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Fabrication of an Advanced Wind Powered Augmented Electric Vehicle

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Abstract:

Power plays an important role in the field of Electronics as automation has created a bigger hype in the electronics. Wind energy has been used since the earliest civilization to grind grain, pump water from deep wells, and power sailboats. The wind turbine has many advantages that make it an attractive energy source, especially in parts of the world where the transmission infrastructure is not fully developed. It is modular and can be installed relatively quickly, so it is easy to match electricity supply and demand.

The fuel – the wind – is free and plentiful, which eliminates or reduces the need to purchase, ship, and store expensive fuels. The presented paper mainly aims in designing a wind powered vehicle which is to control the vehicle (robot) using the wireless remote with RF technology. The Robot is powered using the wind energy. As it is a wireless Robot it can be easily mobilized and can be controlled very easily.

Keywords:

Wind turbine, DC motors, wireless RF transmitter and receiver modules, HT12D, HT12E.

I INTRODUCTION:

Wind-powered mechanical vehicles primarily use wind turbines installed at a strategic point of the vehicle. The wind power, which is converted into mechanical energy through gears, belts or chains, causes the vehicle to propel forward. While they are not in mainstream use yet, many schools have begun building the new technology and research into their curricula to teach students and to get them active in the subject. Seagoing electric propulsion where the electricity is derived from the kite subassembly is an ongoing activity by KitVes.

Wind-powered vehicles have traditionally been associated with seafaring vehicles that, until the advent of steam engines, relied primarily upon winds which were used to drive the sails of such vehicles to their destinations. In the Western world, such sail-based wind propulsion on water persists in the modern day within primarily leisurely activities, such as sailing boats, ships, yachting, and windsurfing. A special case is ice yachting on ice-covered water. Terrestrial sail-based wind propulsion in the form of land sailing and land windsurfing are also popular recreational activities. A wind turbine is a device that converts kinetic energy from the wind, also called wind energy, into mechanical energy; a process known as wind power. If the mechanical energy is used to produce electricity, the device may be called a wind turbine or wind power plant.

If the mechanical energy is used to drive machinery, such as for grinding grain or pumping water, the device is called a windmill or wind pump. Similarly, it may be referred to as a wind charger when used for charging batteries.The result of over a millennium of windmill development and modern engineering, today's wind turbines are manufactured in a wide range of vertical and horizontal axis types. The smallest turbines are used for applications such as battery charging or auxiliary power on boats; while large grid-connected arrays of turbines are becoming an increasingly important source of wind power-produced commercial electricity.

II. RELATED WORK:

This technical improvement together with the need for high performance wind energy and its applications for electric vehicle created faster, more accurate and more intelligent advanced power control algorithms. This project describes a new economical solution for a filtered wind power for vehicle integrated control systems.

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Fig I: Model of Wind power Electric vehicle

The paper presents a system which mainly consists of wind turbine which is installed on the robotic vehicle, which in turn connected to a generator. The energy generated is regulated to the battery charging voltage and given to battery. The battery gets charged up from the wind energy. The battery is used to power up the robotic vehicle and peripherals connected to it. The controlling device of the Robotic vehicle is a Microcontroller. RF Communication ranges in between 30 KHz to 300 GHz. RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength. Each button in the RF remote transmits different data which will be received by RF receiver. The RF receiver feds the data to Microcontroller and Microcontroller acts on the dc motors to control the directions. The Microcontroller is loaded with an intelligent program written in embedded 'C' language.

FABRICATION OF WIND ENERGY VEHICLE

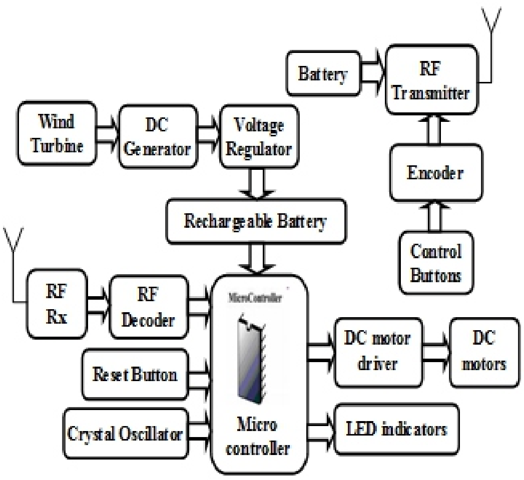

Fig II: Block diagram of working model

This proposed system results in a device where the electricity is transmitted through wind turbine. The types of Wind turbines used for electric vehicles:

