



Power Lab Kit

Baton Rouge Magnet High School Service Learning Project
LSU College of Engineering: Division of Electrical and Computer Engineering
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Problem Statement

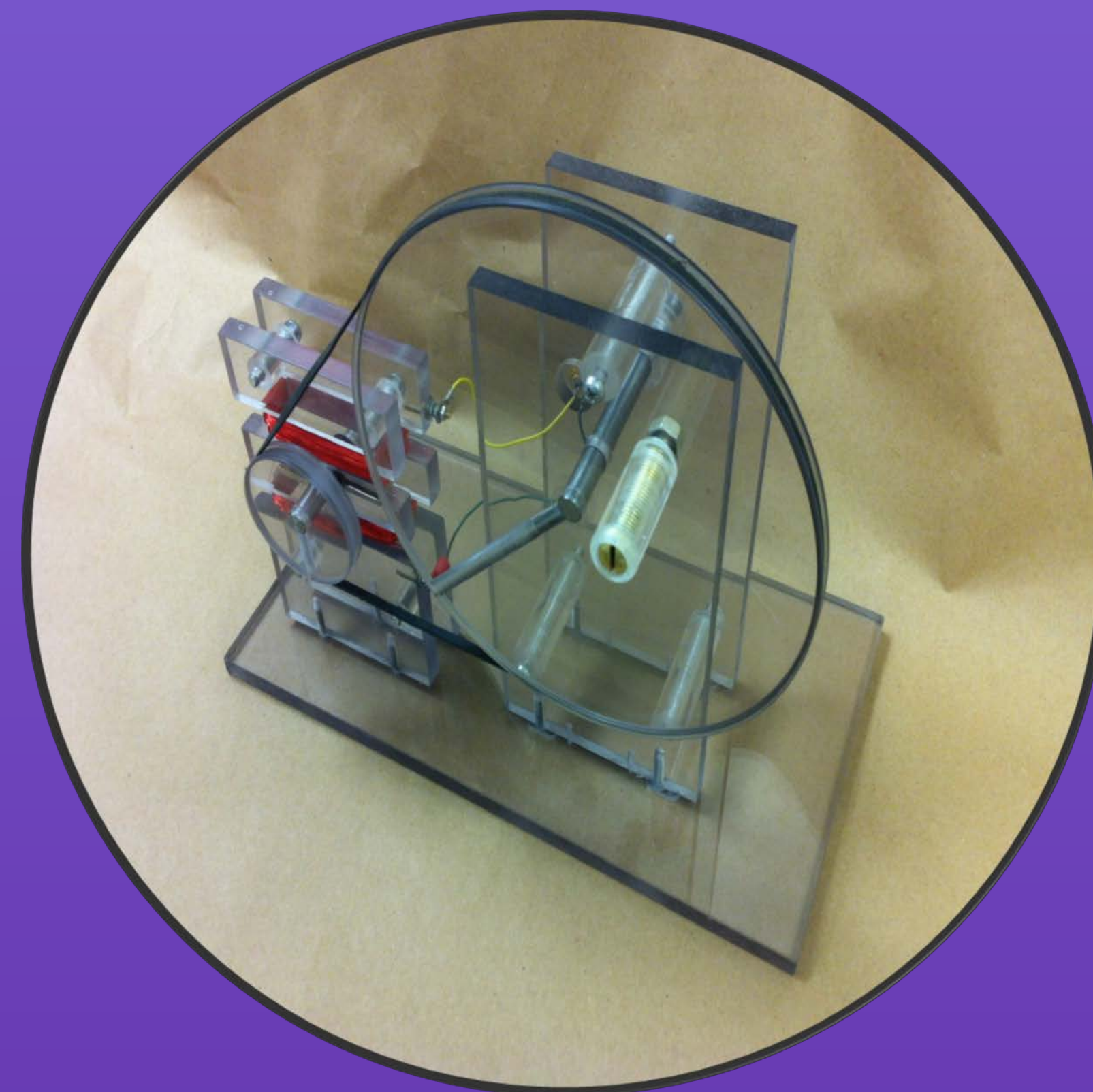
A system is needed to provide a hands-on teaching method of multiple renewable energy sources to high school students to further encourage their interest in STEM related topics. Nearly 60 percent of students who were interested in STEM related fields at the beginning of their high school career lost interest by the time they reached graduation.

