

Tunnel Fire Safety: Wind Speed Measurement and Alert System

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Abstract:

The breeze is an environmentally friendly power source with different engine instruments and sensors for different wellbeing measures. The breeze has a few observing frameworks like Fire Safety, Measurement, and Alert Systems that are examined in the proposed strategy. Voltage dependability is accomplished when a power framework keeps up with voltage inside functional cutoff points. One more huge test in the activity of a power framework is keeping up with speed and power strength. Wind turbines with variable rates have on a very basic level unexpected powerful way of behaving in comparison to twist turbines with fixed speeds. In factor speed wind turbines, a power electronic converter is utilized to decouple mechanical and electrical lattice frequencies. The temperature sensor detects the temperature level and sends information to Arduino control; assuming that the temperature level is high, an alarm message is sent by means of Zig-honey bee transmitter and showed on the LCD, and the zig-honey bee beneficiary is advised through PC (Personal Computer). Likewise, when power is delivered with a steady estimation, the not set in stone by the weather patterns. The general interaction means to make a no problem at all component for creating a superior environmentally friendly power source.

Keywords: Wind Speed Measurement, Zig-bee, Arduino Control, Zig-Honey bee transmitter and receiver, Tunnel fire alert.

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I. INTRODUCTION

Wind energy is one of the most generally accessible and broadly utilized environmentally friendly power sources. Renewables have risen as the most feasible wellspring of electrical power among the different environmentally friendly power sources, and it is more financially savvy than customary sources. Wind power is one of the most practical environmentally friendly power sources, and in created countries with plentiful breeze assets, the coastal breeze frequently outflanks fossil-fuelled yield. Wind power age has detonated in fame throughout the last ten years, and it is presently generally recognized as a naturally advantageous and practical wellspring of power. Wind speed is isolated into two classifications: prompt and normal. The normal breeze speed north of ten minutes is the normal of the momentary breeze speed. Nonetheless, as recently expressed, wind speed changes persistently, and anemometer reaction qualities impact noticed upsides of immediate breeze speed. The words and units utilized in wind estimation are characterized underneath, with an accentuation on those connected with reaction attributes that influence anemometer execution.

Slow down control lessens the incited drag related with a lift by expanding the place where the general breeze impacts the cutting edges, known as the approach. Slow down control is essentially in light of the fact that it tends to be done latently (it increments when the breeze gets), however it builds the cross-part of the sharp edge towards the breeze, and henceforth the ordinary drag. At the point when a turbine sharp edge is altogether slowed down and halted, the level side of the cutting edges faces decisively into the breeze.

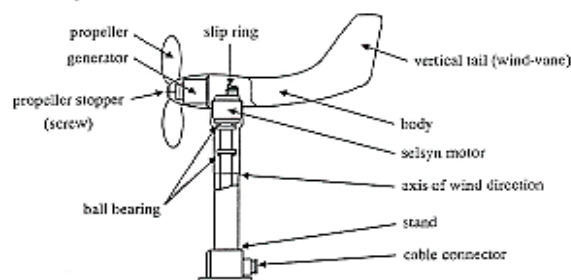


Fig.1 Flow diagram of Wind Turbine System

Whenever the breeze speed surpasses the appraised speed, pitch point control is the most regular technique for changing the breeze turbine's streamlined force. Pitch control isn't utilized to expand age, for example to work at the most proficient working level or to deliver the most elevated measure of power. This provides you with a ton of command over the approach, and consequently the force. The's control will likely broaden the breeze turbine's working reach past the evaluated breeze accelerate to the cut-off speed.

II. LITERATURE SURVEY

R. Liu et al., "A Two-mode Resonant DC-DC Converter for Small-scale Wind Power Generation Systems," 2020 IEEE 9th International Power Electronics and Motion Control Conference (IPEMC2020-ECCE Asia), 2020, pp. 1441-1443. This study proposes a two-mode resonant DC-DC converter. The auxiliary switch allowed the converter to transition between LLC and LLCC modes more easily. To ensure high efficiency, the proposed converter operates in LLC mode at rated conditions. The converter enters LLCC mode as the input voltage rises, ensuring wide voltage gain and built-in over-current protection. The experimental results show that the converter is capable of maintaining the output voltage at its optimum efficiency. Because of its attractive characteristics, it is particularly suited to small-scale wind power generation systems.

