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A MEMS Sensor Multi-Functional Tele-Robotic ARM

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ABSTRACT:

Most of the industrial robots are pre-programmed to do certain task repeatedly without any sensor feedback and when we need to operate in challenging situations then we need a model which can be controlled remotely. This remote control can be achieved by using voice commands, text commands etc. Here we demonstrate a simple model of robotic arm which can be controlled by hand gestures using MEMS. The strength of our approach is demonstrated by picking and placing numerous common objects with assorted dimensions, shapes, weights, and surface compliances.

Keywords:

human interface, industrial robot, primary: arm manipulation, secondary: visual serving, tile-robotics.

I. INTRODUCTION:

Industrial robots allow limited feedback from sensors, for example vision or pressure/torque sensors, through command trajectory modification, but they're not created for human interaction. Probably the most prevalent utilization of robots today involves industrial robots in manufacturing lines. These robots are designed through educate pendants to traverse via a retaught group of suggests execute repetitive tasks. Even if exterior sensors are utilized, they're targeted at specific tasks. Scalping strategies typically involve just one robot arm outfitted by having a finish effector devoted to some specific type of tasks. When multiple arms collectively hold a lot, additionally to the motion from the load, the interior pressure inside the load must be controlled for stable grasping while staying away from harmful the part. Within the situation of pressure-reflecting teleportation, synchronization and stability issues are more serious, because the human operator must regulate both pressure of interaction between your load and also the atmosphere and also the internal squeeze pressure within the load. Within this paper, we present a manuscript tile-automatic framework for human-directed arm manipulation. A person's operator provides gestural instructions and motion directives, as the control system autonomously locates the item of great interest and keeps grasp pressure closure. Our approach is sensor-based, permitting versatility in task specs and execution. We consider robots with multiple cinematically redundant arms. Such robots can tackle a significantly larger selection of tasks than the usual single arm, but simultaneously incur elevated complexity when it comes to potential collision in addition to pressure of interaction in collaborative tasks. our arm's job is to move your hand from place to place.

Similarly, the robotic arm's job is to move an end effectors from place to place. You can outfit robotic arms with all sorts of end effectors, which are suited to a particular application. One common end effectors is a simplified version of the hand, which can grasp and carry different objects. Robotic hands often have built-in pressure sensors that tell the computer how hard the robot is gripping a particular object. This keeps the robot from dropping or breaking whatever it's carrying.

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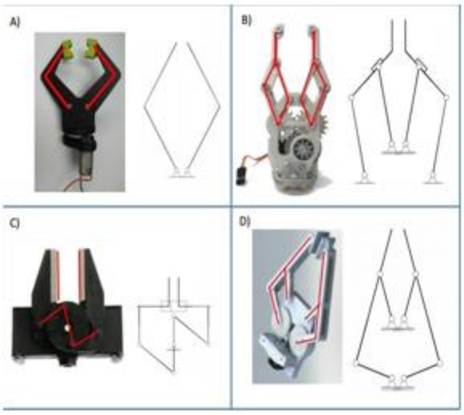

Figure 1: Grippers of one degree of freedom and simplifications

Every mechanism is simulated by rotating one radian the actuator from the maximum opening to its closure holding a 1 cm object. This way it is obtained the stroke curve that shows, for each position of the motor, the position and orientation of the left jaw, knowing that the right one has a symmetrical motion.

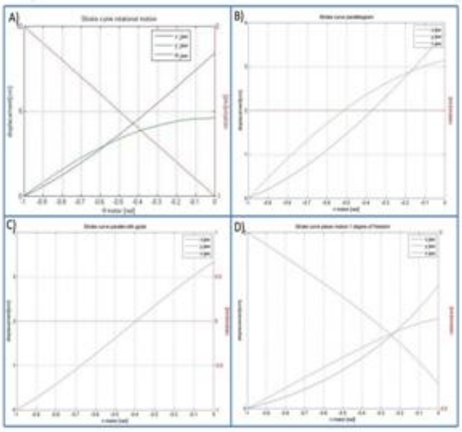

Figure 2: Force curve of the four mechanisms

II. RELATED WORK

a. Forward b. backward

c. Left d. Right

Figure 3: Hand gestures

Working of robot:

a. Movement of robot:

Based on direction in which hand is moved MEMS sensor generates voltage signals and given to robot through ZigBee.

