HAND GESTURE RECOGNITION USING MEMS FOR SPECIALLY CHALLENGED PEOPLE

J SWETHA[1], MARUTHI RAO[2]

[1] J Swetha, Dept Of Ece, Sreyas Institute Of Engineering & Technology, Tattiannaram(V),   G.S.I.Bandlaguda,Nagole, Ranga Reddy Dist, Telangana , India

[2] Guide Details, Maruthi Rao,M.Tech, Associate Professor, Sreyas Institute Of Engineering & Technology, Tattiannaram(V), G.S.I.Bandlaguda,Nagole, Ranga Reddy Dist, Telangana , India

ABSTRACT: This paper presents three different gesture recognition models which are capable of recognizing seven hand gestures, i.e., up, down, left, right, tick, circle and cross, based on the input signals from MEMS 3-axes accelerometers. The accelerations of a hand in motion in three perpendicular directions are detected by three accelerometers respectively and transmitted to a PC via Bluetooth wireless protocol. An automatic gesture segmentation algorithm is developed to identify individual gestures in a sequence. To compress data and to minimize the influence of variations resulted from gestures made by different users, a basic feature based on sign sequence of gesture acceleration is extracted. This method reduces hundreds of data values of a single gesture to a gesture code of 8 numbers. Finally the gesture is recognized by comparing the gesture code with the stored templates. Results based on 72 experiments, each containing a sequence of hand gestures (totaling 628 gestures), show that the best of the three models discussed in this paper achieves an overall recognition accuracy of 95.6%, with the correct recognition accuracy of each gesture ranging from 91% to 100%. We conclude that a recognition algorithm based on sign sequence and template matching as presented in this paper can be used for non-specific-users hand-gesture recognition without the time consuming user-training process prior to gesture recognition.

Keywords: *Arm7, Mems Accelerometer, Gps,L293d,Power Supply*

INTRODUCTION

The increase in human-machine interactions in our daily lives has made user interface technology progressively more important. Physical gestures as intuitive expressions will greatly ease the interaction process and enable humans to more naturally command computers or machines. For example, in telerobotics, slave robots have been demonstrated to follow the master‟s hand motions remotely . Other proposed applications of recognizing hand gestures include character-recognition in 3D space using inertial sensors , gesture recognition to control a television set remotely ,In today's world as the population increases day by day the numbers of vehicles also increases on the roads and highways.

This result in more accident that interns leads to the traffic jams and public get help instantaneously. This module provides information about the accident to the hospital and police station. As a result sudden help public ife may save and the traffic jams are reduced.To improve the level of supervision and management for cargo transport vehicles, especially trucks carrying coal it is important to develop transport vehicles remote monitoring module [2].A server computer at the (remote) monitoring station, that is continuously waiting for data from the system, should record the actions of the vehicle into a database.

This contains the information regarding Vehicle velocity, position, identity and temperature in two fashions. The information given to monitoring station is in continuous manner and when the accident occurs. The development of vehicular design brings public many convenience in life but also brings many problems at the same time, for example, traffic congestion, difficulty in monitoring dispersive vehicle, theft and other series of problems[4].We are intended to made this monitoring wireless using ARM7 hardware platform ported with real time operating system µc/OS-II.

I.   The Hardware System

Micro controller:
This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI:
 ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display:
LCD is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

The interaction between human and sensor-enabled home robots in a smart home environment is important in the field of pervasive computing. While home robots have become available, most robots are custom-made for specific operations without the capability to meet the needs of different users.
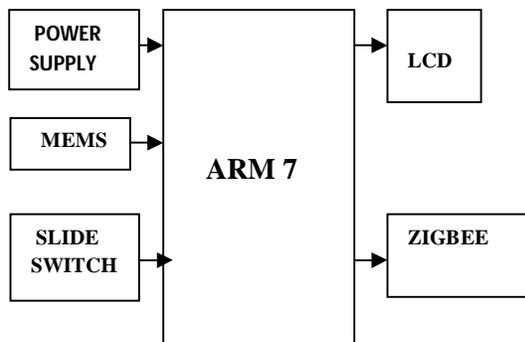
I.   Design Of Proposed Hardware System:
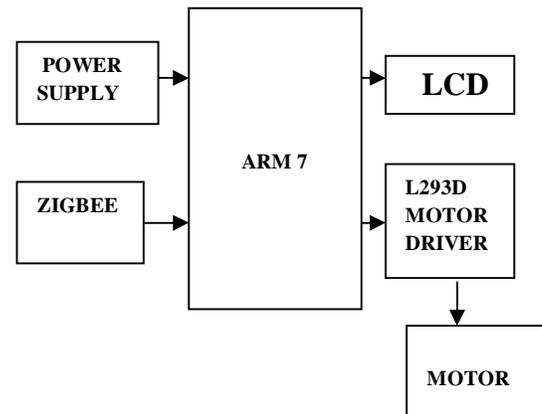

Fig.1.Block diagram

Fig.2.Block diagram

As many everyday tasks (such as cleaning, cooking, moving objects) require specific gestures and movements that vary with users and usage scenarios, it is important to design a system that allows users to train and control the robot the way they want. Here we have designed a system which is controlled using MEMS sensors.In this project we have two sections ie transmitter and receiver sections. In transmitter section it operates two modes. They are robot mode and robotic arm mode. To select these modes we are using slide switch. By changing the switch positions and with the help of mems we are sending the commands to the receiver section with the help of ZIGBEE transceiver. In the receiver section ZIGBEE transceiver receives the directions like front, back, left and right robot is moved. The information about the robot direction is displayed on LCD.

