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TO CONTROL THE DIRECTION AND ANGLE OF STEPPER MOTOR USING ZIGBEE TECHNOLOGY

P.Jithendar[a] , M.Abhignya [a], S.Shashvat [a] , S.Laxman reddy [a], T.Karthik [a]

Dept.of EEE, MLR Institute of Technology, Hyderabad,India.

Abstract

Zigbee based Stepper Motor direction and angle control system

The purpose of this project is to control the direction and angle of a stepper motors using Zigbee based remote control.

For applications where precise measuring of a motors' rotor position is critical, a Stepper Motor is the best choice. Stepper motors operate differently from other motors rather than voltage being applied and the rotor spinning smoothly, stepper motors turn on a series of electrical pulses to the motor's windings. Each pulse rotates the rotor by an exact degree. These pulses are called "steps", hence the name "stepper motor".

The degrees per pulse is set in the motor's manufacturing, and is provided in the spec sheets for that motor. They can range from ultra-fine movements of a fraction of a degree (i.e., 0.10 degrees), to larger steps (i.e. 62.5 degrees).

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks.

Zigbee is the set of specs built around the IEEE 802.15.4 wireless protocol.

Keywords : zigbee transmitter and reciever, ULN2003, Microcontroller, Stepper motor

1. Introduction

Just about every automation revolution has shared four simple goals: Speed up common tasks to lift productivity – get a lot more done with existing resources. Reduce mistakes or errors – ideally improve quality of output too. Improve safety for humans (including workers, customers, general public), Free up humans so they can focus on higher- value work – how much more creative or customer-focused can you be when you outsource record keeping, time tracking and other simple tasks.

The purpose of using robotic arm is to reduce errors and human efforts. As the robotic field is having an application in various department of engineering such as production, inspection, material handling etc. This type of robotic arm is famous for its characteristics like high speed, good accuracy, less maintenance and repeatability in pick and place operation which is required in assembly.

2. Theoretical Analysis

The stepper motor working principle is Electro-Magnetism. It includes a rotor which is made with a permanent magnet whereas a stator is with electromagnets. Once the supply is provided to the winding of the stator then the magnetic field will be developed within the stator. Now rotor in the motor will start to move with the rotating magnetic field of the stator. So this is the fundamental working principle of this motor.

In this project the command is written in the Arduino ide software Ex: A120 (which denotes anticlockwise 100 degrees) and this command is sent to ATMEGA 328P zigbee transmitter which wirelessly passes the command to the ATMEGA 328P zigbee receiver that is placed in the ardunio board. Now the zigbee microcontroller is connected to the stepper motor controller chip ULN2003 which receives the command from the Arduino board and rotates the stepper motor in the specified direction and angle of displacement.

3. Proposed System

The stepper motor working principle is Electro-Magnetism. It includes a rotor which is made with a permanent magnet whereas a stator is with electromagnets. Once the supply is provided to the winding of the stator then the magnetic field will be developed within the stator. Now rotor in the motor will start to move with the rotating magnetic field of the stator. So this is the fundamental working principle of this motor.

