

DIGITAL ANEMOMETER AND WIND VANE USING ARDUINO

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Abstract: *This paper focuses on a smart digital anemometer and wind vane system that is less costly and it is widely used in any wind power plant. In 21st century where automation is playing the most important role in the life of human. Automation allows us to control Appliances with automatic control. Automation gives comfort, increase efficiency as well as save time. Nowadays, most of the industries are used Automation and control mechanism which is expensive for cost and does not suitable for use in a Wind power sector. In present days, electricity problems Occur due to the increase in population. To avoid the problem. We have to encourage the electricity generation sectors or power plant. Due to using this digital anemometer and wind vane we will measure and indicate speed and direction of wind easily. By using this type we can easily use this setup in wind power plant. In this project, we make a Digital anemometer and wind vane system that has to be designed. The system Consist transformer, Arduino and Infrared Sensor. The Infrared sensor is Detect the motion. Then Arduino works as per instruction of infrared sensor and system control by Arduino nano. This project design and development of an automatic Wind measure and indicates the wind direction system.*

Keywords: *Arduino, Transformer, Anemometer, Wind vane, Infrared Sensor.*

INTRODUCTION

As the climate continues to change in nature's own way, the day-to-day attitudes and activities of man such as agriculture, angling, transportation, armed services, etc. Are greatly stimulated. But over the centuries, some acts of nature like floods, cyclones, earthquakes, cyclones. Etc. Destroyed valuable property and many people and animals died.

Climate observation areas are working hard to track and monitor climate variations. Considering these problems, using a portable wind speed direction and monitoring system in every small area like the roof would be very helpful. Hemispherical cups on top of the arms with a single arm or bar.

Also the anemometer is used in various wind power plants to protect the wind mill from high speed winds. In aerodynamics anemometers are also used. Wind vane indicate the direction of wind. Which help to generate maximum wind energy.

LITERATURE REVIEW

Various types of instruments are used to measure wind speed. An important device is the wind vane, which indicates the direction of the wind, first used in Athens in 48 BC. To measure wind speed, an anemometer is used, and the word anemometer comes from the Greek word "anemo" meaning "wind".

The Mayans used “a pressure plate anemometer”. [1]

This anemometer consists of small balls of some weight released from a jar or basket and down winds between 1200 and 1400 BC.

Leon Battista Albert invented first “mechanical anemometer”. [2]

Italian architect Leon Battista Albert invented the first mechanical anemometer in 1450. This anemometer was a simple hanging plate in which a board vibrated with pressure which deflects against a calibrated scale to represent the speed of wind.

Sir Francis Beaufort created “Beaufort scale”. [3]

The Irish hydrographer Sir Francis Beaufort created a wind power scale called the Beaufort scale, which is mainly used in naval activities.

Thomas R. Robinson invented the “cup anemometer”. [4]

In 1846, Irish astronomer Thomas R. Robinson invented the four-cup anemometer. A cup anemometer consists of three or four hemispherical cups on top of the arms with a single arm or bar. A single arm mounted with four or three other arms is connected to a bearing to rotate in the direction of the wind.

Andronicus invented “wind vane”. [5]

It has been around 2000 years ago the Greek astronomer Andronicus in 48 BC, who invented the wind vane to determine the direction of wind.

The wind vane was launched in Greece, Athens. The wind vane looks like the Greek god called triton who had body like fish and head and torso like human.

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BLOCK DIAGRAM

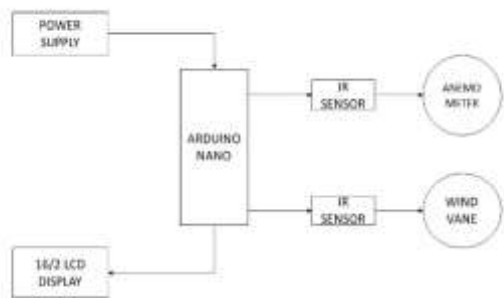


FIG NO 1. BLOCK DIAGRAM

SOFTWARE AND HARDWARE PLATFORM

Hardware for the project:

Infrared sensor, power supply, 16/2 LED display, Bearings, Arduino NANO, Jumpers.

