Small-Scale Wind Energy: Arduino for the Generation of Wind Energy

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The increasing demand for energy and the environmental impact of fossil fuels have driven the need for renewable energy sources. This investigation was conducted on wind energy, incorporating an Arduino board and a fully functional homemade turbine. The turbine was built using simple materials such as cardboard, wooden sticks, and a small motor. To test the system, three wind sources a hair dryer, a fan, and natural wind were used to rotate the turbine and generate electricity. Before proceeding with the experiment, the Arduino code was verified in Tinkercad to ensure its correct operation. The hypothesis stated that if the generator connected to the turbine rotated due to the different wind sources, then the direct current (DC) motor, linked to the Arduino board via copper wires, would illuminate an LED without the need for batteries or external power sources. To evaluate the results, the voltages produced by each wind source were measured using a voltmeter in Tinkercad. The observations revealed that natural wind generated the highest voltage, followed by the fan, while the hair dryer produced the lowest voltage. Additionally, in further tests, the system successfully powered up to three LEDs simultaneously, demonstrating its capacity to supply energy to small devices. These results confirmed the feasibility of the design and the effective utilization of wind energy, even under controlled conditions. As a future improvement, modifications to the Arduino code were proposed to incorporate additional electronic components, such as buzzers or counters. Additionally, the exploration of larger and more efficient turbine designs was suggested to enhance energy generation.

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