

## GYRO LIFT-A INNOVATIVE ANTI-TREMOR STABILIZING HANDLE

*P.Ponmudi*

*Electronics and Communication Engineering, Sri Muthukumaran Institute of Technology,  
Chikkarayapuram, Near Mangadu, Chennai-69, TamilNadu.*

*J.Radhika*

*Electronics and Communication Engineering, Sri Muthukumaran Institute of Technology,  
Chikkarayapuram, Near Mangadu, Chennai-69, TamilNadu.  
Mail Id:rathi1896@gmail.com*

*K.Sivapriya*

*Electronics and Communication Engineering, Sri Muthukumaran Institute of  
Technology, Chikkarayapuram, Near Mangadu, Chennai-69, TamilNadu.*

*S.Mangaiyarkarasi*

*Assistant Professor, Electronics and Communication Engineering, Sri Muthukumaran Institute  
of Technology, Chikkarayapuram, Near Mangadu, Chennai-69, TamilNadu.*

**Abstract-** Gyro-lift is an innovative anti-tremor stabilizing handle to help people with handle tremor eat, lift and carry utensils easily. The device compensates for the shaking and allows the food to stay on the spoon or fork without spilling. The device senses the hand tremor motion and automatically stabilizes the attached utensil. The utensil can be a spoon, fork or larger dining and kitchen vessels. To help the people affected with hand tremor to live independently. It prevents them from being hospitalized for years. It brings them out of depression. This device is helpful for a doctor to identify the hand tremor level of a patient. An animated movement feature is helpful for user needed activity design purpose.

**Keywords-**Flash memory, Joy stick, Bluetooth transceiver, Graphics LCD.

### 1. Introduction

People with neurological conditions are suffering with involuntary shaking of the hands, including essential tremor, Parkinson's disease and multiple sclerosis. Getting the food from the plate or bowl to their mouth without spilling is the primary trouble they face. Lifting objects and utensils is also a major problem for them. This makes them lose their independence and become depressed, and they don't go out in public because of embarrassment. Gyro-LIFT is an innovative anti-tremor stabilizing handle to help people with hand tremor eat, lift and carry utensils easily. The device compensates for the shaking and allows the food to stay on the spoon or fork without spilling. The device senses the hand tremor motion and automatically stabilizes the attached utensil. The utensil can be a spoon, fork or larger dining and kitchen vessels. The device consists of an inbuilt 9-axis motion sensor, a low power ARM Cortex-M4 microcontroller

and 2-axis motor mechanism that distinguishes unwanted tremor from the intended movement of the hand and counteract the tremor. To stabilize the utensil, the controller directs two motors in the handle to move the attached utensil in the opposite direction of any detected tremor. The device can also act as medical testing equipment and can be controlled and monitored from a smartphone app. The device can be paired with an android smartphone using a bluetooth transceiver. This is the primary user interface that helps to view the sensor data, both real-time and recorded, and also to control and configure the device. In addition to this, a graphics LCD display and a set of color LED's are used to show the status of the device. A Joystick button is used to enter user input and also helps to calibrate the sensors and servo motors before using the device for the first time. This helps to diagnose the patient when there is no smart phone available.

## **2. Literature Survey**

### **2.1 Sivanagaraja Tatinati, and Kalyana C.Veluvolu(2016), “Multi-dimensional modeling of Physiological Tremor for Active Compensation in Hand-Held Surgical Robotics”, IEEE Transactions on Industrial Electronics.**

PHYSIOLOGICAL tremor is a major impediment to per-form delicate and fine motor tasks, such as microsurgery. In microsurgery procedures, the surgeons hand motion must be precise at the magnitude smaller than few micrometer. Our analysis with the tremor recored form surgeons and novice subjects shows that there exists significant correlation in tremor across the dimensions. Based on this, a new multidimensional modeling approach based on extreme learning machines (ELM) is proposed in this paper to correct the phase delay on to accurately model 3D tremor simultaneously.

### **2.2 Artem Melnyk, Patrick Henaff (2016) , “Bio-Inspired Plastic Controller for the Robot ARM to Shake Hand with Human” . IEEE 36 th International Conference on Electronics And Nanotechnology (ELNANO).**

Humanoid robot will appear in the human environment as a companion to help or to work with humans . The future coexistence of humanoid robots and human being presuppose knowledge of cognitive mechanism involved in interpersonal human physical and social interactions. The act of a handshake is an example of a physical interpersonal interaction that plays an important social role because it is based on physical and social coupling that lead to synchronization of motion.