Shiyas, P. R., Kumaravel, S., & Ashok, S. (2012). "Fuzzy controlled dual input DC/DC converter for solar-PV/wind hybrid energy system". 2012 IEEE Students' Conference on Electrical, Electronics and Computer Science. To combine the intermittent nature of renewable sources such as solar, wind, and others, a multiple-input power conditioner topology with a Fuzzy controller was developed. To meet the load demand, solar PV and wind generators are used as the principal energy sources, with the multiple input power conditioner providing well-regulated output voltage. The PWM inverter transfers the regulated energy to the load. The topologies of multiple input power conditioners have been mathematically modelled. Dynamic simulation has been carried out using the developed model, and the simulation results are reported in this approach. The proposed fuzzy controller tunes the parameters of the DC/DC converter to get well-regulated output voltage to the load despite the intermittent nature of the source, according to the performance evaluation of the proposed converter.

Sudhakar, C. J., & Joshi, D. R. (2019). "Design of DC-DC converter for wind power application". 2019 Fifth International Conference on Electrical Energy Systems (ICEES). Boost, buck, and buck-boost are three types of power circuitry utilized in switching power supplies. These three topologies handle the majority of power conversion challenges. An uncontrolled DC input voltage is converted to a regulated DC output voltage using DC-DC power converter circuits. By adjusting the duty cycle of the buck-boost converter, it is possible to obtain a voltage that is less or more than the input DC voltage. The DC output voltage has the same polarity as the DC input voltage. As a result, the "Inverting Regulator" is another name for this buck-boost converter. A buck-boost converter is essentially a mixture of both a buck converter and a boost converter circuit. The output to the input conversion ratio of the circuit is as well as the product of the buck converter and boost converter circuit ratios, variables in the output DC voltage can be used to control.

III. EXISTING METHOD

In the current strategy Wind Speed and Wind, Direction technique was created in light of pic microcontroller and ultrasonic sensor. Estimation issues have hampered the advancement of wind energy. The essential issue spins around wind speed and course readings. In many places these days, an anemometer with a vane is utilized to gauge wind speed and bearing. This framework includes hemispherical cups, every one of which is situated toward one side of even arms that are introduced on an upward shaft at right points to one another. Any finish of this framework has air coursing through it, turning the shaft at a precise speed relative to wind speed. The ultrasonic anemometer is an extremely exact and trustworthy instrument for estimating wind speed and bearing. With the defer that relates to the example time, it estimates the shift in twist course. The rule of estimating wind speed with ultrasonic transducers is clear. The speed parts of the breeze stream in a specific breeze course superimpose the speed of sound in ordinary air.

It very well might be unreservedly changed over between LLC mode and LLCC mode by managing the on/off status of the assistant switch. Close to the evaluated point, the proposed converter works in LLC mode. It capacities as a LLCC converter as the info voltage rises, giving a wide voltage gain reach and over-current insurance. The suitable exchanging point is picked after broad trademark correlations are examined. Productive environmentally friendly power has arisen as a potential future energy framework elective. Limited scope wind power age is one of them, and it is habitually utilized because of its low support costs, simplicity of establishment, and high transformation rate. The DC-DC converters, specifically, act as basic point of interaction circuits. The breeze speed can be variable now and again, bringing about a somewhat wide information voltage range.