Horizontal axis Wind Turbine:

Horizontal-axis wind turbines (HAWT) have the main rotor shaft and electrical generator at the top of a tower, and must be pointed into the wind. Small turbines are pointed by a simple wind vane, while large turbines generally use a wind sensor coupled with a servo motor. Most have a gearbox, which turns the slow rotation of the blades into a quicker rotation that is more suitable to drive an electrical generator.Since a tower produces turbulence behind it, the turbine is usually positioned upwind of its supporting tower. Turbine blades are made stiff to prevent the blades from being pushed into the tower by high winds. Additionally, the blades are placed a considerable distance in front of the tower and are sometimes tilted forward into the wind a small amount.Downwind machines have been built, despite the problem of turbulence (mast wake), because they don't need an additional mechanism for keeping them in line with the wind, and because in high winds the blades can be allowed to bend which reduces their swept area and thus their wind resistance. Since cyclical (that is repetitive) turbulence may lead to fatigue failures, most HAWTs are of upwind design.

Turbines used in wind farms for commercial production of electric power are usually three-bladed and pointed into the wind by computer-controlled motors. These have high tip speeds of over 320 km/h (200 mph), high efficiency, and low torque ripple, which contribute to good reliability. The blades are usually colored white for daytime visibility by aircraft and range in length from 20 to 40 metres (66 to 130 ft) or more. The tubular steel towers range from 60 to 90 metres (200 to 300 ft) tall. The blades rotate at 10 to 22 revolutions per minute. At 22 rotations per minute the tip speed exceeds 90 metres per second (300 ft/s). A gear box is commonly used for stepping up the speed of the generator, although designs may also use direct drive of an annular generator. Some models operate at constant speed, but more energy can be collected by variable-speed turbines which use a solid-state power converter to interface to the transmission system. All turbines are equipped with protective features to avoid damage at high wind speeds, by feathering the blades into the wind which ceases their rotation, supplemented by brakes.

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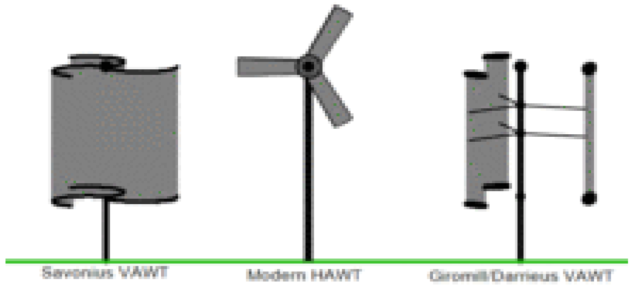

Fig III: Figure of Horizontal axis wind turbine

Vertical axis design:

Vertical-axis wind turbines (or VAWTs) have the main rotor shaft arranged vertically. Key advantages of this arrangement are that the turbine does not need to be pointed into the wind to be effective. This is an advantage on sites where the wind direction is highly variable, for example when integrated into buildings.

The key disadvantages include the low rotational speed with the consequential higher torque and hence higher cost of the drive train, the inherently lower power coefficient, the 360 degree rotation of the aerofoil within the wind flow during each cycle and hence the highly dynamic loading on the blade, the pulsating torque generated by some rotor designs on the drive train, and the difficulty of modelling the wind flow accurately and hence the challenges of analysing and designing the rotor prior to fabricating a prototype.

With a vertical axis, the generator and gearbox can be placed near the ground, using a direct drive from the rotor assembly to the ground-based gearbox, hence improving accessibility for maintenance.When a turbine is mounted on a rooftop, the building generally redirects wind over the roof and this can double the wind speed at the turbine.