### **2.3 Abhijit Saxena and Rajni V.Patel (2015) , “An Active Handheld Tremor Cancellation Device”, IEEE Transactions On Robotics And Automation,VOL.19,NO.5.**

Human tremor is a involuntary motion that ia associated with both healthy individuals having movement disorders. Tremor in the hand puts a limitation on positioning accuracy and thus hampers microsurgical procedures. Any errors in the motion of the hand make microsurgical procedures difficult, and involuntary motions can make some procedures in the case of vitreoretinal microsurgery. This most familiar source of involuntary motion is physiological

tremor. Real-time compensation of tremor would enable a surgeon to accurately perform microsurgery. A light-weight active handheld tremor cancellation device for micromanipulation is currently under development.

**2.4 Shyam.R.Nair and Shalini.R.Nair(2012), "Design of a Voice Controlled Robotic Arm for Picking and Placing an Object", IOSR Journal of Engineering, Vol,2(4) pp:670-673.**

In this paper, the focus is on design of a voice controlled robotic arm for picking and placing an object. The arm has 2 links and 3 joints. The coordinates from which the object is to be picked and placed is selected by giving proper commands and the robotic arm uses inverse kinematics to execute the task. The voice commands are picked up by a PC and by using the speech recognition software and special software developed in Microsoft Visual Studio, the commands are passed to the robot as serial codes. To select the real time object, the corresponding coordinate is selected. Once the robot gets the coordinates, it uses the inverse kinematics to calculate the required rotation.

**2.5 MirSajjid Hussain Talpur and Murtaza Hussain Shaikh(2012), "Automation of Mobile Pick and Place Robotic System for Small food Industry", International Journal of Advanced Engineering and Researches Sciences, Vol.1, No.2, pp: 335-340.**

In this paper ,the use of robotics in food industry based on microcontroller is implemented because the use of robots is becoming more popular in recent years. By utilizing new hardware and software tools, design of these complex systems that need strong integration of distinct disciplines is no longer difficult compared to the past. Therefore, the purpose of this paper is to design and implement a microcontroller based on reliable and high performance robotic system for food manufacturing line. The robot is capable of picking unbaked biscuits tray and places them into furnace and then after baking it picks the biscuit tray from the furnace. A special gripper is designed to pick and place the biscuit tray with flexibility.

### **3. Existing**

Precision ,robustness , dexterity, and intelligence are the design indices for current generation surgical robotics. To augment the required precision and dexterity into normal microsurgical work-flow ,hand-held robotics instruments are developed to compensate physiological tremor in real-time. The hardware (sensors and actuators) and software (causal linear filters) employed for tremor identification and filtering introduces time varying unknown phase-delay that adversely affects the device performance.

#### **3.1 Limitations**

- The speed of the robot is limited by the control system to secure the physical interaction , and the frictions in the joint are not negligible.
- The major challenge with sensing the motion is to have a small Signal-to-noise ratio.Also, it should be light and small in size so that it can be easily incorporated in a small device.

- The proposed algorithm does not consider limitations of the hardware such a torque limit and joined velocity limit.
- Compared to the automated trails ,the errors in the manual tracing are significantly largest and gradually increase with the sizes of the circles.