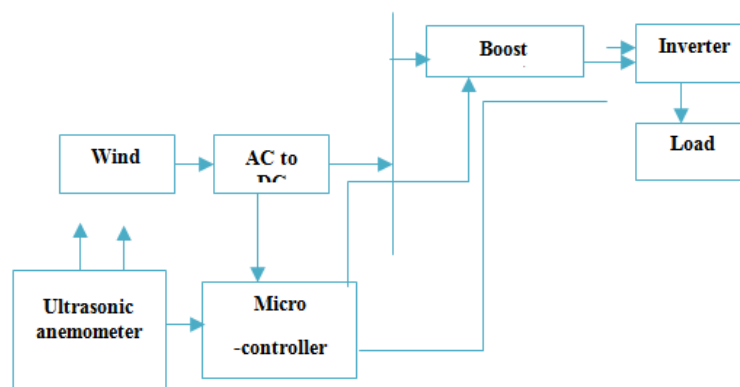


Fig.2 Existing Block Diagram

At the point when utilized in independent mode, an incorporated four-port DC-DC converter is utilized to direct the force of mixture wind and sun powered energy frameworks. The recommended converter has the advantage of utilizing a straightforward design to connect sources with different voltage/current qualities when contrasted with existing four-port DC-DC converters. A half breed energy framework including a Photovoltaic (PV) board, a Wind Turbine Generator (WTG), a battery-powered battery bank, and a heap is planned considering the proposed converter.

As a result of its perfect and elective properties, environmentally friendly power sources, for example, wind and sun oriented energy have drawn a ton of interest. Sun oriented power was the quickest developing wellspring of worldwide energy, as per the International Energy Agency. Nonetheless, in light of the fact that sustainable power is irregular, an energy stockpiling gadget, for example, a battery or different environmentally friendly power sources is often utilized. The age profile of coordinated breeze, sun oriented, and energy capacity framework is better than that of an independent breeze or planetary group. A little power wind energy transformation framework with a stage down Switched-Inductor Hybrid DC-DC converter. The converter has two purposes: it controls the electric generator stacking to keep the breeze turbine at most extreme result, and it charges a powerful thickness supercapacitor that is important for a mixture stockpiling unit that likewise incorporates battery-powered batteries. The converter's consistent state examination in ceaseless and intermittent current modes, which is impossible to miss to this application. The aftereffects of the solidness examination, including the effect of the electrical generator, are accounted for exhaustively. The defined little sign exchange capacity of the control variable can be utilized to rapidly accumulate the data expected to assess the solidness of any comparative Wind Energy Conversion System (WECS). A present regulator were made to accomplish stable activity in constant current mode, and the steadiness was then tried in spasmodic current mode.

In the age of electrical power, wind energy change frameworks are genuinely normal. Wind Energy Conversion System (WECS) mix with the network is a troublesome issue in research spaces. Between the generator side converter and the lattice side inverter, a dc-interface capacitor fills in as a scaffold. A DC interface capacitor's responsibility is to kill voltage swell from the rectifier yield while regulating a consistent voltage as a contribution to the voltage source inverter. A bootstrap converter for a network associated breeze energy transformation framework is introduced in the proposed geography. The bootstrap converter is a buck DC-DC converter in the conventional sense. Utilizing boot capacitors and inductors, the voltage change activity proportion is multiplied. Changing the anode and cathode prompts the lift diode further develops the voltage proportion of the bootstrap converter. By changing the voltage proportion to the inverter in the bootstrap converter, the voltage proportion to the inverter is expanded.

Between the diode span rectifier and the voltage source inverter, there is a DC interface capacitor. PWM exchanging procedures are utilized to change the voltage proportion of the bootstrap circuit. Support inductors and bootstrap capacitors are additionally utilized in the bootstrap circuit to change the voltage proportion. The bootstrap circuit with span game plan is utilized to exhibit the Permanent Magnet Synchronous Generator (PMSG) and Squirrel Cage Induction Generator (SCIG). The bootstrap geography of the Doubly taken care of Induction Generator (DFIG) with span and bridgeless designs is explored.

3.1. Problem Identification:

- The negative impacts resulted from wind power generation including vibration and irritating
- Acoustic noise under a distorted distribution system is still in the stage of exploration.
- Unbalanced and harmonic distortion.
- Need Filtering technique for unbalancing the voltage based on the output.