If the height of the rooftop mounted turbine tower is approximately 50% of the building height, this is near the optimum for maximum wind energy and minimum wind turbulence. It should be borne in mind that wind speeds within the built environment are generally much lower than at exposed rural sites, noise may be a concern and an existing structure may not adequately resist the additional stress.

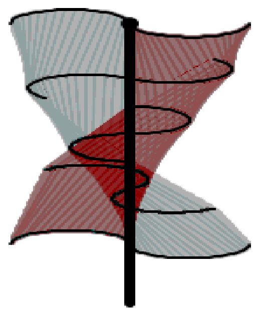

Fig IV: Figure of Vertical axis wind turbine

III. HARDWARE DESIGN FOR PROPOSED METHODOLOGY:

The portable Electric vehicle with wind power is used To fulfill the objectives of the proposed idea we need to understand the basic elements of few electronics like Wind turbine design, DC motors, RF transmitter and receiver modules, PIC microcontroller, charging circuit, rechargeable battery, turbine blades etc.

a. Control buttons:

In the proposed model the direction of wind turbine can be changes using control buttons. A push-button or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.

The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons require a spring to return to their un-pushed state. Different people use different terms for the “pushing” of the button, such as press, depress, mash, and punch.

Fig V: Image of push button

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b. RF transmitter and receiver modules

RF TRANSMITTER:

To change the directions of the wind turbine model for electric vehicle we use RF transmitter for sending the data from controlling section. The ST-TX01-ASK is an ASK Hybrid transmitter module which is an effective low cost, small size, and simple-to-use for designing with a frequency Range 315 / 433.92 MHZ, Supply Voltage 3~12V, Output Power 4~16dBm used for Remote Keyless Entry (RKE), Remote Lighting Controls, Remote controls, Automation systems.

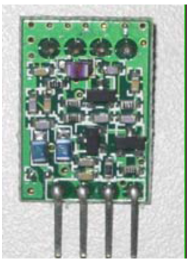

Fig VI: 315/434 MHz TRANSMITTER

RF RECEIVER:

The Electric vehicle is interfaced with receiver module and sends the inputs signal received from transmitter to the microcontroller for controlling DC motors of the vehicle.

The STR-433 is ideal for short-range remote control applications where cost is a primary concern. The receiver module requires no external RF components except for the antenna.

The super-regenerative design exhibits exceptional sensitivity at a very low cost. The manufacturing-friendly SIP style package and low-cost make the STR-433 suitable for high volume low power consumption, easy for applications.

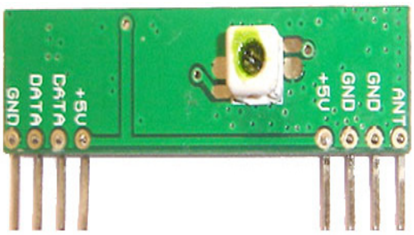

Fig VII: 315/434 MHz RECEIVER

c. PIC Microcontroller:

This project makes use of an onboard computer, which is commonly termed as micro controller. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions. PIC stands for Peripheral Interface Controller given by Microchip Technology to identify its single-chip microcontrollers. These devices have been very successful in 8-bit microcontrollers with Low, mid, high range power crystal oscillators, along with Programmable timers, on-chip ADC, Up to 12 independent interrupt sources, Powerful output pin control 25mA, EPROM/OTP/ROM/Flash memory option, I/O port expansion capability.

Fig VIII: PIC Microcontroller

d. DC motors :

The Microcontroller checks the data with the program embedded in it and performs appropriate actions on the wind turbine interfaced with the Electric vehicle. We are using H-Bridge as a DC motor driver. .

This data will be received by the RF receiver module in the robot system and feds this as input to Microcontroller which judges the relevant task to the information received and acts accordingly.

So the Electric vehicle directions can be controlled indirectly when the wind turbine changes the specified directions by the user. An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction.

These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards.

IV. CONCLUSION:

In conclusion this paper has provided an initial analysis into a new era of implementing an integrated wind powered electric vehicle with wireless RF technology and provided realistic opportunity for system optimization and green transportation. This technical improvement together with the need for high performance wind energy based moving of vehicles created faster, more accurate and more intelligent and advanced power control algorithms. The Electric vehicle or Robot was powered using the wind energy. As it.

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