It works as follows:

Forward: robot moves forward.
Reverse: robot moves reverse.
Left: robot moves left.
Right: robot moves right.

As robot move direction is displayed on LCD.

b. Movement of robotic arm:

Based on movement of fingers flex sensors generates voltage signal and give to receiver section using ZigBee. These received signals are used to run motors connected to gripper.

c. Sensors

Sensors are used to measure non-electrical parameters like temperature, humidity, fire etc.

1. Temperature sensor: It is used to know the temperature around robot and if it is greater than threshold voltage then an alert message is displaced to users on LCD.

2. Humidity sensor: It is used to know the humidity around robot and if it is greater than threshold voltage then an alert message is displaced to users on LCD.

3. Fire sensor: If there is any fire sensed in surroundings of robot then an alert message is displayed in LCD.

III. SYSTEM DESIGN MODEL

a. Hardware Design Module

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Transmitting section:

This section incorporates an accelerometer and flexes which senses the movement of user hand and generate corresponding voltages . These voltage signals converted from analog to digital form and transmitted utilizing ZigBee module.

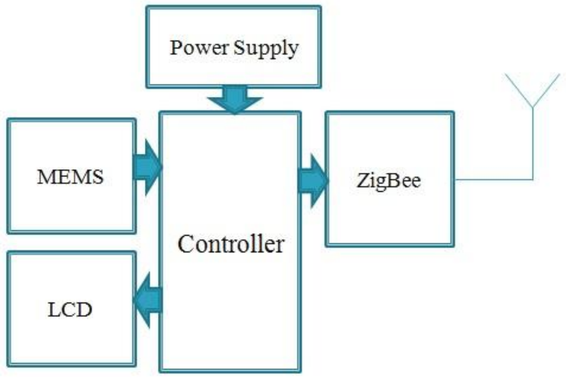

Figure 4 : Transmitter section

Accelerometer:

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g.

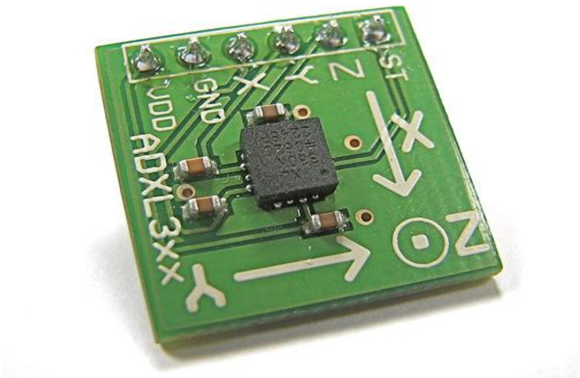

Figure 5: Accelerometer (ADXL335)

It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

Receiving section:

This section incorporates controller (LPC2148), motors, gripper and various sensors like temperature sensor, humidity sensor and fire sensor.

Data given by transmitter is received by receiving section and motors connected to gripper are run based on received data. Sensors detect changes in temperature, humidity and fire in surroundings of robot and sends data to transmitting section.