IV. PROPOSED METHOD

A breeze speed estimation and alert framework in the transmitter area is liable for observing the climate temperature utilizing a temperature sensor, and relying upon the temperature variety, the breeze speed changes naturally. Anything that the temperature changes in the transmitter area are shown on the 16x2 LCD, and it is likewise sent to the collector segment and showed on the PC utilizing Zig-honey bee correspondence. The temperature sensor is associated with the LPC2148 regulator in the transmitter part, and this regulator is responsible for controlling the whole application. Two power supplies are utilized in this task: one is directed 5V for modules and the other is 3.3V for the LPC2148. For voltage guideline, a three-terminal voltage controller is used. The AC result of the optional of 230/12V advance is redressed utilizing an extension type full-wave rectifier. The below block diagram represents the specific requirements with their appropriate connections to build a early warning wind speed alert and measurement system. This is provided with two major sections i.e. Transmitter and Receiver Sections

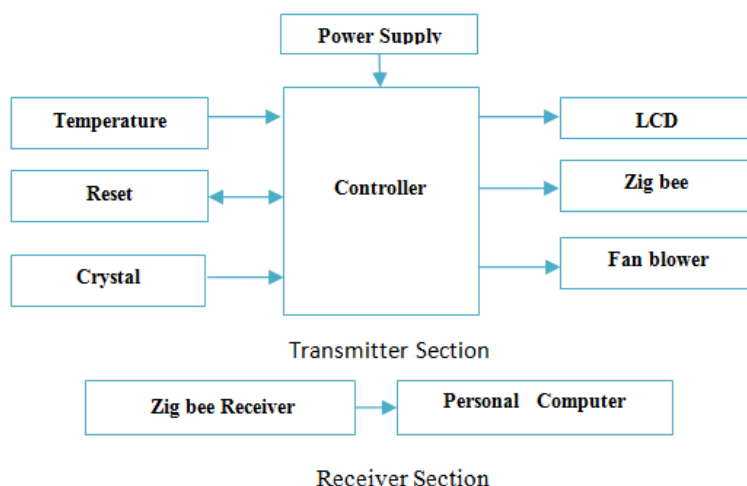


Fig.3 Proposed Block Diagram

4.1. Temperature Sensor:

Since useful mechanical frameworks bring about power misfortune, and influence misfortune will in general increment with the event of a deformity in the framework, because of expanded erosion or lower effectiveness of energy move in the cooling instrument, the temperature can be a solid sign of shortcoming. Thus, the temperature of the part or framework rises, causing an adjustment of warm attributes. Notwithstanding, in light of the fact that functional factors modify framework temperature, the fundamental temperature moving methodology is seldom useful in uncovering likely blames. Albeit the temperature signal has a high enemy of impedance capacity, it is recommended that for a course shortcoming, its straight change pattern can't completely show nonlinear corruption, restricting the data got.

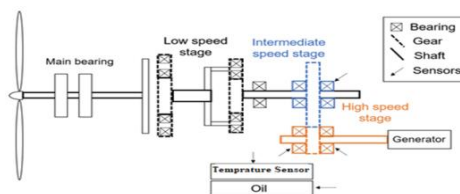


Fig.4 Heat Analysis using Temperature Sensor

Temperature readings were utilized to direct a definite survey of issue discovery. They differentiated research on bearing and stuff disappointments utilizing information from contact sensors and thermography, which is very relevant to this review. The most well-known temperature sensors are contact sensors, and the best analytic technique in the past was to utilize edge values on normal temperatures, yet temperature abnormalities can be affected by an assortment of variables, including oil temperature, encompassing temperature, and other working circumstances. The most common way of deciding edge values can be convoluted, and in the event that not done accurately, can bring about misleading problems or missing disappointment signals. These hardships

were tended to, and certainty spans were produced utilizing a technique in light of likelihood evaluations to survey whether the oil temperature odd.

4.2. Zig-Bee Transmitter and Receiver Section:

A handset is a framework that sends or gets a sign. The improved on block graph of a Radio Frequency (RF) handset. The handset can be parted into the RF front-end part that plays out the transmission and gathering of signs and the computerized part that deals with the sign handling capacities. As a general rule, the RF front-end part is the most eager for power piece of a handset. In the event that we can diminish the power utilization of the frontend part, it will be a critical accomplishment to limit the power utilization of the handset. Subsequently, the general power utilization of the remote gadget can likewise be diminished.

