Self Setting LED clock with Swinging Display

Senior Project Proposal
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**Introduction:** For thousands of years people have been fascinated with, and slaves to, time. Ancient cultures from around the world developed unique systems to track the cycles that govern Earth’s seasons. From ancient Egyptian sundials to the high precision of today’s Cesium atomic clock, we have developed into a society that depends on the accurate measure of time. I propose to satisfy this dependency by combining existing technologies into new type of clock. This clock will be intriguing, stylish and extremely accurate.

**Description:** The style and intrigue of my proposed clock will come from the way the time is displayed. A series of vertically mounted LEDs (light emitting diodes) will swing back and forth through the air. With each pass, the LEDs will be turned on and off with precise timing to create the illusion of numbers floating in mid air. This illusion is created by a phenomenon known as “Persistence of Vision.”

Sir Isaac Newton recognized this phenomenon and wrote, in Book I of his treatise on Optics, "When a coal of fire moved nimbly in the circumference of a circle makes the whole circumference appear like a circle of fire, is it not because the motions excited in the bottom of the eye by the rays of light are of a lasting nature, and continue till the coal of fire, in going round, returns to its former place?" All around us, from computer monitors to overhead lighting, the phenomenon known as “Persistence of Vision” causes rapidly flashing lights to appear continuous.

The precise timing of the flashing LEDs that make up the floating display of this clock will be carried out using a Motorola MC9S12 series microcontroller. The versatility of
this type of display would allow for the date or even brief reminders such as “Dad’s Birthday” or “Happy Anniversary” to be displayed.

In order to ensure the precise accuracy of my proposed clock, it will set itself by synchronizing with the National Institute of Standards and Technology’s signal that is broadcast from the WWVB radio station in Fort Collins, CO. This signal, available throughout most of North and Central America, is broadcast at a rate of one bit per second and repeats every minute. The signal contains data for the time of day (sent as Coordinated Universal Time or UTC), the date, and various flags for events such as a leap year or daylight savings time. Figure 1 shows the basic block diagram of this project.
**Benefits:** There are numerous benefits of my proposed project. There is a high degree of entertainment value in a clock that appears to float in the air. It would quickly become a conversation piece for new clients, friends, or neighbors. The display is easy to read during day or nighttime hours from bed or from across the room. The greatest benefit, however, comes from the self setting aspect of this clock. Never again will its owner be late for work because a power outage during the night reset the bedroom clock. An accurate timepiece is an asset to any household and this clock will display the time standard for the entire world.

**Market Comparison:** There are currently a few “Persistence of Vision” clocks available on the market today. They sell for anywhere from $40 to $70 and none of them have the ability to set themselves. There are hundreds of clocks available, from wall clocks to wrist watches, that set themselves using the WWVB signal, but none of them have the novelty of a swinging display. To my knowledge, this will be the first time that these two technologies are joined in a single device.

**Project Development and Demonstration:** This project will be developed using existing electrical components. The case will require a unique design that is attractive and that fits with the unique theme of this clock. Most of the physical development and assembly will be carried out at my home where I have the necessary tools at my disposal. The software design will be completed in the Ross Engineering Technology building at Western Washington University – Room 340. A working prototype will be on display in this same room in June of 2005.