

A Novel Device to Measure the Speed of a Rodent Wheel

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Abstract. A useful device to measure the speed of the rotation of a rodent wheel was created. Six magnets were equally spaced around the diameter of the exterior of the plastic rodent wheel. As the wheel rotated, the magnets broke the plane of a 100-turn 8.5 cm copper coil. Peak voltage across the coil, as measured with an oscilloscope, was proportional to the estimated rotational speed. The rotational speed was measured with a stop watch and recorded peak voltage on every trial. Based on this data, a graph was developed which came out to be in a linear response. Peak voltage (mV) was approximately 20 times the rotational speed (cycles per second).

Keywords: engineering, rodent wheel, mouse running, generator, energy measure device.

INTRODUCTION

A device was developed that measures the speed of rotation a rodent wheel. This device is similar to devices that are used to generate electricity from a bicycle. Because of the design of the rodent wheel, this device has a lot of flexibility. The device could also be adaptable to gymnasium exercycles to generate clean electricity for the health club. For example, Butcher's stationary bike is hooked up with a generator so it doesn't only work as an exercise machine, but also as a power plant [1].

METHODS

Six magnets equally spaced and glued around the diameter of the rodent wheel which is 12 centimeters. A coil of 30 gauge copper wire (insulated with shellac) was wound and placed near the wheel such that the magnets broke the plane of the 8.5-cm diameter coil (Figure 1). A stop watch was used to time the number of revolutions for various speeds of rotation. For each rotational speed, the peak voltage displayed on an oscilloscope (Figure 1) was recorded. The data was graphed.

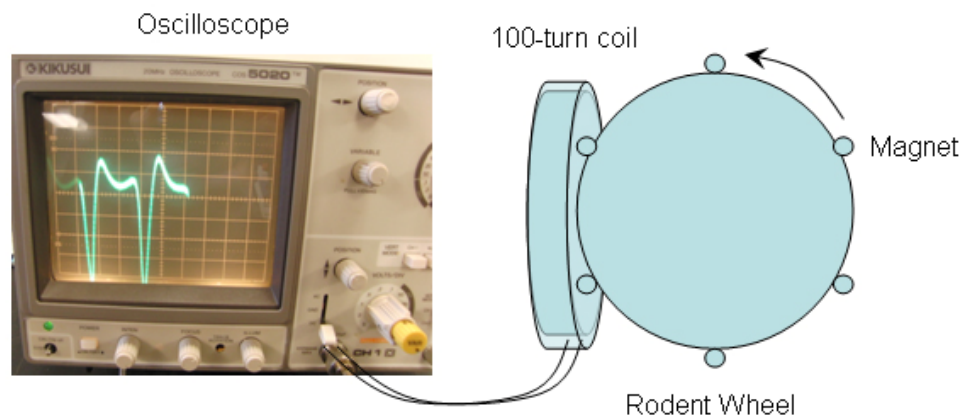


Figure 1. Schematic drawing of a Rodent sensor. 100-turn of copper coil. 6 magnets spread equally

RESULTS

The data was plotted on a graph and it came out to be in a linear response (Figure 2). The peak voltage in mV is approximately 20 times the rotation speed in cycles per second.

DISCUSSION

This rodent wheel has the ability, through magnetic induction, to provide variable resistance to rodent motion. The wheel has a limit in the number of magnets that were spread equally around it. Other limits are: expensiveness of magnets and copper. It is potentially capable of providing feedback to the rodent, for example, the brightness of a light when spinning. For future research I would like to replace the oscilloscope for a custom inexpensive peak voltage meter. Also instead of recording peak voltage by measuring the rotational speed with a stopwatch, I can record the time between pulses on the oscilloscope [4]. Energy stored in battery form can act as a supplemental energy source for battery banks that may already be used for wind, hydro and photovoltaic systems [2].

CONCLUSIONS

The rodent generator is a useful device. It doesn't need an external source of power. This device generates energy as long as the mouse keeps running. It has a linear response. The generator is adaptable to other kind of wheels.

Rodent Wheel Calibration

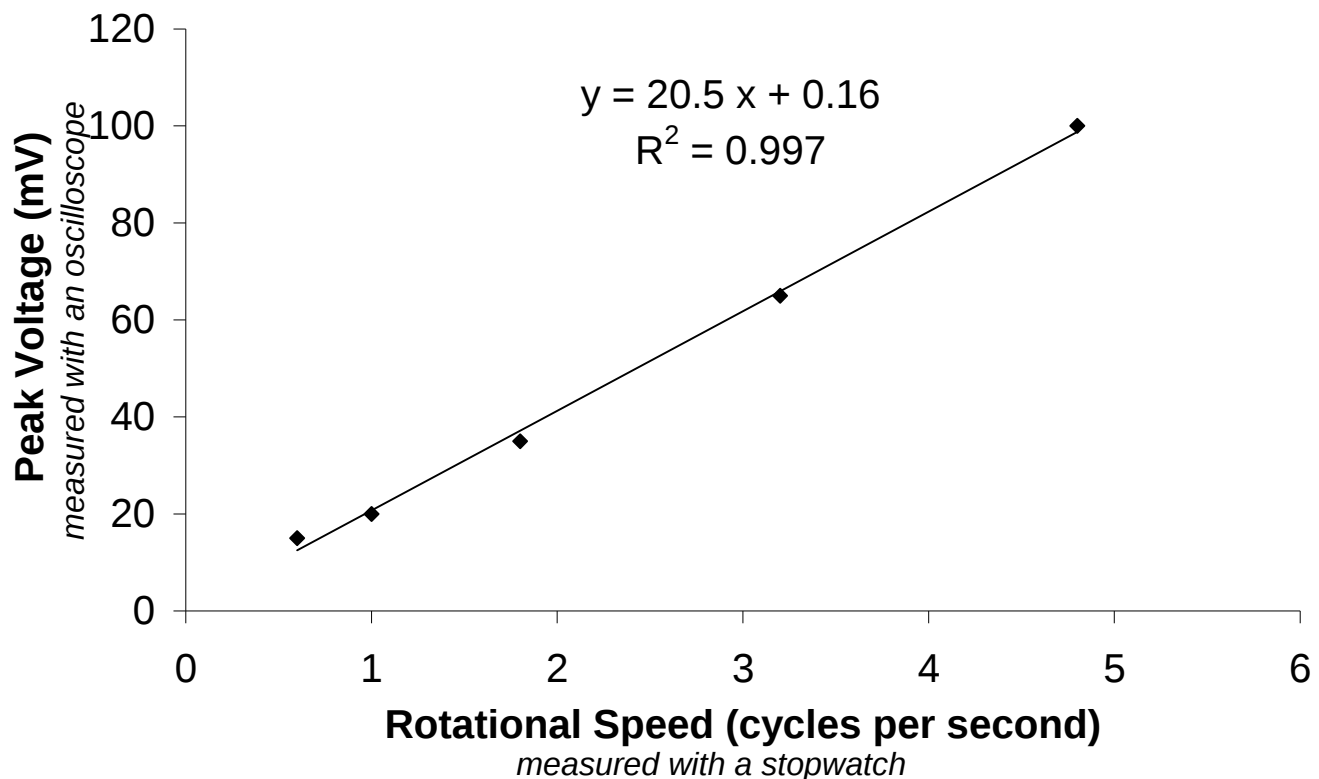


Figure 2. On the vertical axis is peak voltage measure in units of milivolts on an oscilloscope. On the horizontal axis is the rotational speed at which the wheel made a revolution. A linear trend line was fit in Microsoft Excel.

ACKNOWLEDGMENTS

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