FOOTBALLYTICS

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Abstract

Our product, called Footballytics, is an American football that can track location, as well as metrics such as acceleration and orientation.

Contents

1. Introduction

American football, also known as gridiron, is a team sport played by two teams of eleven players on a rectangular field with dimensions of 120 yds by 53 ⅓ yards. Both sides of the field have a goalpost. The team in possession of the oval-shaped football aims to advance the ball down the field by running or passing it while the defense's purpose is to prevent the offense from advancing. A sport comprising two teams of eleven players, one team attempts to either score touchdowns or field goals by either passing or running the football, an oval ball. The offense, or the team attempting to score the ball, has four downs to move ten yards from where they started.

If they accomplish this goal, they get a new set of downs based on where they were stopped [1]. This is decided by the referees, specifically the line judge, and is done through sight. Because so much scoring is done by humans, the accuracy of some rulings has come into question during key matches. With the advent of the new FIFA world cup ball and NBA basketballs [2][3] sporting cutting-edge sensory equipment allowing coaches to track ball movement and analyze player performance, we believe that there should be a solution to the inaccuracy of football and the subjectivity surrounding it. In addition, balls can get deflated over the course of the game, so pressure in the ball needs to be monitored as well.

1.1 Problem

To create a section head, go to the Styles gallery under the Home tab and pick Heading 2. It automatically formats as above and creates a table of contents entry (after you click the Update tab). Word will not make the capitalization consistent; you have to do that yourself.

Figure 1 is an example of figure and caption style. Table 1 is an example of table and table title style. A starter table for parts costs is in Chapter 4 of this template.

Use the References Insert Caption tool to generate consistently formatted captions (always *below* the figure), and use the grouping function in Word's drawing tools to hold figure and caption together. Use picture formatting tools to hold figures in place (preferably at top or bottom of page) and to define text wraps ("top and bottom" is best).

Use Word's table design and layout tools to format titles, column heads, and borders.

Insert page break at end of every chapter to ensure next chapter starts on new page.

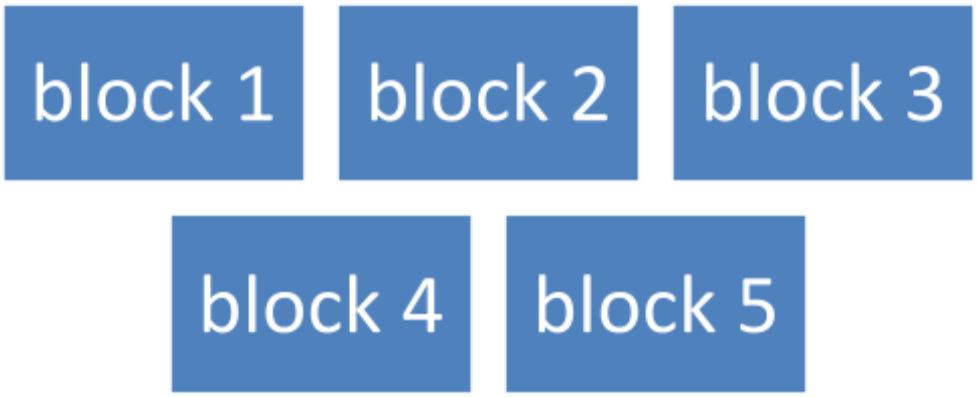

Figure 1 Example of placement and caption for a block diagram. With picture selected, go to References Insert Caption. This creates a neat, consistent caption style that stays connected to the figure. Size the figure so that one-inch margins are preserved. Group the figure and caption to hold them together.

Table 1 Example of a Table and Its Title

Part	Electricity	Magnetism
Field intensity	**E**	**H**
Flux density	**D**	**B**
Constitutive factor	$\boldsymbol{\varepsilon}^{b}$	$\boldsymbol{\mu}^{c}$

2 Design

Discuss general design alternatives. Give equations, simulations, general circuits. Describe design in detail, addressing each major component. Include schematics with components, drawings, flowcharts, etc. Some teams may wish to split this chapter in two: 2. Design Procedure, and 3. Design Details. This template will not automatically update numbering systems for chapters, sections, figures, tables, etc., so keep track of them as you develop and revise the text.

Following is a "template" for displayed math. Use the MathType extension of Word to generate your own content, and note the use of the invisible table (no borders) to keep the optional number flush right.