Software for the project:

Arduino NANO (C Programming).

COMPONENT SELECTION

Transformer:-

The transformer is an electrical device which step up or step down the magnitude of voltage. The function of transformer in this project is to step down the 230volt AC supply into 12 Volt AC supply.

IR sensor:-

The infrared sensor is a device which continuously transmits the infrared light and gives signal to the Arduino when the transmitted rays get received. The role of IR sensor in our project is to measure the RPM from the anemometer and also to give the signal of wind vane to the Arduino.

Arduino NANO:-

The function of Arduino nano in our project is to get the signal from IR sensor which are in RPM form and convert them into the unit of speed i.e. Km/hr with the help of a fixed formula.

16/2 LED display:-

The led display is used to get the readings. The use of led display in this project is to indicate the speed and the direction of wind.

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TECHNICAL APPRAISAL OF PROJECT

a. Methodology:-

In this project, we can use a microcontroller which is Arduino NANO, Infrared sensor and LED display are connected to Arduino UNO board through connecting wires, only in this section connections are provided. Infrared sensor will sense the data will be transferred to Arduino. Then the Arduino convert the rpm of anemometer into km/hr and also it will sense the direction of the wind and then the output of Arduino is given to led display to show the direction and speed of wind.

b. Planning:-

Analysis of the situation and the exact problem faced through discussions with the project guide. We will use different technologies in the system. We can implement the project with the help of our guide and the specification of the program were decided by the guide. Use of infrared sensor to interface the computer and embedded system meant for process and control. Testing and development still underway to enhance the user interface.

At last the Arduino gives its output to the led display and we can find the speed and direction of the wind.

SPECIFICATION

1. This project is helpful to measure the direction and speed of wind.
2. This anemometer and wind vane is also useful in various airports and wind power plants.
3. With the help of this project we can save the damage of windmill.
4. Also the wind energy will be properly utilized with the help of this device.
5. Easy to maintain and handling.

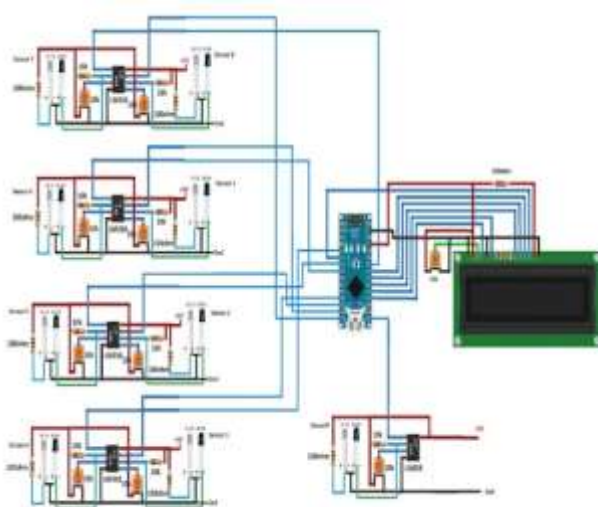


FIG NO 2. SCHEMATIC DIAGRAM

c. Working methodology:-

This project is based on the anemometer and wind vane. The transformer gives the 12volt AC to the rectifier circuit. Rectifier convert the AC supply into DC.

The Infrared sensors sense the rotation of anemometer and send to the Arduino. Arduino convert the rpm of anemometer into speed i.e. km/hr.

Also for wind vane the I.R. sensor sense the movement of wind vane and gives signal to Arduino and Arduino gives the direction of wind.