#### 4.Block Diagram

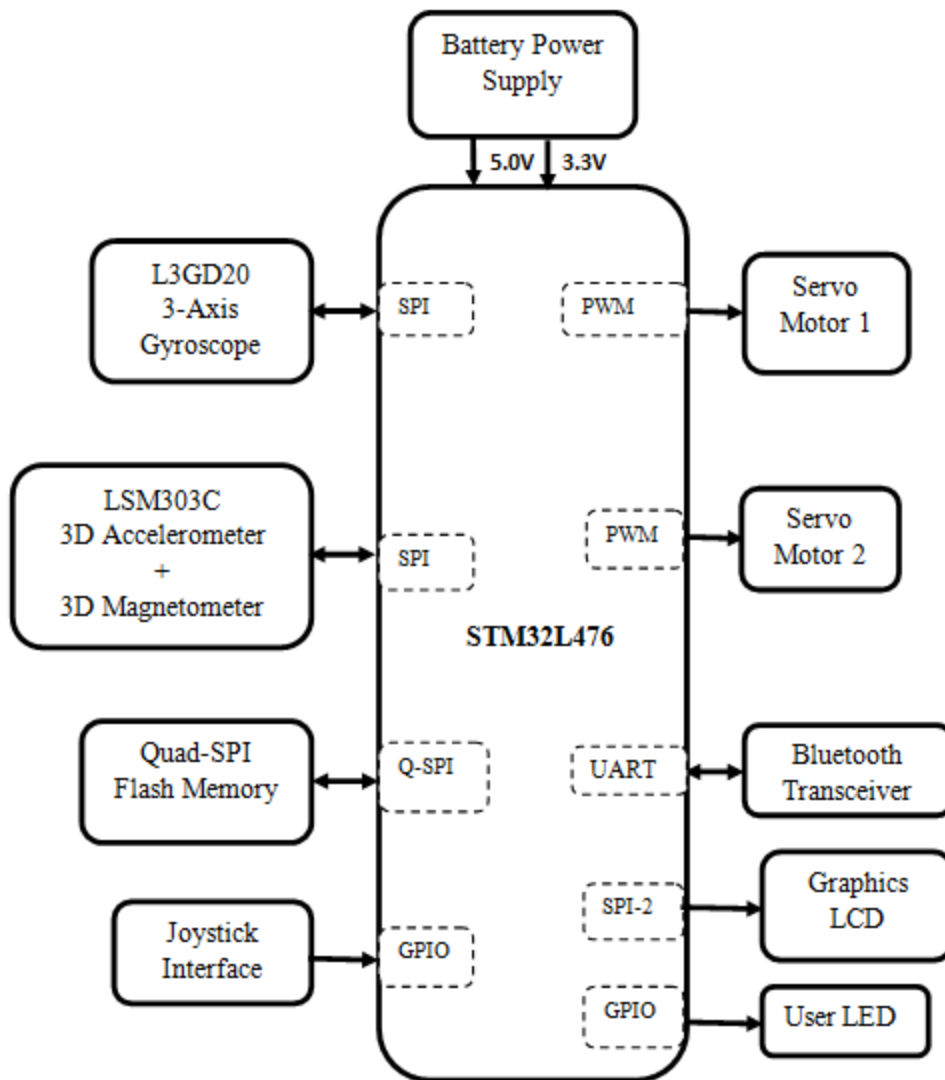


Figure 4.1: Gyro Lift-A Innovative Anti-Tremor Stabilizing Handle

#### 5. Proposed Method

The current techniques that focus on three-dimensions (3D) tip position control involves modeling and cancelling the tremor in three axes (x, y, and z axes) separately. Based on

this, a new multidimensional modeling approach based on extreme learning machines (ELM) is proposed in this paper to correct the phase delay and to accurately model 3D tremor simultaneously. Proposed method is evaluated through both simulations and experiments. Comparison with the state-of-the-art techniques highlight the suitability and better compensation in hand-held surgical robotics.

### 5.1 Advantages

- This device is helpful for doctor to identify the hand tremor level of the patient.
- Animated movement feature helpful for user needed activity design purpose.

## 6. Results and Discussion

When the kit is switched on, software defined radio will be displayed on 16×2 LCD. When all the parameters like password, frequency and modulation techniques are matched, the data will start transmitting which will be indicated by the flickering of LED. Once the data transmission is complete, the LED will stop flickering. The device can measure tremor frequency and tremor baseline amplitude data and show the results on the onboard display. This parameter represents the tremor stage of the patient and gets recorded in the onboard memory to be viewed on the smartphone app.

