have developed an unencumbered system for identifying individuals during the performance of a free-hand signature-gesture.Present technologies available to recognize gestures in free air which uses Common methods include cameras, depth sensors or capacitive systems. This work is focusing on study of electric field (E-field) for advanced proximity sensing which are distorted through hand movements in detecting movements. While compared to the other systems this technology can be employed unobtrusively, work through various materials and do not have a high computational burden also. Classification of the user's hand or finger motion in free space is RF transmission Robot movement control has been controlled. Classification of the user's hand or finger motion in free space seems to be a challengeable and will make device control eco-friendly.

Block Diagram:

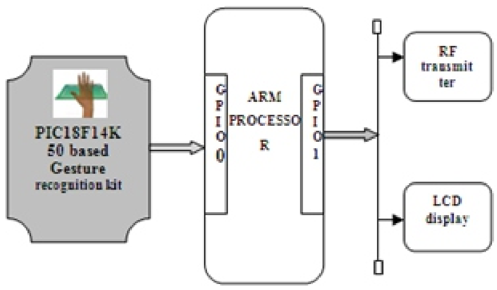

Fig1: gesture Pad section

Fig2: Device section

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

II. Design and Implementation:

This project is to control a device based on free air hand gesture motion technology. This process is going to be done with a hand gesture pad interfaced with a microcontroller. Hand gesture pad will works based on electric field variation. The magnitude or strength of an electric field in the space surrounding a source charge is related directly to the quantity of charge on the source charge and inversely to the distance from the source charge. The direction of the electric field is always directed in the direction that a positive test charge would be pushed or pulled if placed in the space surrounding the source charge. Since electric field is a vector quantity, it can be represented by a vector arrow. For any given location, the arrows point in the direction of the electric field and their length is proportional to the strength of the electric field at that location. From the theory , it is confirmed that an e field generate based on a source charge.These positive charges will be received by a negative source.Such vector arrows are shown in the diagram below.

Electric field vectors for locations around a negative (on left) and a positive (on right) source charge.

Fig3: E-field vector .

So, In the gesture pad, the electrodes will acts as positive charge receivers. These positive charges will be converted into the digital value by the signal processing IC, present inside the Gesture Pad kit and continuously will be checked by the threshold values. If any value cross the threshold value set inside the Gesture Pad, it will generate the digital outputs. For the device control application we are going to work with four digital outputs. The output of the hand gesture is connected to general purpose input and output pins. In port 1, we have to configure four pins as input pins and we have to read the status of those pins through IOPIN register. These gesture output pins are active high. So, if there is any state change in the IO pin, then as per the program it will enable an appropriate RFID pin.The first output of the hand gesture board is connected to the port 1 of 16th pin. Second output to the port 1 of 17thand third output to the port 1 of 18th pin fourth output of the hand gesture board is connected to the port 1 of 19th pin. RF transmitter is connected to the 24th, 25th, 26th and 27th pin of the ARM microcontroller.

Based on the input received in the GPIO pins from the hand gesture, the RF transmitter pin connected to the ARM microcontroller will be high. RF transmitter receives serial data and transmits to the receiver through an antenna which is connected to the 4th pin of the transmitter. The transmitted data is in 12 bit format containing 8 address bit and four data bit. The encoder will convert the 4 bit parallel data given to pins D0 – D3 to serial data and will be available at DOUT. This output serial data is given to RF Transmitter. Status of these Address pins should match with status of address pins in the receiver for the transmission of the data. Data will be transmitted only when the Transmit Enable pin (TE) is LOW. It operates at a specific frequency of 433MHz.RF Receiver receives the data transmitted through RF Transmitter. Decoder will convert the received serial data to 4 bit parallel data D0 – D3. The status of these address pins in the decoder should match with status of address pin in the encoder of the transmitter for the reception of data. In that RF receiver is input to the ARM controller and device is act as a output to the controller.

