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DESIGN AND IMPLEMENTATION OF SPORT EMBEDDED BASED ON THE INTELLIGENT MACHINES LEARNING SYSTEMS IN ARM SOC SYSTEMS

N. Hari Sankar[1], P. Lokesh[2],R.Lingesh[3], K. Jeevanantham[4], Dr. N. Suthanthira Vanitha[5]
UG Student[1,2,3,4], Head of the department[5]
Department of Electrical and Electronics Engineering, Knowledge Institute of Technology, Salem

ABSTRACT

This modern world draws inspiration and involvement to sports. Where sports plays a vital role in everyone's life sports is not alone played for fun but also it gives confidence, fitness, enthusiasm, team work, planning etc. There are many sports events available. The aim is to make an efficient training for the different people who are used to improve the performances which are considered as the important scenarios of the sports. In that we are concentrating an events named long jump. In this sports an athletes have to jump the longest distance. We can monitor an athlete by having a coach itself. But there are some hidden facts which cannot be monitored by a coach, such as speed, ground contact and explosive power. For that purpose, we are building an equipment to monitor, the speed level, ground contact and explosive power of an athlete in the practice session itself. In order to overcome this difficulty, this project provides equipment using embedded system as a tool. By incorporating this technology, the probability of getting accurate result is high. So that it gives a confidence and improves the performance of the athlete before the events.

1. INTRODUCTION

Sport is a physical activity which through casual or organized participation, aim to use, maintain or improve physical ability.

Sports are usually governed by a set of rules or customs, which serve to ensure fair competition and allow consistent adjudication of the winner. Technology plays an important part in modern sports. With it being a necessary part of some sports, it is used in others to improve performance. Some sports also use it to allow off-field decision making.

Sports science is a widespread academic discipline and can be applied to areas including athlete performance, such as video analysis to fine tune technique, or to equipment. The increased in technology has to allowed many improvement in the performance of the players towards the game.

The long jump is a track and field event in which athletes combine speed, strength and agility in an attempt to leap as far as possible from a take-off point. Along with the triple jump, the two events that measure jumping for distance as a group are referred to as the "horizontal jumps".

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2. DESCRIPTION

2.1Armprocessor

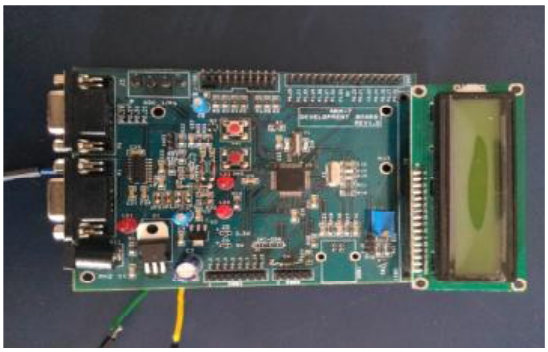

Figure2.1 ARM Processor

The LPC2148 microcontrollers are based on a 32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support. Those combine the microcontroller with embedded high-speed flash memory ranging from 32 kb to 512 kb. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

The input supply to the board is fed from dc source. The serial communication can be done by means of UART. It uses a crystal oscillator for generating frequency. This board is specially designed for connecting digital sensors and analog sensors which has input voltage range 5VDC as well as it can be interfaced with serial communication devices, relay boards etc. The output can be monitored in lcd as well as pc.

2.2 EMG sensor

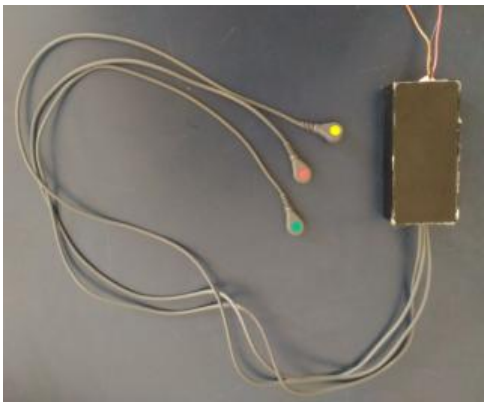

Figure2.2 Electromyography (EMG) sensor

Electromyography (EMG) enables the translation of this surface into electrical signals, enabling them to be used in a wide array of applications. Our sensor is especially designed for surface EMG, and works both with pre-gelled and most types of dry electrodes.

