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Tracking Limb Motion using a Wireless Network of Inertial Measurement Unit (IMU)

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Abstract: ***It is the method we are finding the motion of the leg help of the IMU sensor. Because of this system based on the human leg motion captured by the 9DOF. It working based on the angles and axis, based on my angle and axis movement of the leg will find and take the decision in automatic and will make the movement in mechanical setup. It is look like the leg, this artificial leg move happen based on the 9DOF sensor. This 9 Degrees of Freedom (DOF) Inertial Measurement Unit (IMU) is used for tracking and sensing motion of any mechanical platform and is an ideal sensor system motion control of aerial autonomous systems like multi-rotors, model airplanes, helicopters etc, and other systems that require to control the pitch, roll and yaw. First, MEMS IMU sensors are placed on user's body and limbs according to human skeletal action, and each sensor performs a 9 degrees of freedom (DOF) tracking at a high-speed update rate. Second, the collected sensors' data transferring through Microcontroller, The inner communication between the MCU and the IMU is I2C.Finally The IMU sensor values is serial communication with Matlab based PC Program for Motion detection.***
Keywords: IMU, MCM, 9DOF, I2C

I. INTRODUCTION

In recent years, the demand for Virtual Reality (VR) services has risen due to advancements in VR technology. The market for VR services is expanding beyond that for gaming, education, and rehabilitation services.

In this vein, the use of VR technology in virtual training has attracted considerable research attention. To reduce the cost of training and improve its the effectiveness, various industries, such as the military and fire fighting, have attempted to develop virtual training simulators.

To provide a trainee with an interactive and immersive environment, it is necessary for a virtual training simulator to recognize actions performed by the trainee. For this reason, human action recognition methods have been introduced as a major component of successful virtual training.

Most research on virtual training simulators thus far has been based on wearable motion capture suit based human action recognition to obtain precise information concerning human action, which is needed to synchronize the content in accordance with the action. For example, in this, a dismounted soldier training system (DSTS) was introduced, where it is mandatory for a trainee to wear a motion capture suit consisting of a head-mounted display and several motion capture sensors.

In this, a wearable simulation interface for military training was proposed. For training, the trainee had to attach three-axis motion sensors to his/her body to track movement. Quantum 3D's Expedition, one of the most well-known commercial products for virtual training simulators, also requires the trainee to wear a motion capture suit to record motion information. However, this can distract thetrainee from the virtual training.

Moreover, the motion capture suit provides accurate joint position data only in the early stage of the training because small positioning errors generated by the motion capture sensors accumulate over the training period. Since training time can be extensive depending on the training scenario, accumulation may result in inaccurate pose estimation and action recognition, which can degrade the performance of the simulator. To overcome this drawback, several studies on virtual training simulators have been conducted using a motion capture camera. Furthermore, most research using this approach has employed a Kinect sensor because of its low price and acceptable accuracy for data concerning the human skeleton.

For example, the authors of proposed an intelligent soldier combat training (ISCT) system consisting of a Kinect sensor, a projection screen, a projector, and a BB gun mounted on a motion platform. In the ISCT system, The trainee's position and posture are captured by the Kinect sensor. According to this information, the virtual enemy can disappear or appear on the projection screen during training. In this, a virtual assembly training system was proposed consisting of a screen monitor and a Kinect sensor mounted on a screen monitor. The trainee stood in the front of the monitor and practiced virtual assembly training. During the training, the trainee's hand gestures were recorded by the Kinect sensor. Kinect sensor system for people with restricted.

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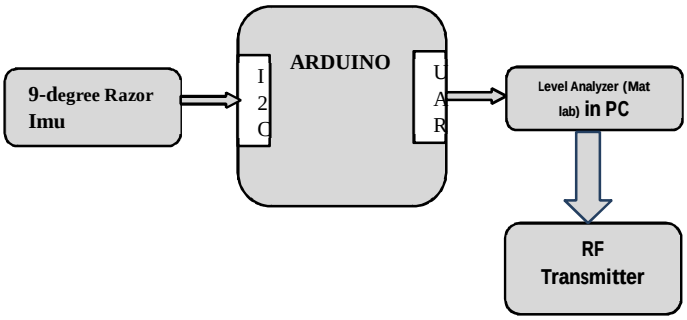
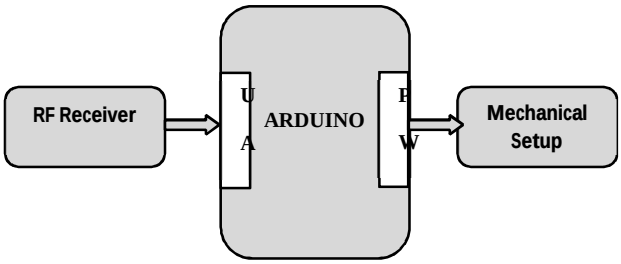
II. BLOCK DIAGRAM