The RF receiver pin is connected to the ARM microcontroller in the GPIO ports. RF receiver contains four data pins are connected to 16th, 17th, 18th and 19th pin of microcontroller. Based on the input received to the controller from the RF transmitter, the device connected to the controller will be operated. The device is connected to the 24th, 25th, 26th and 27th of the ARM microcontroller. Based on the RF receiver data and flag, the device will be performing operation.In the transmitter section, if the user makes the device to hand motion toward the right direction, then a RF D0 signal will be transmitted. So in the receiver section RX D0 will get low. In receiver controller, if 16th pin get low and also flag will be set as zero means, the Robot move forward. If the user makes a free motion gesture of left direction, then robot move left direction. This gesture makes an RF D1 transmission in transmitter kit. IN receiver section, this signal will be read by RX D1 connected to 17th pin of the controller .For robot movement, if 17th pin of the controller get low and also flag will be zero with maximum delay, after that set the flag as one. If the 17th pin get low and also set the flag as one means robot will move. For the robot move right direction means user have to make a free air gesture in right direction. This will make the 18th pin low, then robot move right direction. For robot move backward, the 19th pin of the controller should get low. Then robot move backward.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

III. SYSTEM HARDWARE:
LPC2148 Processor:

LPC2148 Microcontroller Architecture. 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

2. Lcd display:

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

Gesture Pad:

This gesture pad Utilizes Electrical Near Field (E-field) sensing for advanced proximity sensing. E-Field is generated by electrical charges.

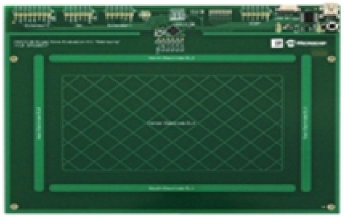

Fig4: Gesture Pad Outlook

The magnitude or strength of an electric field in the space surrounding a source charge is related directly to the quantity of charge on the source charge and inversely to the distance from the source charge. The direction of the electric field is always directed in the direction that a positive test charge would be pushed or pulled if placed in the space surrounding the source charge.The gesture Pad consists of five electrodes. The transmitter electrode transmits the charge from the source. The remaining five electrodes receives those positive charge. If a hand interrupted in the E-Field then the amount of negative ions falling on the rx electrode will change. This makes a signal variation inside the

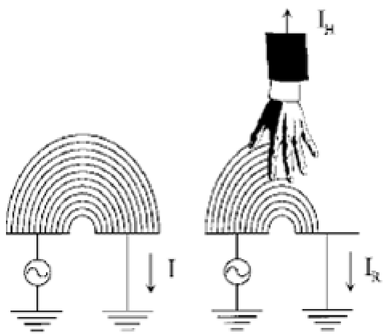

Fig5: Gesture pad E-Field distortion

MGC3130 processor and it will generate a digital output. Field distortion translated into 3D hand tracking and gestures. Very low power consumption since nearly no energy is transported.

Gesture Pad Features:

•Frame shape electrodes
•1x Transmitter electrode Tx

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

•4–5x Receiving electrodes Rx
•2-Layer stack-up
•Optional GND layer
•Microchip MGC3130 MCU
•I²C™ to USB bridge (PIC)
•USB powered

Wireless communication:
RF communication:

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.

Transmitter:

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The TWS-434 modules do not incorporate internal encoding. If simple control or status signals such as button presses or switch closures want to send, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functionsThe transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls. The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy

Fig6: RF Transmitter

RF receiver:
RWS-434:

The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances, when no carrier is present the output will remain low.The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available.

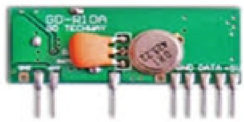

Fig7: RF receiver

IV SOFTWARE TOOLS:
KEIL C:

Keil software is the leading vendor for 8/16-bit development tools (ranked at first position in the 2004 embedded market study of the embedded system and EE times magazine).Keil software is represented worldwide in more than 40 countries, since the market introduction in 1988; the keil compiler is the de facto industry standard and supports more than 500 current arm device variants.

Now, keil software offers development tools for ARM. Keil software makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for ARM, 251, ARM and XC16x/C16x/ST10 Microprocessor families.

The arm Compiler allows you to write ARM Microprocessor applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the arm Compiler give you full access to all resources of the arm.

The keil Compiler translates C source files into relocatable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference .

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

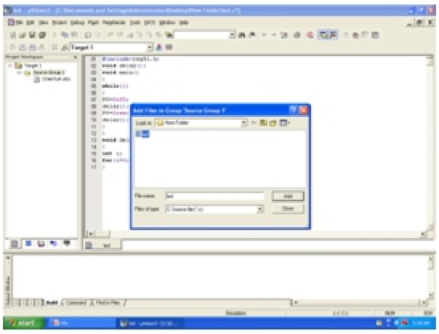

Fig: Program window of Keil compiler

FLASH MAGIC:

Flash magic can control the entry into ISP mode of some Microprocessor devices by using the COM port handshaking signals to control the device. In most of the cases typically the handshaking signals are used to control such pins as Reset, PSEN and VCC.