Electromyography (EMG) is an electro diagnostic medicine technique for evaluating and recording the electrical activity produced by skeletal muscles.

To conduct EMGs, the red and green leads need to be placed on electrodes that are attached to the muscle of interest. The two leads are interchangeable for EMGs. The black lead serves as a ground. It should not be placed on the muscle of interest. Alternatively, the ground electrode can be placed on the wrist of the adjacent arm to minimize movement artifacts

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2.33AxisSensor

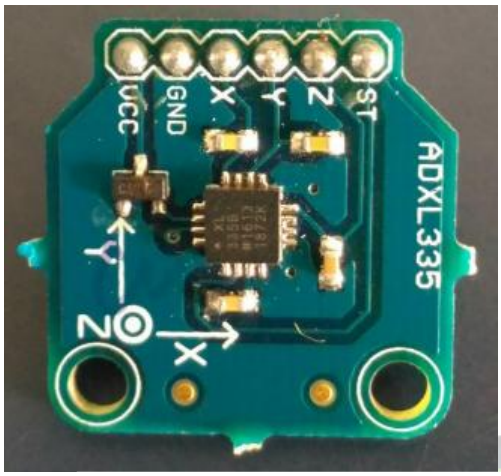

Figure 2.3 Axis Sensor

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The sensor measures acceleration with a minimum full-scale range of ±3 g. It contains a polysilicon 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. It can measure the static acceleration of gravity in dynamic acceleration resulting from motion, shock, or vibration.

In This Sensor selects the bandwidth of the accelerometer using the CX, CY and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

2.4Arduino

Figure 2.4 Arduino

Arduino is an open-source project that created microcontroller-based kits for interactive objects that can sense and control physical devices. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits.

The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers.

It is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter. It has a number of facilities for communicating with acomputer, another Arduino board, or other microcontrollers.

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2.5Pressuresensor

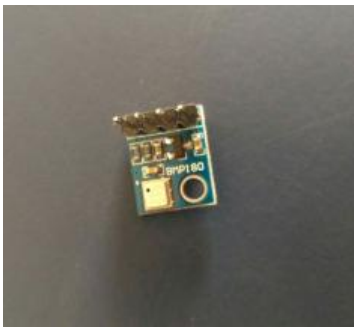


Figure 2.5 Pressure sensor

The BMP180 is the new digital barometric pressure sensor with a very high performance, which enables applications in advanced mobile devices, such as smart phones, tablet PCs and sports devices.

The BMP180 comes a fully calibrated, ready to use sensor module without the need for additional external circuitry. Pressure and temperature data are provided as 16 bit values, which, together with the stored calibration data, are used for temperature compensation on the external microcontroller. Data transfer can be performed I2c interfaces.

3. WORKING

Figure3 Working of the prototype

Here, we use three sensors namely,

i) 3 Axis Sensor
ii) Electro Mytho Graphic (EMG) Sensor
iii) Pressure Sensor

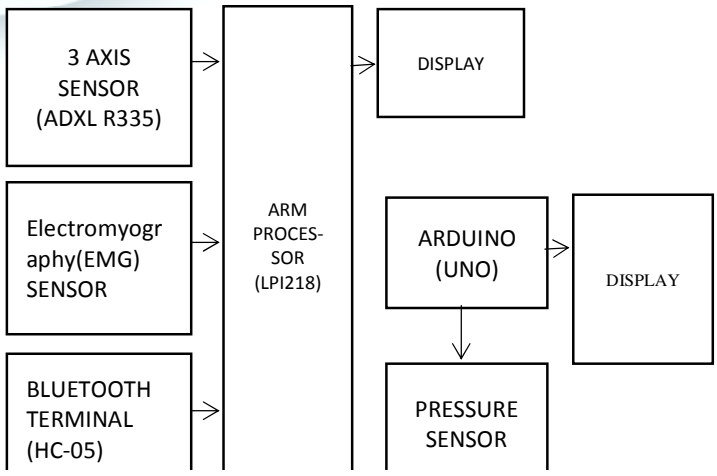
The Axis sensor is used to measure the three angles like x, y, z axes of the player's body. The EMG sensor senses the characteristics of the player. The pressure sensor measures the pressure exerted on the ground by that player.

