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HAND GESTURE RECOGNITION USING MEMS SENSORS

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ABSTRACT

Mobile and wearable devices are continuously optimized towards a small outline. At the same time the number of functions in these devices continuous to increase. While this Development is clearly beneficial for the ubiquity of mobile and wearable systems, e.g. for using the systems during daily activities, it hampers interaction. MEMS sensors play a major role in the µIMU due to their low-cost and miniaturized size. We use MEMS sensors to measure the 3D accelerations and 3D angular rates. A Micro Control Unit (MCU) performs coordinate transformations and filtering calculations. In this paper, we are measuring the actions performed on sign languages in to an equal acceleration values. The acceleration values are measured in 3 axis, using a 3-axis accelerometer. Every action generates a unique set of acceleration values I all the axis. The action and the corresponding acceleration values are placed in to a look up table along with appropriate voice commands. Once the glove is placed in the hands, whenever an action for sign language is performed, the acceleration values are obtained and are checked with the look up table. If the acceleration values match with any set of the look up table, then the corresponding action is identified and the voice channel is selected. Here we are using a 3-axis accelerometer. The 3 channel analog output is fed to the micro controller's ADC channels. The Processed output is then output via the Ports available on the controller. The output is fed to the Voice chip, where the pre-recorded voices are stored. By activating the corresponding channel the voice will be played in the speaker.

Keywords: MEMS, ARM, PROTEUS

I. INTRODUCTION

Human gestures have long been an important way of communication, adding emphasis to voice messages or even being a complete message by itself. Such human gestures could be used to improve human machine interface. These may be used to control a wide variety of devices remotely. Vision-based framework can be developed to allow the users to interact with computers through human gestures. This study focuses in understanding such human gesture recognition, typically hand gesture.

Gesture recognition is an important area for novel human computer interaction (HCI) systems and a lot of research has been focused on it. These systems differ in basic approaches depending on the area in which it is used. Basically, the field of gestures can be separated into dynamic gestures (e.g. writing letters or numbers) and static postures (e.g. sign language). The goal of gesture analysis and interpretation is to push the advanced human-machine communication in order to bring the performance of human-machine interaction closer to human-human interaction

In existing system, Vision-based framework can be developed to allow the users to interact with computers through human gestures. This study focuses in understanding such human gesture recognition, typically hand gesture. Hand gesture recognition generally involves various stages like video acquisition, background subtraction, feature extraction and gesture recognition. The rationale in background subtraction is detecting the moving objects from the difference between the current frame and a reference frame, often called the background image or background model. Most researchers use single color cameras for data acquisition. A big advantage of these cameras is that they are fast and simple to control, so it is possible to realize a suitable gesture recognition system also in real-time applications. Additionally, the color map of the image can be used for skin color recognition in order to improve the segmentation results. However the robustness of such a system can suffer from a complicated real background. And the separation of region of interest will be a challenging problem if only one camera system is used.

II. PROPOSED SYSTEM

In the proposed system is an approach to once the glove is placed in the hands, whenever an action for sign language is performed, the acceleration values are obtained and are checked with the look up table. If the acceleration values match with any set of the look up table, then the corresponding action is identified and the voice channel is selected. Here we are using a 3-axis accelerometer. The 3 channel analog output is fed to the micro controller's ADC channels. The Processed output is then output via the Ports available on the controller. The output is fed to the Voice chip, where the pre-recorded voices are stored. By activating the corresponding channel the voice will be played in the speaker.