I.   Board Hardware Resources Features
MEMS

Micro electro mechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. Their size range from the sub micrometer (or sub micron) level to the millimeter level and there can be any number, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears, diaphragms, and springs to devices.

Examples of MEMS device applications include inkjet-printer cartridges, accelerometers, miniature robots, microengines, locks, inertial sensors, micro transmissions, micromirrors, micro actuators, optical scanners, fluid pumps, transducers and chemical, pressure and flow sensors. Many new applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices.

These systems can sense, control and activate mechanical processes on the micro scale and function individually or in

arrays to generate effects on the macro scale. The micro fabrication technology enables fabrication of large arrays of devices, which individually perform simple tasks, but in combination can accomplish complicated functions.

MEMS are not about any one application or device, or they are not defined by a single fabrication process or limited to a few materials. They are a fabrication approach that conveys the advantages of miniaturization, multiple components and microelectronics to the design and construction of integrated electromechanical systems. MEMS are not only about miniaturization of mechanical systems but they are also a new pattern for designing mechanical devices and systems.

L293D

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression.

ZIGBEE

Zigbee modules feature a UART interface, which allows any microcontroller or microprocessor to immediately use the services of the Zigbee protocol. All a Zigbee hardware designer has to do in this ase is ensure that the host's serial port logic levels are compatible with the XBee's 2.8- to 3.4-V logic levels. The logic level conversion can be performed using either a standard RS-232 IC or logic level translators such as the 74LVTH125 when the host is directly connected to the XBee UART. The below table gives the pin description of transceiver. Minimum connections: VCC, GND, DOUT & DIN

- ➢ Minimum connections for updating firmware: VCC, GND, DIN, DOUT, RTS and DTR
- ➢ Signal Direction is specified with respect to the
- ➢ module
- ➢ Module includes a 50kΩ pull-up resistor attached to RESET
- ➢ Several of the input pull-ups can be configured using the PR command
- ➢ Unused pins should be left disconnected

Data is presented to the X-Bee module through its DIN pin, and it must be in the asynchronous serial format, which consists of a start bit, 8 data bits, and a stop bit. Because the input data goes directly into the input of a UART within the X-Bee module, no bit inversions are necessary within the asynchronous serial data stream. All of the required timing and parity checking is automatically taken care of by the X-Bee's UART. Just in case you are producing data faster than the X-Bee can process and transmit it, both X-Bee modules incorporate a clear-to-send (CTS) function to throttle the data being presented to the X-Bee module's DIN pin. You can eliminate the need for the CTS signal by sending small data packets at slower data rates.

MOTORS

Motors are configured in many types and sizes, including brush less, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. DC motors are most commonly used in variable speed and torque.

Motion and controls cover a wide range of components that in some way are used to generate and/or control motion. Areas within this category include bearings and bushings, clutches and brakes, controls and drives, drive components, encoders and resolves, Integrated motion control, limit switches, linear actuators, linear and rotary motion components, linear position sensing, motors (both AC and DC motors), orientation position sensing, pneumatics and pneumatic components, positioning stages, slides and guides, power transmission (mechanical), seals, slip rings, solenoids, springs.

Motors are the devices that provide the actual speed and torque in a drive system. This family includes AC motor types (single and multiphase motors, universal, servo motors, induction, synchronous, and gear motor) and DC motors (brush less, servo motor, and gear motor) as well as linear, stepper and air motors, and motor contactors and starters.

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with

magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

I. CONCLUSION

This paper describes a non-specific person gesture recognition system by using MEMS accelerometers. The recognition system consists of sensor data collection, segmentation and recognition. After receiving acceleration data from the sensing device, a segmentation algorithm is applied to determine the starting and end points of every input gesture automatically. The sign sequence of a gesture is extracted as the classifying feature, i.e., a gesture code. Finally, the gesture code is compared with the stored standard patterns to determine the most likely gesture. Since the standard gesture patterns are generated by motion analysis and are simple features represented by 8 numbers for each gesture, the recognition system does not require a big data base and needs not to collect as many gestures made by different people as possible to improve the recognition accuracy. We note here, however, to enhance the performance of the recognition system, we will need to improve the segmentation algorithm to increase its accuracy in finding the terminal points of gestures. Moreover, other features of the motion data may be utilized for pattern classification, i.e., more recognition methods will be investigated in our future work.

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AUTHORS

Guide Details:
Name: Maruthi Rao

Designation: Associate Professor

STUDENT DETAILS:
Name: J Swetha
Qualification: M.Tech In (Embedded Systems)
Mail Id: Shwethajangaon234@Gmail.Com