A. *Transmitter Section*



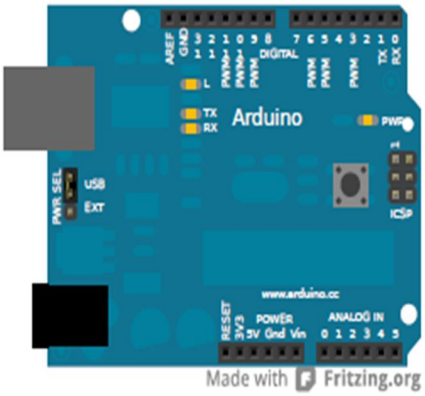
B. *Receiver Section*



III. HARDWARE EXPLANATION

A. *Arduino*

A micro -controller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/ output peripherals The important part for us is that a micro-controller contains the processor (which all computers have) and memory, and some input/output pins that you can control. (often called GPIO - General Purpose Input Output Pins).



We will be using the Arduino Uno board. This combines a micro-controller along with all of the extras to make it easy for you to build and debug your projects. The Uno 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 a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

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IV. SOFTWARE TOOLS

A. Software

When bootloading na Atmega8 chip with Arduino 0010, there is a command (-i800) that makes bootloader delay 10 minutes. So, if you need to use bootloader, use command line instead of IDE, removing "–i800" command and adding "–F" command, or use Arduino 0007 IDE. To upload sketches Arduino 0010 works fine.

B. Arduino S3v3 New Features

1) full compatible with Shield Boards (Version 2 is the only Arduino Board not compatible with Shield Boards because of ICSP header wrong position, and tall components);
2) AVcc LP filter to reduce noise level on ADC;
3) auto reset feature;
4) auto reset enable/disable jumper, to avoid not desired resetting;
5) arduino Diecimila compatible reset pin;
6) pin 13 onboard led, with current limiter resistor;
7) TX and RX onboard leds;
8) power led with appropriate current limiter resistor (less 20mA of consumption);
9) jumper to disable serial communication and to enable RX external pull down resistor, to avoid "RX floating error". This feature allows to use digital pin 0 and pin1 as a normal pin, when serial communication is not needed;
10) all similar components (diodes, transistors, leds, capacitors) has the same board orientation (to makes easier to mount with less mistakes);
11) no wires between pads, more space between wires, larger wires, larger pads (better for etching, soldering and drilling, with no short circuits, soldering bridges or open wires in corrosion);
12) only 3 wire bridges;
13) electrolytic capacitor (in serial to TTL circuit) changed to bipolar type (to avoid inverted voltage problem when serial cable is not connected);

V. COMPONENTS USED

A. Hardware

1) IMU 9DOF sensor
2) Arduino(ATMega328)
3) Zigbee transmitter
4) Zigbee receiver
5) Arduino
6) Motor

B. Software

1) Arduino IDE
2) Language: Embedded

VI. APPLICATIONS

A. As a sensor for autonomous control of aerial vehicles like quad- rotors, helicopters, miniature airplanes.
B. As a sensor for robotics platform that require to balancing
C. Handicapped application
D. Army based application

VII. CONCLUSION

There has been a considerable amount of research interest in virtual training simulators. To provide a trainee with an interactive training environment, past research on virtual training simulators have focused on obtaining precise human action information using a wearable motion capture suit-based human action recognition approach, with less emphasis on user convenience. Advanced 9 degree based tracking process.9DOF Razor IMU incorporates three sensors - an ITG-3200 (MEMS triple-axis gyro),

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ADXL345 (triple-axis accelerometer), and HMC5883L (triple-axis magnetometer) - to give nine degrees of inertial measurement. Low power consumption and small compact size.