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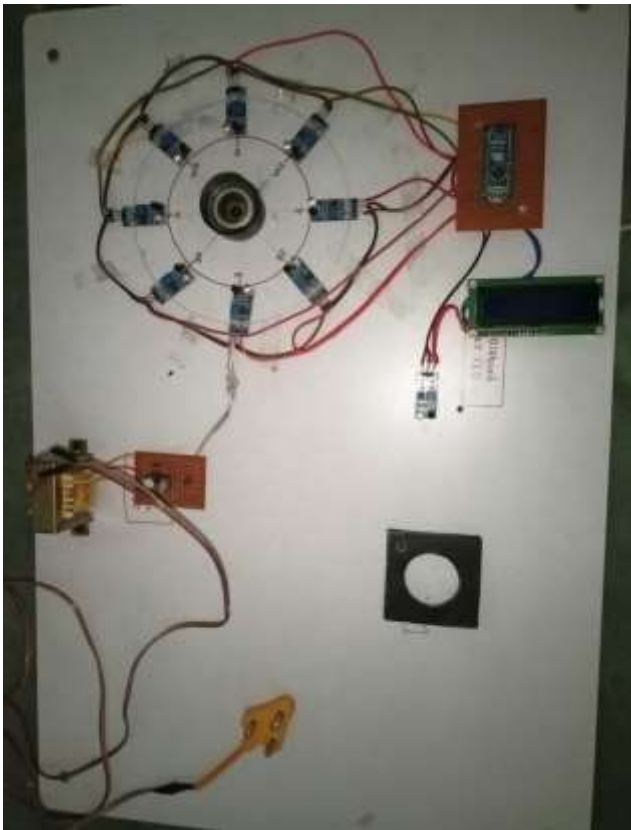


FIG NO 3. CIRCUIT OF THE PROJECT

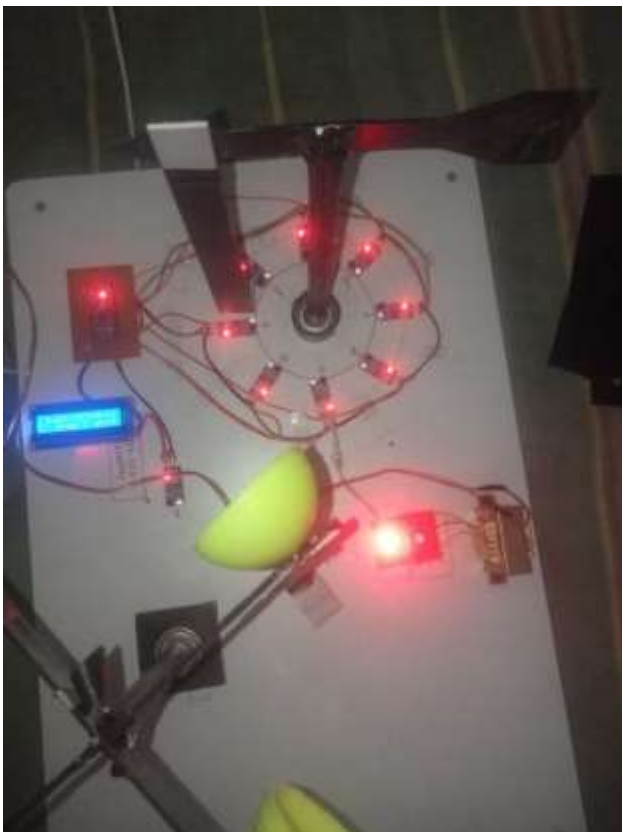


FIG NO 4. ACTUAL STEP OF THE PROJECT

OBSERVATIONS

Anemometer is help to find the wind speed in order to utilise the maximum wind energy. To reduce human efforts and make work easy we make the system automatically. Finding the speed of wind can also be helpful in aerodynamics. Also we can protect the windmill from damage due to heavy winds.

RESULT

This is model of digital anemometer and wind vane. The I.R. sensor sense the rotation and Arduino gives the speed of wind by using this device. We don't need to measure the wind speed and direction manually. This devise will automatically measure it. Also by using this device the large wind mills in wind power plants can be saved from over speeding.

CONCLUSION

An anemometer is an essential part weather forecasting. Wind speed can give certain information of weather which are necessary in the field of aviation, shipping, agricultural field and many more industrial and experimental works. On the basis of design assumption and keeping in mind the objectives of the design, a four-cup digital anemometer was constructed.

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