Gesture Control Robotic Hand

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Abstract—*An embedded system is a computer system designed for specific control functions, often with real-time computing constraints. A general-purpose computer, such as a personal computer (pc), is designed to be flexible and to meet a wide range of end- user needs. Embedded system control many devices in common use today. The scope of the package of various modules of the embedded system has been defined in a co-operation of the people teaching at the centre which deals with the Advance RISC Machine(ARM) and its other features and components. Gesture is controlled using three axis accelerometer. It has been designed using LPC2148 controller with which it can be interfaced with various hardware components.*

I. Introduction

The ARM architecture describes a family of Reduced Instruction Set Computer (RISC)-based computer processor designed and licensed by British Company ARM Holdings. It was first developed in the 1980s by Acron Computer Ltd to power their desktop machines and subsequently spun off as a separate company, now ARM Holdings. Globally as of 2014 it is the most widely used 32-bit instruction set architecture in terms of quantity produced. According to ARM Holdings in 2010 alone, producers of chips based on ARM architectures reported shipments of 6.1 billion ARM-based processors, representing 95% of smart phones, 35% of digital television and set-top box, and 10% of mobile computers.

As an IP core business, ARM Holdings itself does not manufacture its own electronic chips, but licenses its designs to other semiconductor manufactures. ARM-based processors and systems on a chip include the Qualcomm Snapdragon, NvidiaTegra , Marvell Xscale and Texas Instruments OMAP, as well as ARM'S Cortex series and Apple System on Chips(used in iPhones). The name was originally an acronym for AcornRISC Machine and subsequently, after the name Acorn was dropped, Advanced RISC Machine.

Using a RISC based approach to computer design, ARM processors require significantly fewer transistor than processor that would typically be found in a traditional computer. The benefits of this approach are lower costs, less heat, and less power usage, traits that are desirable for use in light, portable, battery-powered devices such as smart phones and tablet computers. The reduced complexity and simpler design allows companies to build a low-energy system on a chip for an embedded system incorporating memory, interfaces, radios, etc. The earliest example was the Apple Newton tablet but this same approach is still used in the Apple A4 and A5 chips in the iPad.

A. Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gesture via mathematical algorithms. Gesture can originate from any bodily motion or state but commonly originate from the face and hand gesture recognition. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture, gait, proxemics, and human behaviors is also the subject of gesture recognition techniques.

B. Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interface or even GUIs (graphical user interface) which still limit the majority of input to keyboard and mouse.

Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant.

Gesture recognition can be conducted with techniques from computer vision and image processing.

II. Applications

The ARM7 is ideally suited to those applications requiring RISC performance from a compact, power-efficient processor.

- Various areas are:
- Telecomm
- Data communication
- Portable Computing
- Portable Instrument
- Automotive
- Information systems

Digital Imaging

Consumer Entertainment

A. ARM7 - Operating Modes

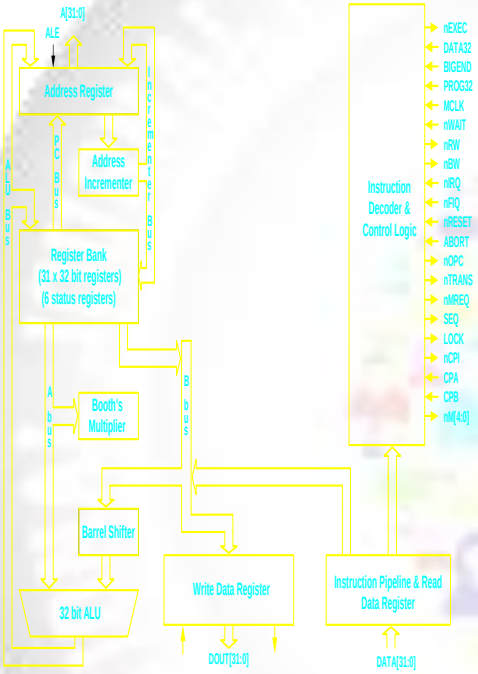
- User mode (usr): the normal program execution state
- FIQ mode (fiq): designed to support a data transfer or channel process
- IRQ mode (irq): used for general purpose interrupt handling
- Supervisor mode (svc): a protected mode for the operating system
- Abort mode (abt): entered after a data or instruction pre fetch abort
- Undefined mode (und): entered when an undefined instruction is executed
- System mode(sys):the full access is on system

B. ARM7 – Registers

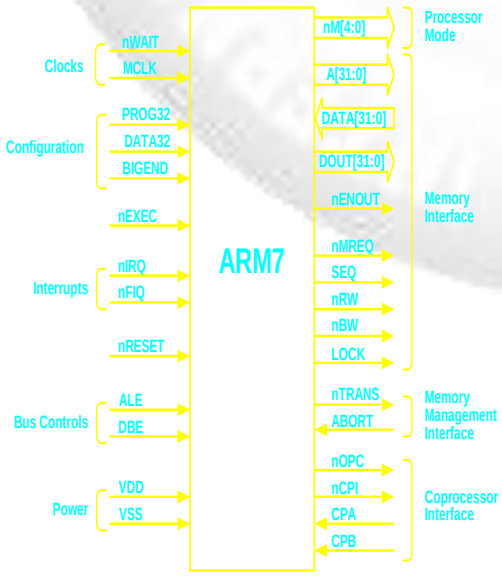
- 37 registers

- 31 general 32 bit registers
- 6 status registers
- 16 general registers and one or two status registers are visible at any time
- The visible registers depend on the processor mode
- The other registers (the banked registers) are switched in to support IRQ, FIQ, Supervisor, Abort and Undefined mode processing
- R0 to R15 are directly accessible
- R0 to R14 are general purpose
- R15 holds the Program Counter (PC)
- CPSR - Current Program Status Register contains condition code flags and the current mode bits
- 5 SPSRs (Saved Program Status Registers) which are loaded with CPSR when an exceptions occurs