The Axis sensor is kept on the wrist, the EMG sensor is kept on the muscle contraction area and pressure sensor is kept on the player's leg.

The axis sensor and EMG sensor gives the analog values. So they are connected with the Analog to digital Converter (ADC) to get the digital output.

The EMG and axis sensors are interfaced with the ARM processor and Pressure sensor is interfaced with the Arduino board. Both the processor and the Arduino are connected to the system through Bluetooth module. The system displays the date from the Arduino and ARM processor.

3.1BLOCK DIAGREAM



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4. TESTING

Initially the axes sensor is placed on the wrist of the player. It detects the X, Y, Z values at the position of three different angles of the hand. This process is showed by the following picture.

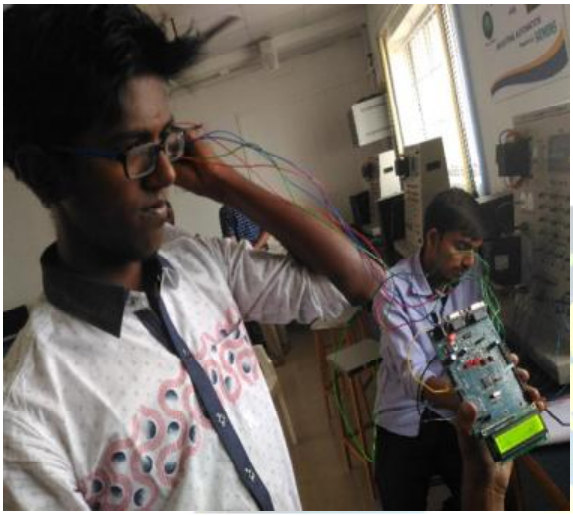

Figure 4.1 Testing the axes at 135^{o}

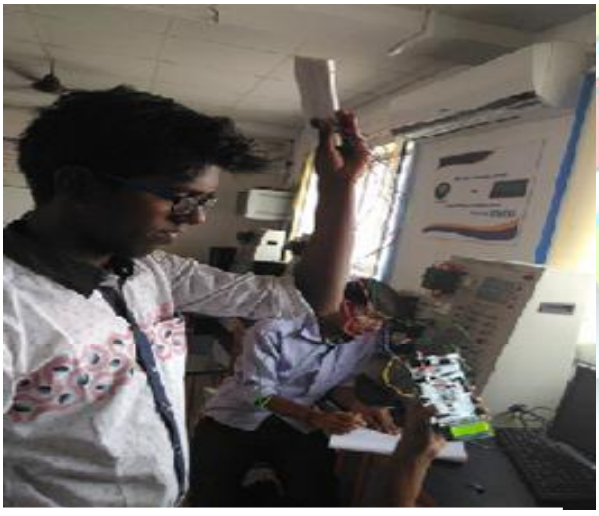

Figure 4.2 Testing the axes at 90^{o}

5. ADVANTAGES

- Each player needs separate coach. This project the coach to train nearly 20 players at a time
- Physically the coach will not able to identify the characteristics of the muscles. By using this project, the characteristics of the player can be determined and monitored easily.
- Compact in size
- Economically good

6. CONCLUSION

Now-a-days, demand on coach and trainer's accuracy became very essential in sports. This proposed idea will definitely help the trainer or coach to monitor and guide the sportsmen towards perfection.

7. FUTURE WORKS

Presently this kid is connected through Bluetooth module. The range will be limited in the Bluetooth module. In future, this kid will be interfaced through Internet of Things. So the trainer across the world can coach anyone in the world.