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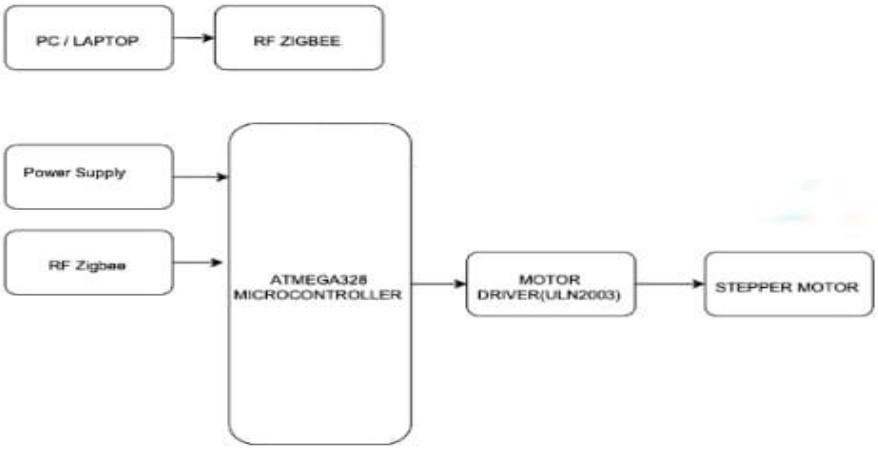
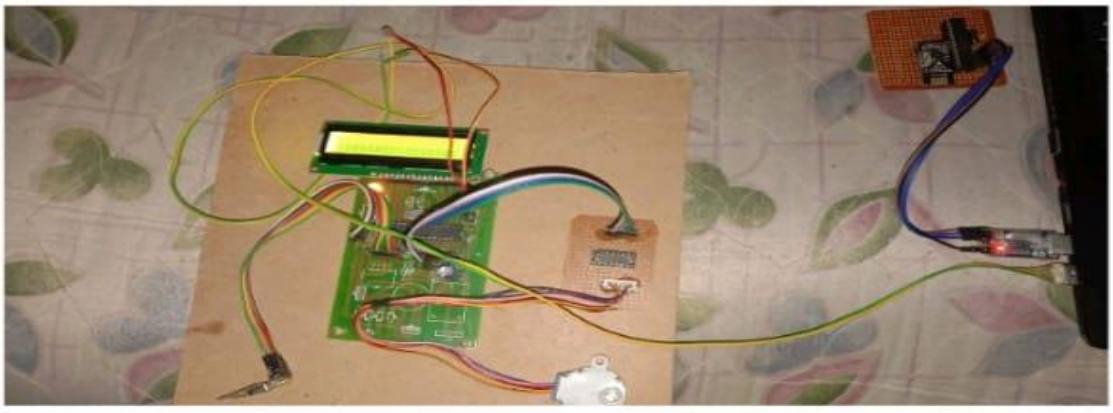
3. Block Diagram and working principal

SYSTEM DESIGN AND DEVELOPMENT

1. : *Block Diagram:*





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4. Results and Discussions

RESULTS

This project helps us in understanding and analyzing the performance of a stepper motor that is being operated wirelessly through zigbee modules.

Now in the below tables and graphs we are going to see the performance of the stepper motor.

Speed of the motor in Clockwise direction:

ANGLE (degrees)	*TIME TAKEN (seconds)*	*SPEED OF THE MOTOR (degrees/sec)*
100 degrees	*10 sec*	*10*
150 degrees	*12.33 sec*	*12.16*
200 degrees	*15 sec*	*13.33*
250 degrees	*20.56 sec*	*12.1*
300 degrees	*25.22 sec*	*11.82*
360 degrees	*31.89 sec*	*11.22*

5. Conclusion

In this project DIRECTION AND ANGLE CONTROL OF STEPPER MOTOR USING ZIGBEE TECHNOLOGY , The stepper motor is controlled wirelessly as we are using a Zigbee transmitter and receiver pair of ATMEGA 328P-u and the stepper motor controller ULN2003 ARG. The Zigbee based remote control system transmits the wireless signals according to the commands given by the software to the Zigbee transmitter. The Zigbee receiver that is connected to the Stepper motors to be controlled receives these commands. The received commands are sent to the microcontroller for validation and processing. If the commands received are valid then the microcontroller takes necessary action of controlling the motors

the motor is controlled accurately and precisely and also perform the following actions Turn the stepper motors in clockwise direction, Turn the stepper motor in anti-clockwise direction and Rotate the motor to a specific angle with precision.

This hels the Stepper Motor to be used for holding or positioning applications. In areas like lasers and optics, they are used in precision positioning equipment such as linear actuators, linear stages, rotation stages, and more.

As they provide a micro-step drive can be used to minimize vibration from the stepper motor. This is one of the ways in which stepper motors help ensure the reliable conveyance of precision components. Stepper motors are also used to drive the hands or joints of industrial robots

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