The exact pins used depend on the specific device. When this feature is supported, Flash Magic will automatically place the device into ISP mode at the beginning of an ISP operation. Flash Magic will then automatically cause the device to execute code at the end of the ISP operation. Straight forward and intuitive user interface.

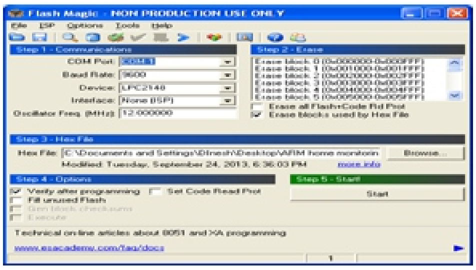

Fig: Programmer window of Flash magic.

ORCAD:

ORCAD really consists of tools. Capture is used for design entry in schematic form. You will probably be already familiar with looking at circuits in this form from working with other tools in your university courses. Layout is a tool for designing the physical layout of components and circuits on a PCB. During the design process, you will move back and forth between these two tools. The design flow diagram is given below:

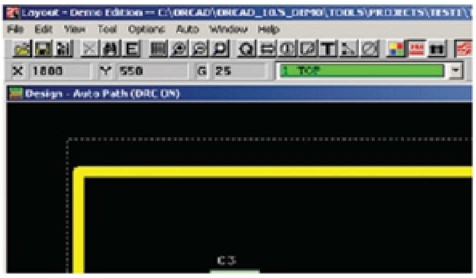

Fig: Orcad Layout Window

V. CONCLUSION:

A gesture pad has been used to control a device based on free air hand gesture motion / It uses the Hand gesture pad which works on a principle of e-field distortion. Hand gesture pad will works based on electric field variation. With this technology, any devices can be controlled from the user spot. It can able to bring a reliable assistance and security in electronics sector. RF transmission Robot-movement control has been controlled. Classification of the user's hand or finger motion is discussed to make device control with video transmission.

VI. References:

[1] A. Dennis, N. R. Ryan, and T. Peter, "Perceived usefulness, ease of use, and usage of information technology: A replication," MIS Quart., vol. 16, no. 2, pp. 227–247, Jun. 1992.

[2] J. Guo, D. Doermann, and A. Rosenfeld, "Local correspondence for detecting random forgeries," in Proc. Int. Conf. Doc. Anal. Recognit., Ulm, Germany, 1997, p. 319.

[3] A. K. Jain, F. D. Griess, and S. D. Connell, "On-line signature verification," Pattern Recognit., vol, 35, no, 12, pp. 2963–2972, 2002.

[4] N. Singh-Miller, M. Collins, and T. J. Hazen, "Dimensionality reduction for speech recognition using neighborhood components analysis," in Proc. Interspeech, 2007.

[5] Z. Yang and J. Laaksonen, "Regularized neighborhood component analysis," in Image Analysis. Berlin, Germany: Springer, 2007, pp. 253–262.

[6] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," MIS Q., vol. 13, no. 3, pp. 319–339, 1989.

Author 1:

N.Mounica received the B.Tech degree in electronics and communication engineering from Indirapriyadarshni college of enigering and technology for women, Kurnool, A.P., India (affiliated with JNTU Anantapur, Anantapur, India) in 2012 and is currently pursuing the M.Tech degree in electronics and communication engineering at Chaitanya Bharathi Institute of Technology, Proddatur, A.P., India (affiliated with JNTU Anantapur, Anantapur, India).

Author 2:

Y. Pavan Kumar Reddy was born at Pulivendula, Kadapa (Dt), AP on 03/08/1988. He got his B.Tech (ECE) from JNTU Anantapur in 2009 and M.Tech (DECS) from JNTU Anantapur in 2011. He had worked as Assistant Professor in the Department of ECE at Sir Vishveswariah Institute of Technology and Science in the year 2011-13. Presently he is working as Assistant Professor in the Department of ECE in CBIT proddatur since june 2013; he also acted as project coordinator for the batch 2009-13. He had published three papers in international journals and two papers in National Conference.

Author 3:

K.Chandra Sekhar was born at Proddatur kadapa (dt) ,AP on 04/06/1981. He got his B.Tech (ECE) from JNTU Hyderabad in 2006 and M.Tech (VLSI) from JNTU Anantapur in 2012.He worked as a Assistant Professor in VITS Proddatur during nov 2007-10. Presently he is working as an Assistant Professor in the department of ECE in CBIT, Proddatur from July 2012 to till date.