



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title
Is It Possible to Levitate an Object Using the Principle of Magnetic Levitation?

Abstract

Objectives/Goals
The purpose of my experiment is to determine if it is possible to suspend an object in space using the principals of magnetic levitation. My plan is to attempt this using both permanent magnets and electromagnets. I will try to make a hemispherical magnetic field by ling a ceramic potting bowl with magnets displaying like poles. My design involving the electromagnet is to drive a coil with a pulse width modulated signal. My approach is to use a Hall effects sensor to detect the presence of the suspended objects magnetic field. This will automatically change the polarity of the coil to compensate for the floating objects altitude. Basically the electromagnet will repel the object if it becomes to close to the Hall effects sensor, and change its polarity to attract the object if it begins to drift away from the coil.

Methods/Materials
Soldering Iron
Roll of Solder
Honeywell high performance SS495A (U2) Hall Effect Sensor
Micrel MIC502 (U3) Fan Management IC PWM controller
LMD18201 (U4) Motor H-Bridge w/ heat sync
Etched circuit card supplied by ART-TEC
LED light bulb
80 Ohm ferrous core solenoid coil (electromagnet)
1 cm x 1.75 cm permanent magnets (ceramic)
1 cm round neodymium magnets
12vdc power supply
6# ceramic potting dish
36# shoelace
6# length of 1# aluminum angle stock.

Conclusions/Discussion
After completing this experiment, I have determined that it is in fact possible to suspend an object in space using the principals of magnetic levitation. Using the Hall Effect sensor to control the polarity and power of the electromagnet was much easier to levitate an object than the hemispherical permanent magnet design. When trying to balance an object on the permanent magnet structure, it had the tendency to topple over. The object being levitated by the electromagnet would remain vertical and completely suspended with much less effort than the permanent magnet structure.

Summary Statement
Using a self adjusting, reversible polarity, pulsewidth modulated circuit to control an electromagnet.

Help Received