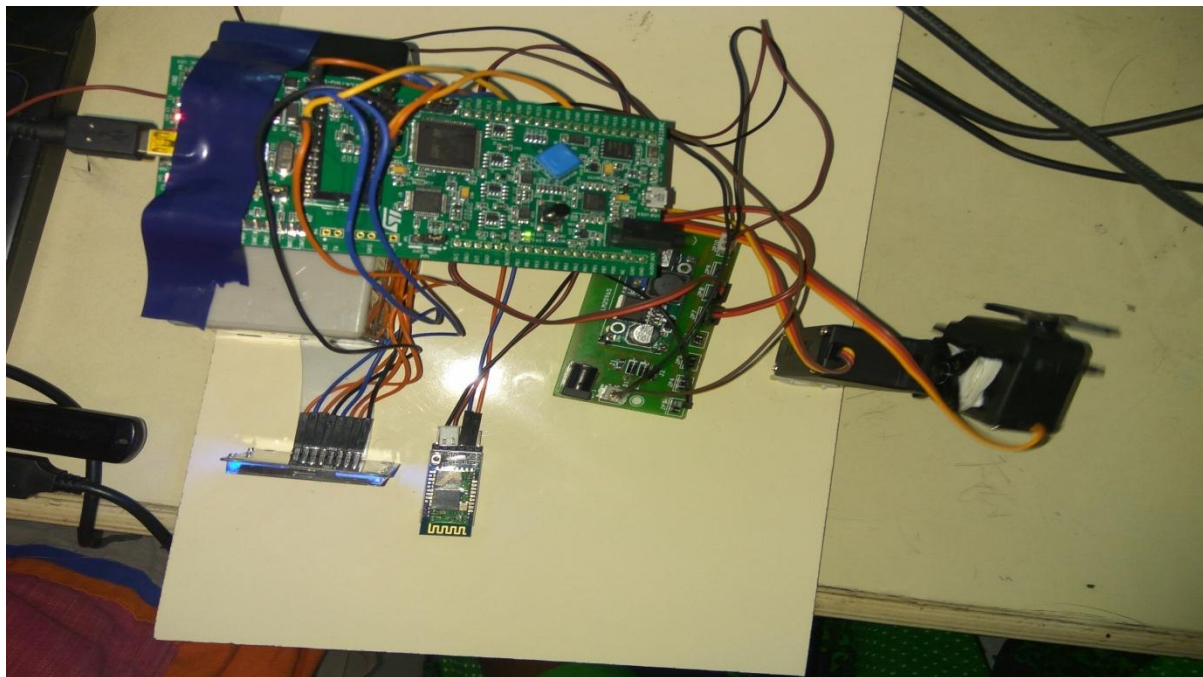
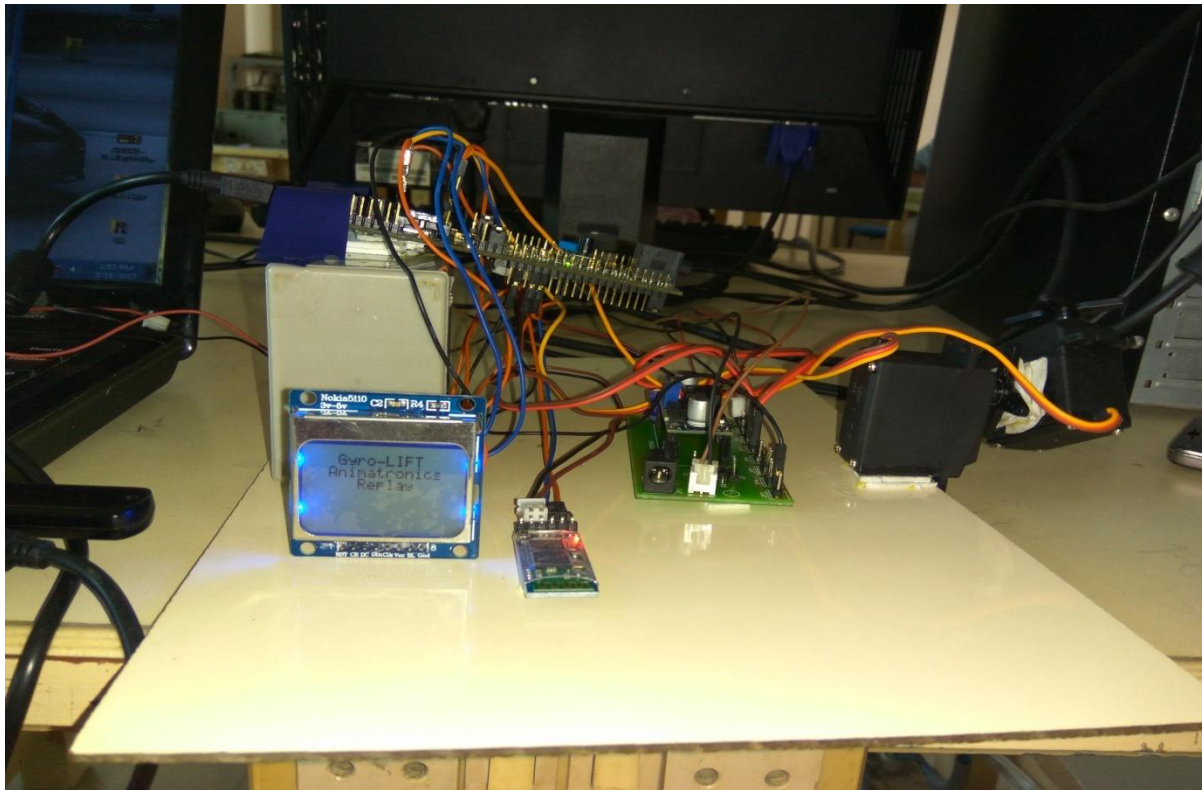


Figure 6.1: Gyro lift-a Innovative Anti-Tremor Stabilizing Handle Setup





**Figure 6.2 : Gyro lift- a Innovative Anti-Tremor Stabilizing Handle Output**

BODY REGION	TREMOR FREQUENCY Hz	ESTIMATED AMPLITUDE
Eye	35 - 40	1.2 mm
Wrist	8 - 12	7 mm
Elbow	3 - 5	1.5 mm
Body Position	1.5	2mm

**Table 6.1: Tremor in Human Body**

## 7. Conclusion

Our country has a great history in providing medical facility at low cost. Thus we conclude that our project is a device, which compensates for the shaking and allows the food to stay on the spoon without spilling. The device senses the hand tremor motion and automatically stabilizes the attached utensil. It help the people affected with hand tremor to live independently. It prevents them from being hospitalised for years. It brings them out of depression. The lives of people is changing everyday and expecting a technological innovation to help them solving their

issues. This project is unique and surely help the poor people who are not aware of the current medical hazards.

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