ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 19, April 2016

HUMAN ARM REHABILITATION USING PIC MICROCONTROLLER.

1. Manikandan.M, 2. Sasikumar.S, 3. Rafick Mohideen.M.K and 4. Rajasekar.A
1.Finalyear ECE, 2. Finalyear ECE, 3.Finalyear ECE , and 4.Assistant professor, ECE.
1.maxmani.m@gmail.com 2.sasikumar007007@gmail.com 3.guru.rafi95@gmail.com
4. rajasekarbe@gmail.com
Dhaanish Ahmed College of engineering.

Abstract: Stroke remains the leading cause of permanent disability. Recent studies Estimate that it affects more than 1 million people in the India and more than 0.7 million in the U.S. each year. The degree of recovery highly depends on the severity and the location of the lesion. However, only 18% of stroke survivors regain full motor function after six months. Restoration of arm and hand functions is essential to cope with tasks of Daily living and regain independence in life. For this to occur, effective therapy must comprise key factors containing repetitive, functional, and task-specific exercises performed with high intensity and duration. During these rehabilitation exercises, if the movements of stroke patients can be tracked incorrect motion patterns can be readily identified and corrected. Inertial sensors are adopted to measure the orientation of the arm. Kinematics models then allow us to recover the coordinates of the wrist and Elbow joints, given a still shoulder joint.

Keywords: Inertial sensor, BP sensor, stroke, pic controller

I. INTRODUCTION

THIS document is to design and develop a human arm movement tracking system to aid the rehabilitation of stroke patients. A wearable inertial sensor is used to capture arm movements. The tracking algorithm is based on a kinematical model that considers the upper and lower forearm. To improve accuracy and consistency, a weighted least square filtering strategy is adopted.

The inertial sensor is fixed in the arm then the inertial sensor values are sent to the Microcontroller. Then the Microcontroller sends the commands to the motor driver for the movement of the motor. The motor movement is controlled by the Microcontroller according to the inertial sensor values. Thus, this project helps to cure the disabled persons arms by themselves without anyone's help.

1.1EXISTING METHOD

A typical approach in most studies discussed above involves integrating angular velocity from gyroscopes to obtain orientation, and fusing accelerometer measurements into a Kalman filter to correct the accumulation in integration drift. In these studies, orientation estimates were accurate for brief periods when acceleration was only due to gravity, and accelerometers could be used as inclinometers. Other studies utilized magnetometers to update estimates of orientation angles around the vertical axis.

However, using these sensors in the vicinity of magnetic field disturbances lead to large orientation errors .Use of the linear Kalman filter in highly nonlinear dynamics introduces more tracking errors. Large number of sensors increases the state and observation model dimensions. Consequently, increase of model dimensions and the highly nonlinear dynamic equations make the filter algorithms computationally expensive and prone to stability problems.

2. METHODOLOGY

The inertial sensor is fixed in the arm then the inertial sensor values are sent to the Microcontroller. Then the Microcontroller sends the commands to the motor driver for the movement of the motor. The motor movement is controlled by the Microcontroller according to the inertial sensor values. Inertial sensors consisting of 3D gyroscopes, accelerometers and a magnetometer were compared against an electromagnetic motion tracking system for measuring

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 19, April 2016

motions of an artificial hinge joint and random 3D motions.

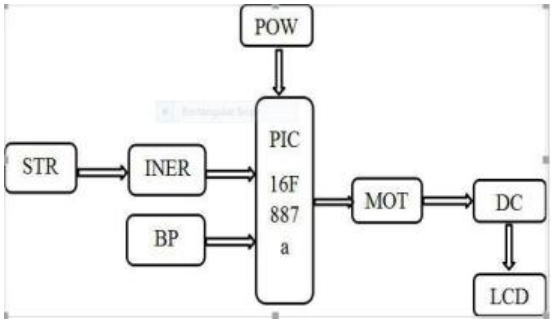
Subsequently, to assess the feasibility of using inertial sensors for human motion analysis, the movements of the hip joint during walking were recorded in 20 normal asymptomatic subjects. The comparative study demonstrated good agreement between the inertial and electromagnetic systems. Measurements obtained for hip joint movement during walking were similar to those reported in previous studies.

Inertial sensors have the potential to be used for motion analysis and an inertial measurement unit works by detecting the current rate of acceleration clinical research, like pitch, roll and yaw using one or more gyroscopes. And some also include a magnetometer mostly to assist calibration against orientation drift. Inertial navigation systems contain IMUs which have angular and linear accelerometers (for changes in position); some IMUs include a gyroscopic element (for maintaining an absolute angular reference).Angular accelerometers measure how the vehicle is rotating in space. Generally, there is at least one sensor for each of the three axes: pitch (nose up and down), yaw (nose left and right) and roll (clockwise or counter-clockwise from the cockpit).

Linear accelerometers measure non-gravitational accelerations of the vehicle. Since it can move in three axes (up & down, left & right, forward & back), there is a linear accelerometer for each axis. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

Switch button is used to set the upper and lower limit. Switches can be used as operator controls. They can sense if a door is open or closed. A limit switch can detect if a part of a machine has reached a certain position. Switches can be used for many purposes, but they can be in only one of two states: On (closed) or off (open).

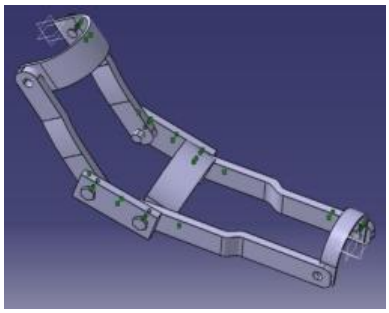
component on the line goes active, it overrides the pull-up resistor.