Mission Objectives

- To demonstrate clean energy principles to high school students
- To promote STEM programs to future college students
- To engage students in hands-on learning of various energy concepts related to the East Baton Rouge Parish High school physics curriculum
- To implement a microcontroller to display the relevant power equations associated with the different energy sources

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MicroModule

The MicroModule contains a solar panel which will charge a battery for portable use. The solar panel will also be used to give power readings to display the energy from the sun. It also contains a microcontroller and measurement circuit, which are used to acquire power values from the different sources and display them to an LCD screen. The source to be displayed is selected using a keypad.



Spin Lever

The spin lever incorporates a lever that can be vertically operated in order to spin a generator due to the centrifugal motion of the flywheel. While the hand crank shows the basic principle of rotational motion through the use of pulleys, the spin lever displays how forces exerted on the system can effect the amount of power produced with the presence of gears.

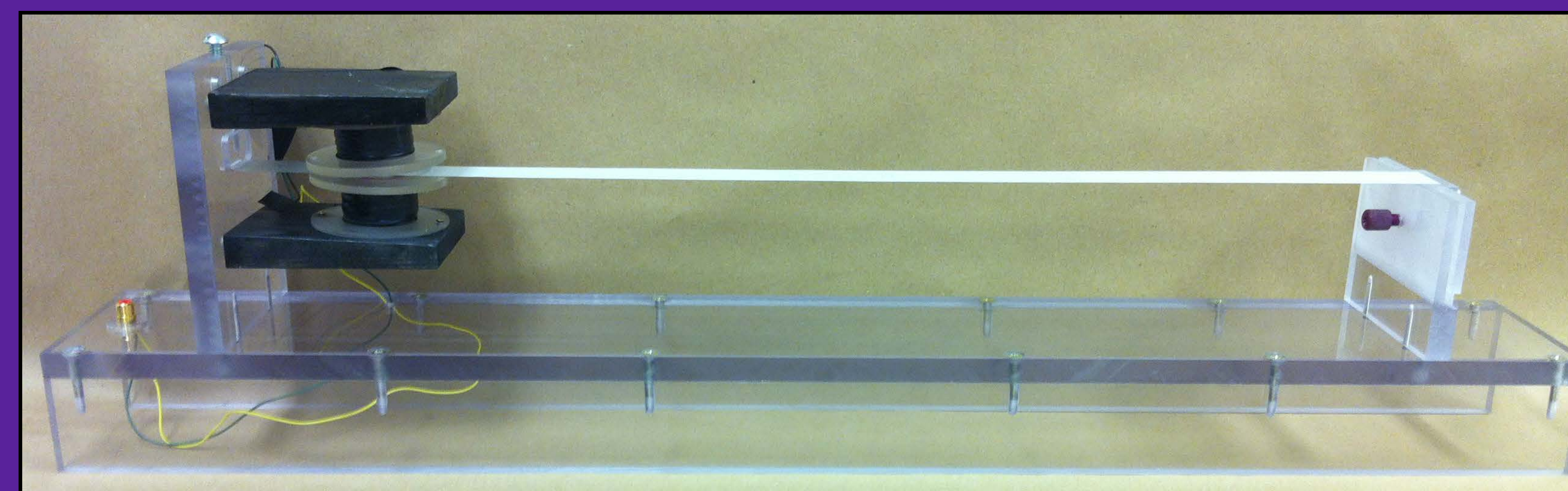


Hand Crank

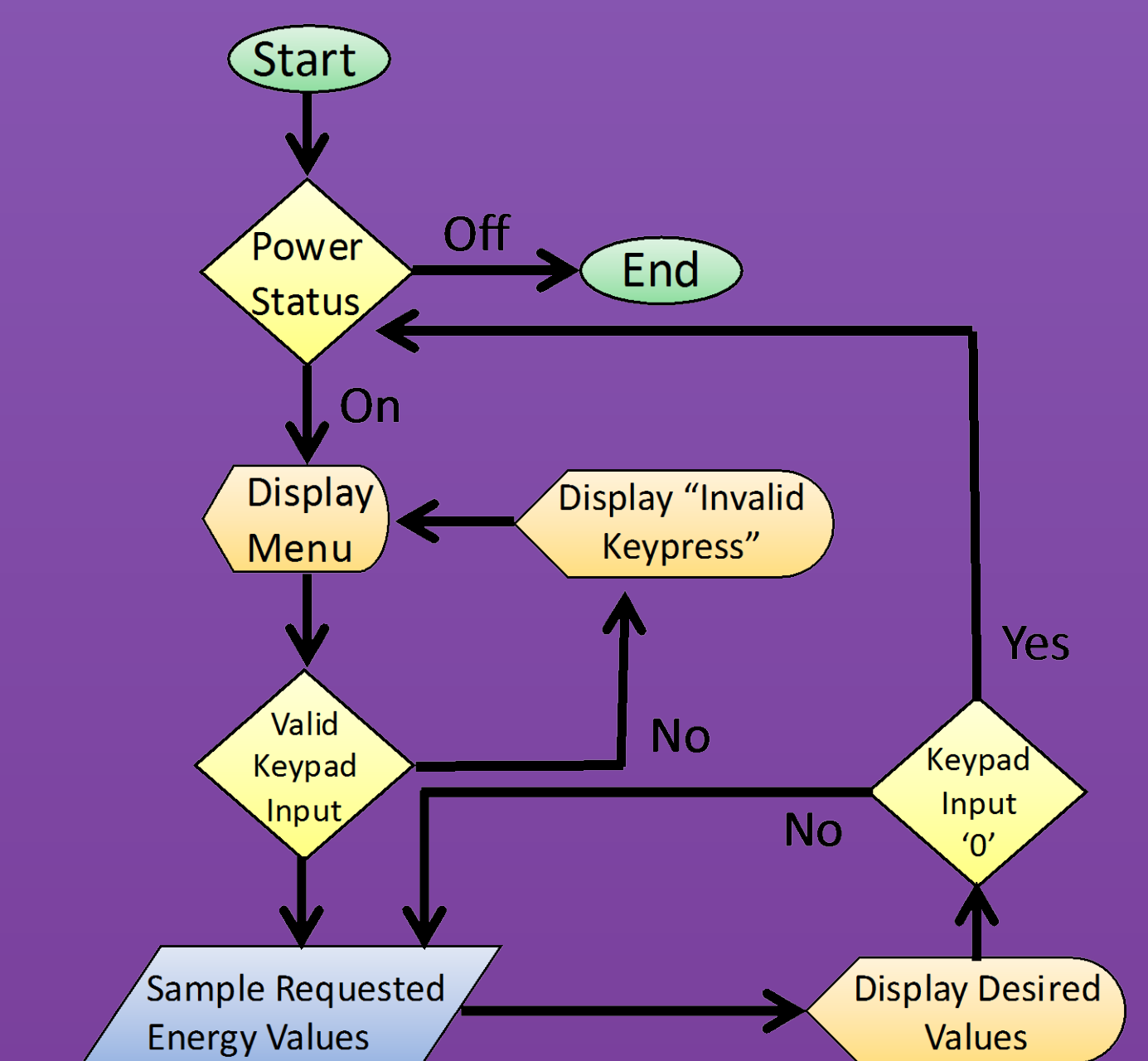
The hand crank module contains visible magnets with the visible coils of wire. The rotational motion of the magnets is also visible. We created a simple visible generator which allowed the students to have a basic understanding of power generation principles.

Windbelt

The windbelt is a new form of wind energy that uses minimal amounts of wind to produce power. Two magnets are attached to a belt that flutters when hit by wind. The flutter causes the two magnets to vibrate between a set of copper coils. This process creates an electric charge which produces an AC current.



System Overview



Results

- A microcontroller was implemented to display acquired values on an LCD screen as well as take user input from a keypad
- Output of the sources was accurately measured within a $\pm 0.5\%$ margin of error
- All electrical components are safely contained in a Lexan box
- An operating manual that includes safety procedures and potential hazards was authored
- An lab manual containing physics related experiments was created to accompany the kit

Conclusion

We successfully created a modular lab kit that demonstrates three different sources of renewable energy: solar, mechanical, and wind. Each module interconnects with the MicroModule in order to measure and display their respective power outputs. The lab kit will be used to demonstrate physics principles to Baton Rouge Magnet High.