High Air Pressure - Auto Stop Wind Machine

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Abstract— This paper is presenting Auto Stop Windmill in case of High Air Pressure using microcontroller and wind sensor. In normal small windmills when air is flowing with high pressure either blade of mill or the base is broken. This is because of high air pressure or wrong direction of air flow. To prevent these losses we are trying to make a wind mill which will stop by changing pitch angle of blades so that break will prevent it from damage to blades and base of mill. In this windmill we will use Anemometer as wind sensor which will sense air pressure and speed of air. If speed will increase or direction will change, microcontroller will sense it and motor controller IC will change blade angle by rotating motors connected to individual blades.

Index Terms— DC motor, L293D IC, CMOS technology

1 Introduction

In this technique we are using speed and direction sensing method of air using air sensor. It is not possible to deal with all mechanical and electrical parts of windmill within the limits of single paper so we have choose the one method only, i.e. System use combination of microcontroller, air sensor and motors with windmill. One of the main reasons of this paper is to point out use of controlled blade rotation in saving of blades and base form damage.

2 Selection of Microcontroller

The 8051 microcontroller was designed by Intel in 1980's. It is based on Harvard Architecture and developed primarily which is use in Embedded Systems. Primarily it was developed using NMOS technology but because those requires more power to operate so Intel redesigned by use of CMOS technology and then came later versions with letter 'C' in their name, example is 80C51 etc. These latest Microcontrollers need less power to operate than their predecessors.

It has two buses one for program and other one for data. Thus it has two memory spaces of size 64K for both program and data. It has an 8 bit processing unit and an 8 bit accumulator register. Also it includes 8 bit B register as blocks for main processing. Also it has some other 8 bit and 16 bit registers.

8051 has a built-in RAM for purpose of internal processing. It is primary memory used for temporary data storage. It is Volatile memory so its contents get vanished whenever power is turned OFF.

Block diagram of Microcontroller 8051 is given below. Have a look at each block of this Architecture:

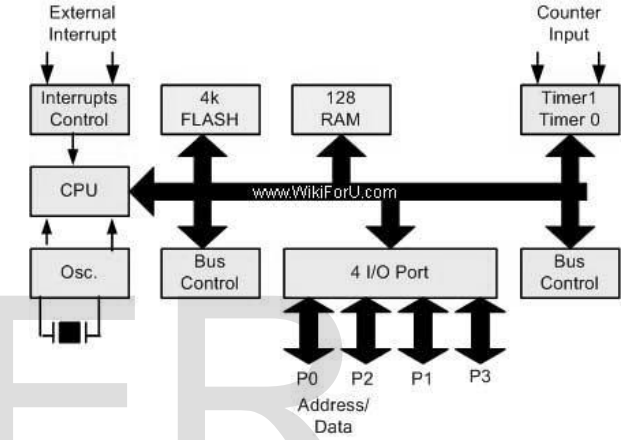

Fig. 1 Block Diagram [1]

3 Wind Speed Measurement

An anemometer is a sensing device to measuring wind speed, and also it is a common weather station instrument. This term is derived from Greek word anemos, which means wind, and it is used to describe any airspeed measurement instrument which is used in meteorology or aerodynamics.

Anemometers is divided in two classes: one are those which measures the wind's speed, and others are those which measures the wind's pressure; but because there is a close connection between pressure and speed, so if we design an anemometer designed for one it will give information about both speed and pressure.

Fig. 2 Anemometer [2]

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One form of mechanical velocity anemometer may be described as windmill/propeller type anemometer. In Robinson anemometer, axis of rotation is in vertical direction, but with this subdivision the rotation axis must be parallel to wind direction and therefore horizontal. Since as the wind varies in direction and axis has to follow changes in it, a wind vane or other contrivance to fulfill the same purpose must be employed. On same axis An aero vane combines a propeller and a tail to obtain accurate and precise wind speed and direction measurements from same instrument.

4 DC MOTOR

DC motor is a mechanically commutated electric motor which is powered from direct current . The stator is stationary in space by its current. To be stationary in space, current in the rotor is switched by commutator . Thus the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees and it generates maximum torque.

DC motor has a rotating armature winding in which a voltage is induced, a non-rotating armature magnetic field and a static field winding that produce the main magnetic flux/ permanent magnet. Different inherent speed/torque regulation characteristics are provided by Different connections of the field and armature winding. We can control the speed of a DC motor by changing the voltage applied to the armature or by changing the field current. Speed control is applied by introduction of variable resistance in the armature circuit or field circuit. Modern DC motors are controlled by power electronics systems which are called DC drives.

By the introduction of DC motors to run machinery, need for local steam or internal combustion engines, and line shaft drive systems is eliminated. We can operate DC motors directly from rechargeable batteries, providing the motive power for the first electric vehicles.

5 L293D IC

L293D is a dual H-bridge motor driver IC. Since they take a low-current control signal and provide a higher-current signal so Motor drivers act as current amplifiers. To drive the motors this higher current signal is used.

It contains two inbuilt H-bridge driver circuits. Two DC motors can be driven simultaneously in its common mode of operation, in both directions forward and reverse. The operations of two motors can be controlled by input logic at pins 2, 7 and 10, 15. To stop the corresponding motor Input logic will be 00 or 11. To rotate it in clockwise logic will be 01 and anticlockwise directions logic will be 10.

To start operating Enable pins 1 and 9 corresponding to the two motors must be high for motors. When an enable input is high, the associated driver will get enable. As a result, the outputs will become active and it will work in phase with their inputs. Similarly, when the enable input is low, that driver will be disable, and their outputs will off and in the high-impedance state.

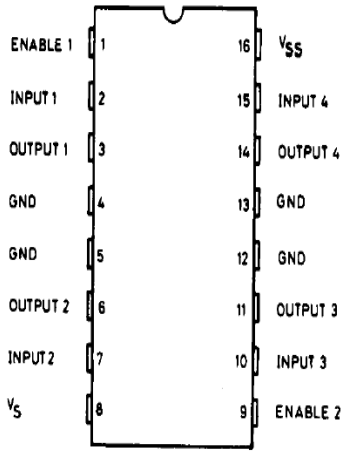

Fig. 3 Pin Configuration [3]

6 FUNCTIONAL BLOCK DIAGRAM

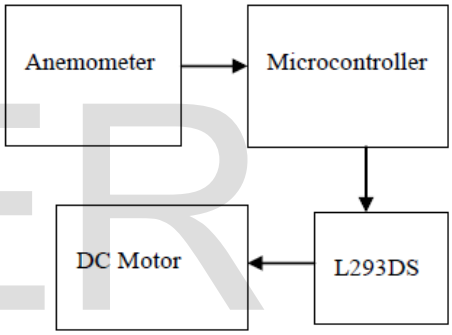

Fig. 4 Functioning Diagram [3]

As shown in functional block diagram wind sensor anemometer will sense the air pressure and direction. If speed will increase from specified limit or direction will change it will sense and microcontroller connected with it send signals to motor driver IC. Motor driver IC will rotate the DC motor which is connected with each blade inside hub, and thus pitch angle of each blade will change and will stop the wind mill.

6 RESULT ANALYSIS

This will result in a Auto Control Windmill which will stop windmill in automated manner by sensing the speed and direction of air.

4 CONCLUSION

Auto Stop Windmill in case of High Air Pressure using microcontroller and wind sensor has been performed. To characterize sensors use for air speed and direction of air this developing project will be a very useful tool. It is a low cost automat-

ed windmill with good accuracy and time response as well portable. It will fulfill the target of prevent windmill from damage.

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