The pull-up resistor ensures that the wire is at a defined logic level even if no active devices are connected to it. Christo Ananth et al. [4] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for. The main design of this project is to track the heart attack of patients who are suffering from any attacks during driving and send them a medical need & thereby to stop the vehicle to ensure that the persons along them are safe from accident. Here, an eye blinking sensor is used to sense the blinking of the eye. spO2 sensor checks the pulse rate of the patient. Both are connected to micro controller.If eye blinking gets stopped then the signal is sent to the controller to make an alarm through the buffer. If spO2 sensor senses a variation in pulse or low oxygen content in blood, it may results in heart failure and therefore the controller stops the motor of the vehicle. Then Tarang F4 transmitter is used to send the vehicle number & the mobile number of the patient to a nearest medical station within 25 km for medical aid. The pulse rate monitored via LCD .The Tarang F4 receiver receives the signal and passes through controller and the number gets displayed in the LCD screen and an alarm is produced through a buzzer as soon the signal is received.

3. MECHANICAL SYSTEM:

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 19, April 2016



In electronic logic circuits, a pull-up resistor is a resistor connected between a signal conductor and a positive power supply voltage to ensure that the signal will be a valid logic level if external devices are disconnected or high impedance is introduced. They may also be used at the interface between two different types of logic devices, possibly operating at different logic levels and power supply voltages. A pull-up resistor pulls the voltage of the signal it is connected to towards its voltage source level. When the other components associated with the signal are inactive, the voltage supplied by the pull up prevails and brings the signal up to a logical high level. Mechanical setup is used in this project is stainless steel coated with aluminum. This coated material helps to prevent the corrosion. It acts as a

corrosion resistant. Inertial sensors like accelerometer are placed on the wrist of the human arm. It senses the value of the upper limit and the lower limit. According to the inertial sensor values, the microcontroller sends the commands to the motor to Rotate in forward and reverse direction. Motor driver is placed next to the PIC controller in order to drive the motor. This project helps to cure the persons who were affected by the strokes without physiotherapist help.

4. APPLICATIONS

Human arm rehabilitation is used mainly useful for stroke affected patients and fractured patients. This project helps to recover the patients from disorders by themselves without physiotherapist help. Inertial sensors are used to capture the human arm movements and to do all kinds of physical exercises by sending the command to the microcontroller.

5. CONCLUSION

The paper depicts the technique for the computation of the inverse kinematic model of the human arm. The approach is based on the measurements of the hand position and orientation and radial acceleration of the upper arm. The algorithm gives sufficiently good estimates of the arm angles, for use in trajectory planning for rehabilitation purposes, for evaluation of movement capabilities of patients with movement disorders using inertial sensors like accelerometer and gyroscopes. By using an RF transceiver exact status of the patient can be monitored by Doctor. Depending upon the patient Blood Pressure speed of the motor will be increased or decreased. By using a Gyroscope human arm can be rotated up to 360 degree.

REERENCES:

[1] D. O. Adewole; M. J. Johnson (2015) _A computer model of the human arm: Predictive biomechanics for the theradrive rehabilitation system‘ Robotics and Mechatronics (ICROM), 3rd RSI International Conference ,vol. 13, no.1, pp. 1-14.

[2]M. Bamdad; H. Zarshenas (2015) _Modeling of a novel cable driven robot For upper limb rehabilitation‘ Engineering in Medicine and Biology Society, 27th Annual International Conference of the IEEE, vol. 33, no.11,pp. 21-34.

[3] A. Bertomeu-Motos; R. Morales; L. D. Lledo; J. A. Diez; J. M. Catalan; N. Garcia-Aracil (2015)_Kinematic reconstruction of the human arm joints in robot-aided therapies with Hermes robot‘ Engineering in Medicine and Biology Society (EMBC), 2015 37th Annual International Conference of the IEEE, vol. 11, no.23,pp. 61-74.

[4] Christo Ananth, S.Shafiqa Shalaysha, M.Vaishnavi, J.Sasi Rabiyathul Sabena, A.P.L.Sangeetha, M.Santhi, “Realtime Monitoring Of Cardiac Patients At Distance Using Tarang Communication”, International Journal of Innovative Research in Engineering & Science (IJIRES), Volume 9, Issue 3,September 2014,pp-15-20

[5] A. Guneysu; B. Arnrich; C. Ersoy (2015) _Children's rehabilitation with humanoid robots and wearable inertial measurement units‘ Pervasive Computing Technologies for Healthcare (Pervasive Health), 2015 9th International Conference, vol. 23, no.23,pp. 111-124.

[6] S. Hartopanu; M. Poboroniuc ; F. Serea ; G. Livint (2014) _Human arm rehabilitation in stroke patients by means of a hybrid FES &robotic glove‘ Rehabilitation Robotics (ICORR), 2015 IEEE International Conference, vol 6, no.22,pp. 71-114.

[7] M. S. Karunarathne; S. W. Ekanayake; P. N.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 19, April 2016

Pathirana (2014) _An adaptive complementary filter for inertial sensor based data fusion to track upper body motion' Information and Automation for Sustainability (ICIAfS), 2014 7th International Conference, vol. 33, no.24,pp. 121-144.

[8] Y. Mao; X. Jin; G. Gera Dutta; J. P. Scholz; S. K. Agrawal (2015) _Human Movement Training With a Cable Driven ARmEXoskeleton (CAREX)' IEEE Transactions on Neural Systems and Rehabilitation Engineering International Conference, vol. 33, no.5,pp. 141-154.