III. BLOCK DIAGRAM



IV. PIN DIAGRAM

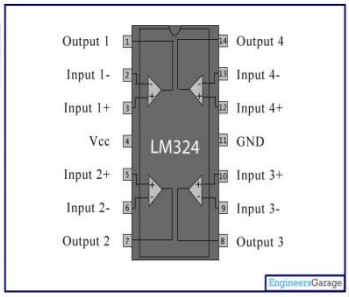


V. COMPONENTS AND ICS USED

Accelerometer

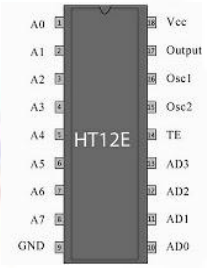
- An Accelerometer is a kind of sensor which gives an analog data while moving in X,Y,Z direction

A. *Comparator (LM324)*



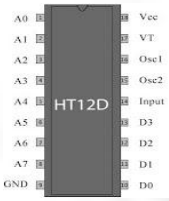
- For the purpose to change the analog voltage into digital we use comparator which compare that analog voltage to a reference voltage and give a particular high or low voltage

B. *Encoder HT12E*



- The HT12E is an 4bit encoder which encode the input data applied on it .

C. *Decoder HT12D*



- HT12D converts that serial data into parallel which is received by the rf receiver module. The input data is decoded when no error or unmatched codes are found.

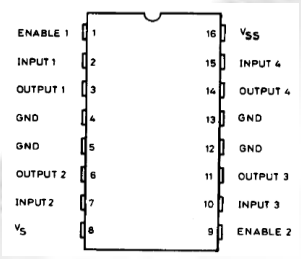
D. *RF Transmitter Module Tx*

- The transmitter module is working on the frequency of 433MHz,TheVcc pin is connected to the +terminal in the circuit.
- The next pin is shown in figure is GND that is connected to the ground terminal.

E. RF Receiver Module Rx

– The RF receiver module will receive the data which is transferred by the gesture device. It is also working as similar to the transmitter module.

F. Actuator L293D

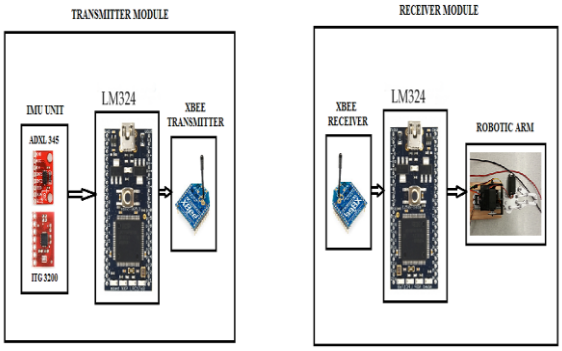


The Actuator's are those devices which actually gives the movement or to do a task like motor's. In the real world, there are various types of motor's available which works on different voltages. So we need motor driver for running them through the controller. To get interface between motor and microcontroller. We use L293D motor driver IC in our circuit.

Servomotor

servomotor is a servomechanism that uses position feedback to control its motion and final position.

TRANSMITTER AND RECEIVER MODULE



PROGRAM

```
#include<reg51.h>        //INCLUDE reg51.h for 8951

void                                                    main()
{
        P1=0xff;        //  set     port    as      input   port
        P2=0x00;        //  set     port    as      output  port
  while(1)    // infinite loop
{
if(P1==0xf1)
 {
 P2=0x0a;
 }
elsei      f(P1==0xf2)
{
 P2=0x02;
 }
 elseif     (P1==0xf4)
 {
  P2=0x08;
  }
 elseif(P1==0xf8)
{
 P2=0x05;
 }
 else
 {
 P2=0x00;
 }
 }
}
```

VI. CONCLUSION

Due to the growing demand for natural Human Machine Interfaces and robot intuitive programming platforms, a robotic system that allows users to control an industrial robot using arm gesture and postures was proposed. Two 3-axisaccelerometers were selected to be the input devices of this system, capturing the human arm behaviors. When compared with other common input devices, especially the teach pendant, this approach using accelerometers is more intuitive and easy to work, besides offering the possibility to control a robot by wireless means. Using this system, a non-expert robot programmer can control a robot quickly and in a natural way. The low price and short set-up time are other advantages of the system. Nevertheless, the reliability of the system is an important limitation to consider. The robotic arm has shown to be a good choice to recognize gestures and postures, presenting an average of 92% of correctly recognized gestures and postures. The system response time(160milliseconds) is another important factor.

VII. APPLICATION AND FUTURE SCOPE

– Sign language recognition
– For socially assistive robotics
– Directional indication through pointing
– Control through facial gestures
– Alternative computer interface
– Immersive game technology
– Virtual controllers
– Affective computing
– Remote control.

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