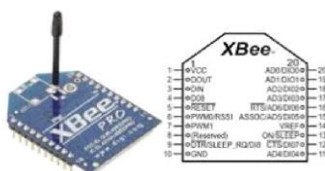


Fig.5 Zig-bee Module

Thusly, the objective of this postulation is to investigate the low voltage plan issues in the RF front-end part of a handset. ZigBee is a remote systems administration standard that characterizes a progression of low-information rate, short-range correspondence conventions. The 868 MHz, 915 MHz, and 2.4 GHz recurrence groups are utilized by ZigBee-based remote gadgets. 250 kilobits each second is the greatest information rate. ZigBee is generally utilized in battery-controlled applications that request a low information rate, modest expense, and long battery duration. This technique explores low-power RFIC plan for different Zig-honey bee Transmitter blocks. Low Pass Filter, Variable Gain Amplifier, up converter Mixer, and Power Amplifier make up a Zig-honey bee RF Transmitter.

4.3. Wireless Communication:

As the names demonstrate, remote correspondence permits information to be communicated between two gadgets without the utilization of a wire or association. A remote console communicates information to a PC without the utilization of a console link, while a PDA sends information to one more telephone without the utilization of a telephone link. Utilizing remote innovation, may change the station on your TV, open and close your carport entryway, and move records starting with one PC then onto the next. Data is moved and gotten in these conditions through electromagnetic energy, regularly known as electromagnetic radiation. The LPC2148 is based on an ARM7TDMI-STM CPU with constant copying and installed follow ability, as well as 128/512 kilobytes of inserted fast blaze memory.

32-digit code execution at greatest clock rate is conceivable because of a 128-bit wide memory point of interaction and an exceptional gas pedal engineering. The elective 16-bit Thumb Mode cuts code by over 30% with irrelevant execution misfortune for fundamental code size applications. These microcontrollers are great for modern control, clinical frameworks, access control, and retail location due to their little 64-pin bundle, low power utilization, and different 32-cycle clocks, 4-channel 10-digit ADC, USB PORT, PWM channels, and 46 GPIO lines with up to 9 outside hinder pins. They're likewise great for correspondence passages, convention converters, and implanted delicate modems, as well as an assortment of other universally useful applications, on account of their wide scope of sequential interchanges interfaces.

4.4. LCD Screen:

The LCD board is partitioned into two lines, each with 16 characters. Each character is comprised of a 5x7 speck framework. The showcase's not entirely set in stone by the power supply voltage and whether the messages are shown in a couple of lines. Subsequently, a variable voltage of 0-Vdd is applied to the Vee pin. Commonly, a trimmer potentiometer is utilized for this reason. Backdrop illumination is remembered for a few showcase models (blue or green diodes). A resistor for current limitation ought to be utilized during activity (like with any LE diode).

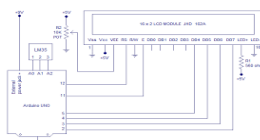


Fig.6 Working of LCD

V. RESULT

With the help of the obtained results, we can conclude that the system continuously senses the speed. This is done automatically and it monitors the rate of speed of the tunnel at every point. When the speed limit reaches more than the desired speed, the system automatically makes an alert by making it work according to meet the fire safety measures.

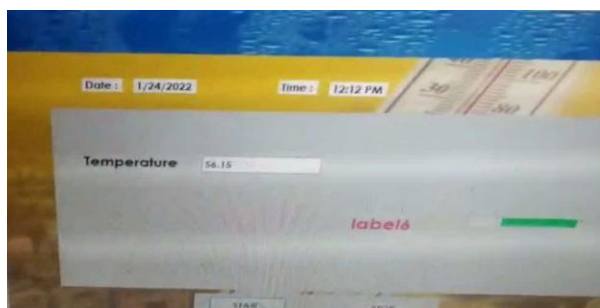


Fig.7 Output from PC

VI. CONCLUSION

The executed frameworks comprise of an Arduino, which fills in as the framework's fundamental handling unit. The regulator can run the sensors to download data from them, and it can play out the investigation utilizing the sensor information. Information portrays a technique for wind speed estimation and ready that might be transferred and kept on a site to work as a data set. Other passage frameworks, for example, fire security and traffic light, benefit from the data given by the framework. The outcomes show the examination of temperature and wind speed on the continuous system and send an alarm through Zig-Transmitter and collector and ready message to the individual gadget. The Wind Speed Measurement examination gives wanted result and better productivity power age on the environmentally friendly power source.

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