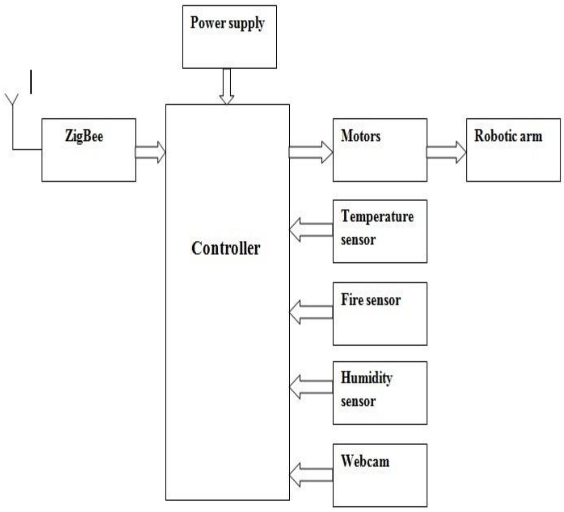

Figure 8: Receiver section

b. Flow chart

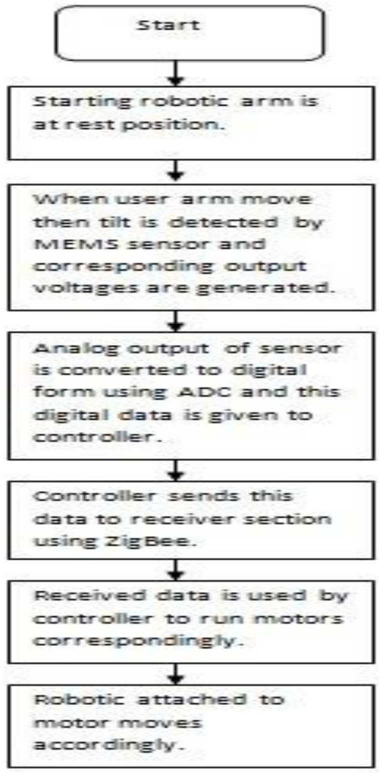

Figure 10: flow chart-1

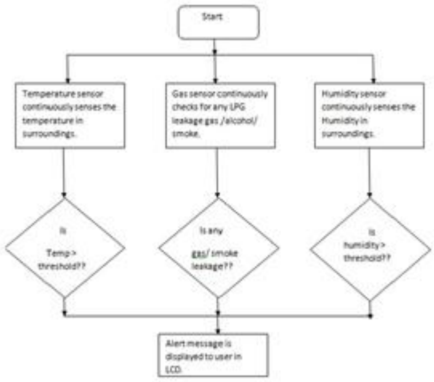

Figure 11: flow chart 2

IV. DISCUSION AND FUTURE WORK

This project results shows simple procedure to recognize gestures of hand for controlling robot. We have considered only few gestures and this can be extended. This model need to be improved if this has to be used in more challenging situations.

V. RESULT:

VI. CONCLUSION:

We integrated these interconnected components inside a robust and versatile distributed control and communication architecture, and shown. The primary aspects of the machine include vision-led motion control, redundancy resolution, collision avoidance, squeeze pressure control, load compensation, and human gestural interface. We presented the expansion and outcomes of a tele-robotic system concerning the combination of countless sensors and actuators by having an industrial robot. Effectiveness in adjusting a number of objects with various shapes, surface textures, weights, and mass distributions.

As the implementation and demonstration is perfect for a particular platform, we mostly use off-the-shelf components and software, therefore the approach is definitely extensible with other robots and platforms. We used a commercial robot controller, and despite its significant time delay, we could achieve robust performance for complex motion and pressure objectives. A limitation for this implementation is it is unconditionally only effective like a local planner later on we'll incorporate global planning techniques to deal with local equilibrium and introduce modern-day redundancy resolution. In the present system, we used high-friction contact pads created for no rigid grasping.

Motivated by fabric layups in composites manufacturing, we're also looking into an alternative around the earlier talked about complementarity pressure control condition in which, rather than using a squeeze pressure on the rigid body, the robot must conserve a recommended tension inside a flexible object during motion. We're also looking into using modern, articulated grippers within the types of manipulation tasks analyzed within which an enveloping grasp doesn't seem possible. we have only considered a limited number of gestures. Our algorithm can be extended in a number of ways to recognize a broader set of gestures. The gesture recognition portion of our algorithm is too simple, and would need to be improved if this technique would need to be used in challenging operating conditions.

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