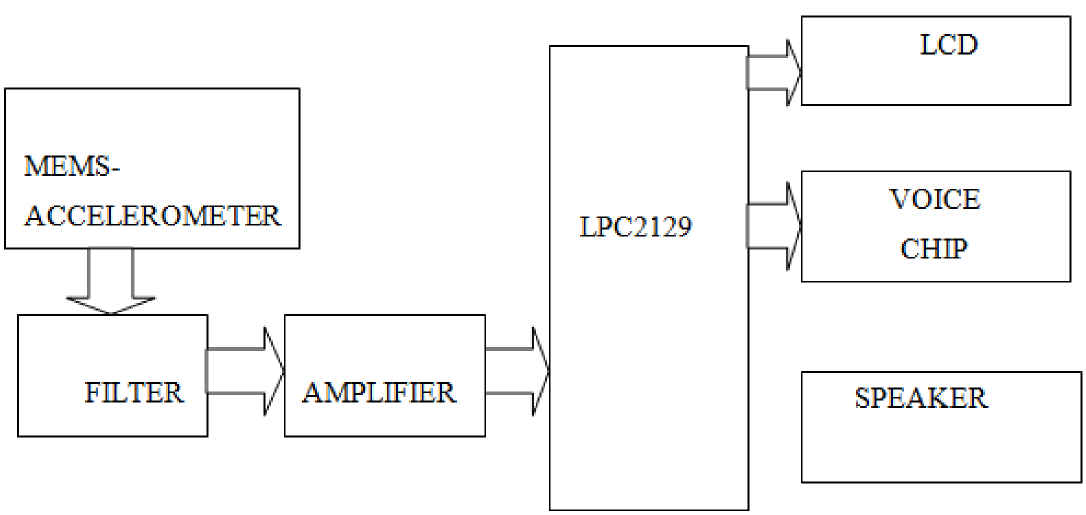

Fig 1:- MEMS ACCELEROMETER

Fig.1 shows the block diagram of MEMS accelerometer based hand gesture recognitation. We are using a 3-axis accelerometer. The 3 channel analog output is fed to the micro controller's ADC channels. The Processed output is then output via the Ports available on the controller. The output is fed to the Voice chip, where the pre-recorded voices are stored. By activating the corresponding channel the voice will be played in the speaker.

III. MEMS ACCELEROMETER

The ADXL330 is a complete 3-axis acceleration measurement system on a single monolithic IC. The ADXL330 has a measurement range of ±3 g minimum. It contains a poly silicon surface micro machined sensor and signal conditioning circuitry to implement open-loop acceleration measurement architecture. The output signals are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration.

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications.

APLUS integrated achieves these high levels of storage capability by using its proprietary analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels. This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

IV. SAMPLING RATE & VOICE QUALITY

According to the Shannon's sampling theorem, the highest possible frequency component introduced to the input of a sampling system must be equal to or less than half the sampling frequency if aliasing errors are to be eliminated. The APR9600 automatically filters its input, based on the selected sampling frequency, to meet this requirement. Higher sampling rates increase the bandwidth and hence the voice quality, but they also use more memory cells for the same length of recording time. Lower sampling rates use fewer memory cells and effectively increase the duration capabilities of the device, but they also reduce incoming signal bandwidth. The A P R 9 6 0 0 accommodates sampling rates as high as 8 kHz and as low a 4 kHz. You can control the quality/duration trade off by controlling the sampling frequency. An internal oscillator provides the APR 9600 sampling clock.