Insert math here using MathType (number)

2.1 Ultra-Wideband System

The ultra-wideband system is the module used to track the location of the ball. This technology is based on three "anchors" and a "tag". The "tag" is what is being tracked, in this case, the football. This tag communicates with three anchors using ultra-wideband technology to get the distance from each anchor to the tag. Ultra-wideband technology differs from conventional radio waves in that UWB works by generating a large bandwidth at specific times. In the case of Footballytics, the anchors ping the tag and use the time delay to come up with a distance. Of course, this is prone to environmental factors, so calibrating the anchors with the right antenna delay factor is necessary.

2.1.1 Tag

The tag is the microcontroller that will be inside the football. This microcontroller has bluetooth capability so that real game situations can be simulated.

3. Design Verification

Once the design of our product was complete, we had to verify that our product worked as intended. We put our product through stringent tests to ensure that the location and data that was being displayed was accurate.

3.1 [Component or Block]

Insert text.

3.1.1 [Subcomponent or subblock]

Insert text.

4. Costs

Make sure that any tables of costs are numbered, given titles, and cited directly in the text.

4.1 Parts

Following is a starter table for parts costs. Add cell contents as well as rows and, if necessary, columns. Update the table number according to your sequence. Note that columns 1 and 2 are set up for centered text (words) and columns 3-5 (numbers) are set up for right-alignment so that decimal points align.

Table X Parts Costs

Part	Manufacturer	Retail Cost ($)	Bulk Purchase Cost ($)	Actual Cost ($)
Total				

4.2 Labor

5. Conclusion

The conclusion may contain the following sections or others of your choosing.

5.1 Accomplishments

5.2 Uncertainties

5.3 Ethical considerations

5.4 Future work

References

[1] *Motorola Semiconductor Data Manual,* Motorola Semiconductor Products, Inc., Phoenix, AZ, 2007.

[2] *Double Data Rate (DDR) SDRAM,* datasheet, Micron Technology, Inc., 2000. Available at: http://download.micron.com/pdf/datasheets/dram/ddr/512MBDDRx4x8x16.pdf

[3] Linx Technologies LT Series, web page. Available at: http://www.linxtechnologies.com/products/rf-modules/lt-series-transceiver-modules/. Accessed January 2012.

[4] J. A. Prufrock, *Lasers and Their Applications in Surface Science and Technology,* 2nd ed. New York, NY: McGraw-Hill, 2009.

[5] W. P. Mondragon, "Principles of coherent light sources: Coherent lasers and pulsed lasers," in *Lasers and Their Applications in Surface Science and Technology,* 2nd ed., J. A. Prufrock, Ed. New York, NY: McGraw-Hill, 2009, pp. 117-132.

[6] G. Liu, "TDM and TWDM de Bruijn nets and shufflenets for optical communications," *IEEE Transactions on Computers*, vol. 59, no. 1, pp. 695-701, June 2011.

[7] S. Al Kuran, "The prospects for GaAs MESFET technology in dc–ac voltage conversion," in *Proceedings of the Fourteenth Annual Portable Design Conference*, 2010, pp. 137-142.

[8] K. E. Elliott and C. M. Greene, "A local adaptive protocol," Argonne National Laboratory, Argonne, IL, Tech. Rep. 916-1010-BB, 2006.

[9] J. Groeppelhaus, "Java 5.7 tutorial: Design of a full adder," class notes for ECE 290, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, 2011.

Appendix A Requirement and Verification Table

An appendix is a good place for the Requirement and Verification Table from your design review. Below is a starter table. Including these details here will help to avoid lengthy and tedious narrative descriptions in the main text, which may not be of immediate interest to your imagined audience of company managers and professionals. Any requirement that is not verified should be explained either in the main text or the appendix. Note that both the pagination and the numbering of figures, tables, and equations continues from main text to appendices.

Table X System Requirements and Verifications

Requirement	Verification	Verification status (Y or N)
1. Requirement a. Subrequirement b. Subrequirement c. Subrequirement	1. Verification a. Subverification b. Subverification c. Subverification	
2. Requirement a. Subrequirement b. Subrequirement c. Subrequirement	2. Verification a. Subverification b. Subverification c. Subverification	
3.	3.	
4.	4.	