

University of Connecticut
Electrical and Computer Engineering
ECE 290 Fall 2006

Remote Controlled Scoreboard

Written Proposal

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Background:

A scoreboard is a device that allows the spectators and players to be able to know the score at every point in the game. This is critical to competition as teams usually strategize their game play based on key factors related to the information displayed on the scoreboard such as the time remaining in the game, which team is in the lead, and by how many points? In order for this information to be current and easily updateable it is best that the scoreboard be remote controlled. There are many types of remote controlled scoreboards. Some are used in professional stadiums to display the score and have special effects where they can even show instant replays to thousands of fans. Other scoreboards are used for high school athletics and displays basic information such as the score, time and period. Our scoreboard is going to follow the simplified design of a clock, home and away score and a period. This will not only be power and cost efficient but will allow for us to create a scoreboard that is portable and can be used for multiple sports as well. This is because the parameters specified are shared among many sports mainly baseball, soccer and football.

Technical:

To create a fully functional scoreboard there are many technical issues; they are the layout of the scoreboard, the method of communicating the data and the way in which that data is then displayed. These issues coupled with other design factors such as visibility and power dissipation will be addressed as follows.

The layout of the scoreboard is shown in Figure 1. The clock will display from 99:99 to 0 and each of the digits for the home and away score will display from 99 to 0. The period will display from 9 to 0. This layout was chosen because it contains all of the parameters common to the main



Figure 1

sports (baseball, soccer, and football) that the scoreboard is being designed for.

The way in which we choose to communicate the data from the remote control to the scoreboard is via infrared. However, infrared typically transmits around 20ft and our target length to transfer the data is ~250ft. Shown below in Figure 2 is the block diagram layout of how we hope to overcome this problem.

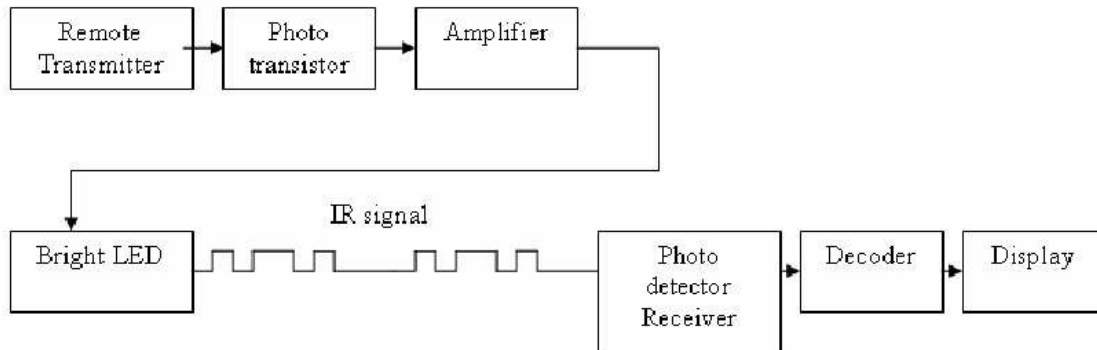


Figure 2

Once the data is sent and received it is then decoded by a microcontroller. The microcontroller will then address the information to the appropriate destination. For example if the user enters a home score of 6 into the keypad that information will then need to be encoded, transmitted, received and then decoded so that the Home team receives 6 points. This is essential to the functionality to the scoreboard because without addressing there is no way to tell the data where it should be displayed. In the aforementioned example this would mean that the 6 points could end up being displayed in the period or away team score and maybe not even be displayed at all without proper addressing.

Electromagnetic Spectrum

The electromagnetic spectrum is important because of the range of wavelengths being used in the creation of the scoreboard. The scoreboard will have both visible light as well as infrared light. On the electromagnetic spectrum, visible light ranges from 380 nm to 750 nm. Infrared light covers from 750nm to 1mm.

Visible Light

The human eye interprets colors based on the rods and cones in the retina. Rods distinguish black and white while the cones distinguish color and have a faster response to time. Of all the colors in the visible light spectrum, red has the widest range. Red ranges from about 620nm to 750nm. Because the faster response time to color and red having the widest range on the visible light spectrum signals requiring immediate responses such as traffic lights signaling stop and the break lights of a vehicle are red.

Based on information about the visible light spectrum and the tendencies of the human eye we choose to have the numbers on the scoreboard displayed in red. Our objective is to construct the display so the numbers will be visible from 300 feet away. This is potentially the furthest the scoreboard would be mounted from the spectators on a playing field or gymnasium.

Infrared Light

Infrared light will be used to transmit the digital signal to the scoreboard. A few ways to transmit the digital signal to the scoreboard is the use of multiple IR LED's to increase power, use high wattage IR LED consisting of about one watt, or use of an amplifying lens. The IR LED that will be used ranges between 850nm to 950nm with an acute angle to increase beam strength.

Scoreboard Display

Displaying the numbers on the scoreboard will be implemented using a standard 7 segment display. This display breaks down a number into 7 segments, identical to the one used in digital clocks. In order to display the desired number, each of the segments lights up according to the particular number. Each of these segments has an address which typically runs 'a' through 'g'. Each of these segments will be lit using 3 to 4 high intensity LED's, which will be shown through some kind of light filter so that the light is blended together to appear as one segment.

Timeline:

Our current time line was created for the Fall 2006 semester only. It is broken up into two main sections: "Presentation" and "Design". Under "Presentation" falls our written documentation, such as our project statement, project specifications, etc. Under "Design" falls our research, the ordering of parts, proof of concept, etc. The timeline was created in the hopes to give our group a cushion if needed. We hope to get ahead of our timeline, that way if any unforeseen obstacles appear we will have the time to deal with them without falling behind. Our Time line can be seen below.

Senior Design Timeline - Fall 2006				
	September	October	November	December
Presentation				
Project Statement	█			
Project Specs		█		
Oral Presentations		█		█
Written Proposal			█	
Design				
Research	█	█	█	█
Order Parts			█	█
Proof of Concept			█	█

Budget:

At the moment our group has a loose working budget. We over estimated the cost of things so that we will not run into a money issue. Our limit for this project is set at \$1,000.00. The budget can be seen below.

Budget		
Device	Quantity	Price
Microcontrollers		\$20
Red LED's		\$125
Remote		\$15
Battery		\$250
Battery Recharger		\$0 (donation)
Circuit Items		\$150
Raw Materials to Build Scoreboard		\$150
Total	\$	\$710

Conclusion:

In conclusion, our project is coming along nicely. A lot of research has been accomplished with the help of our sponsor, advisor, and professors. We still have some unknowns that we will have to solidify. We will be finalizing ideas, ordering parts, and start collecting data in the near future. We are currently on schedule.