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V. ARM7

The LPC2141/2/4/6/8 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

VI. SIMULATION OUTPUT

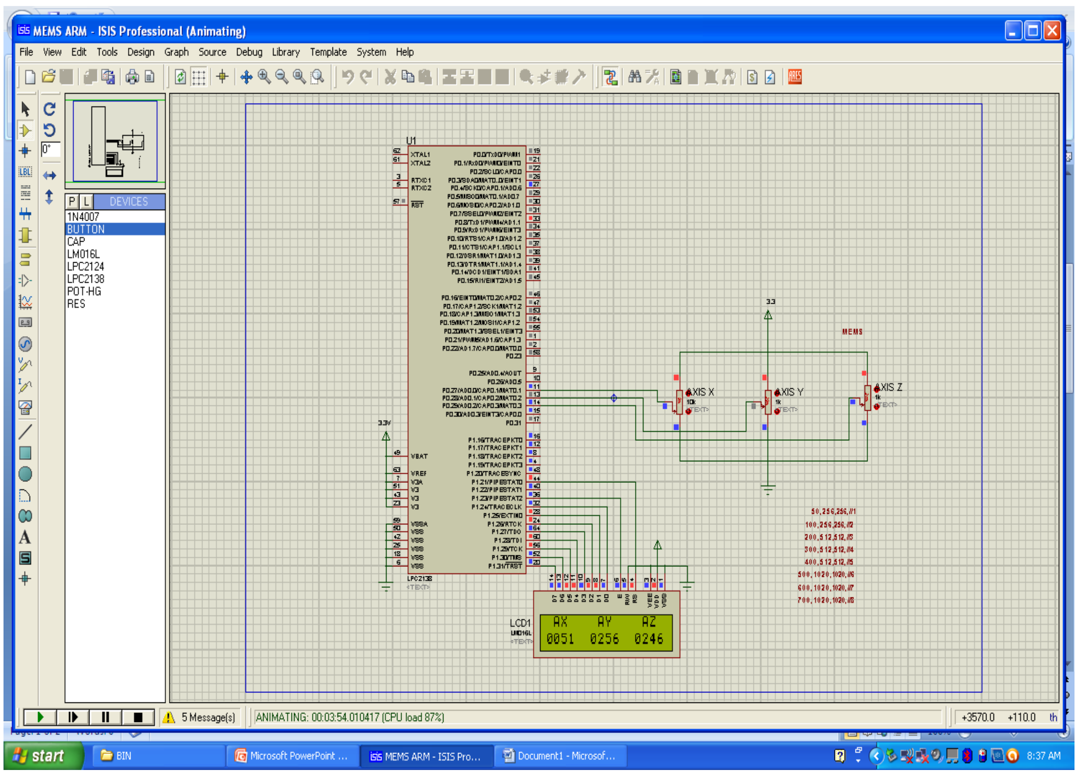

Fig 2:- MEMS Output

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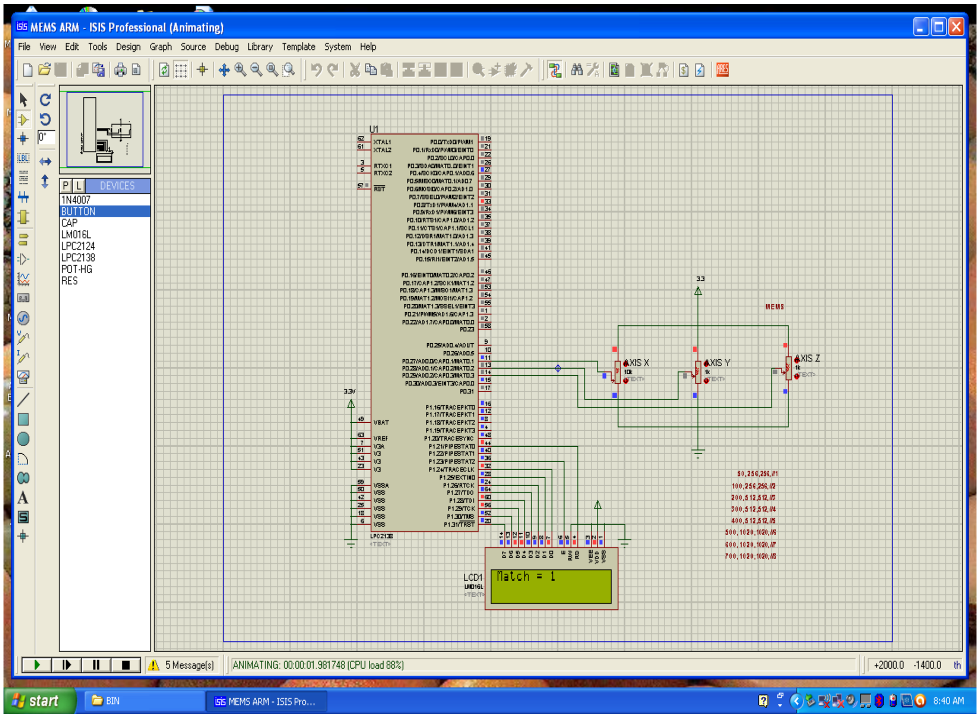

Fig 3:- MEMS Match Output

VII. CONCLUSION

In today's digitized world, processing speeds have increased dramatically, with computers being advanced to the levels where they can assist humans in complex tasks. Yet, input technologies seem to cause a major bottleneck in performing some of the tasks, under-utilizing the available resources and restricting the expressiveness of application use. Hand Gesture recognition comes to rescue here. A review of MEMS Accelerometer-based hand gesture recognition methods has been presented. Considering the relative infancy of research related to MEMS Accelerometer based gesture recognition remarkable progress has been made. To continue this momentum it is clear that further research in the areas of gesture representation are required to realize the ultimate goal of humans interfacing with machines on their own natural terms.

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