REFERENCES

[1] D. Lee, K. Baek, J. Lee, and H. Lim, "A Development of Virtual Reality Game utilizing Kinect, Oculus Ri\ft and Smartphone," International Journal of Applied Engineering Research, vol. 11, no. 2, pp. 829-833, 2016.
[2] Z. Merchant, E. T. Goetz, L. Cifuentes, W. Keeney-Kennicutt, and T. J. Davis, "Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: a meta-analysis," Computers & Education, vol. 70, pp. 29-40, 2014.
[3] D. Meldrum, A. Glennon, S. Herdman, D. Murray, and R. Mc Conn Walsh, "Virtual reality rehabilitation of balance: assessment of the usability of the Nintendo Wire Fit Plus," Disability and rehabilitation: assistive technology, vol. 7, no. 3, pp. 205-210, 2012.
[4] K. E. Kopecky, and E. H. Winer, "Meta Tracker: unifying and abstracting 3-D motion tracking data from multiple Heterogeneous hardware systems, "IEEE Access, vol. 4, pp. 189-203, 2016.
[5] H. Oh and S. Lee, "Visual presence: viewing geometry visual information of UHD S3D entertainment," IEEE Transactions on Image Processing, vol. 25, no. 7, pp. 3358-3371, Jul. 2016.

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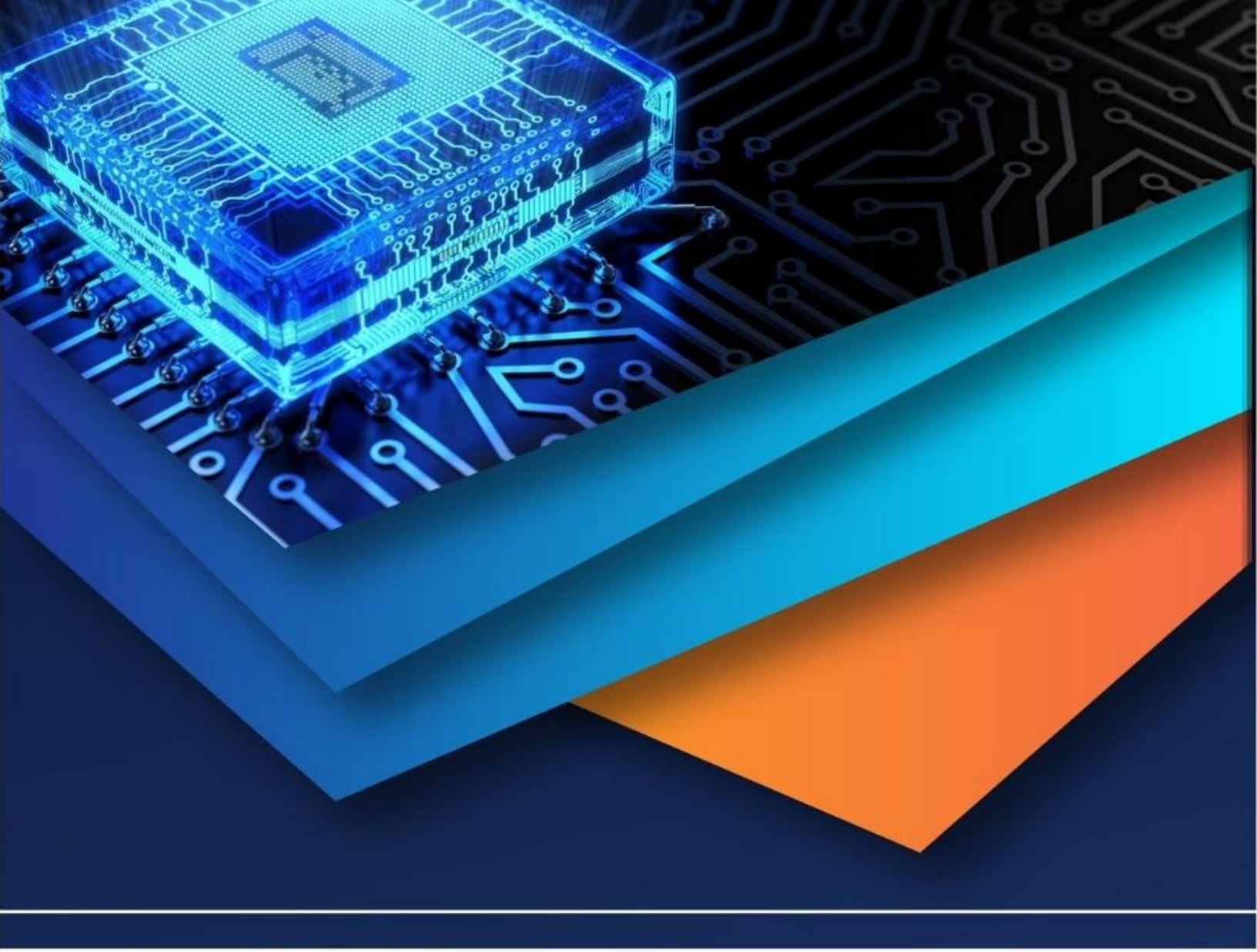

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