Senior Design Project Proposal
Request for Approval

[redacted]
Names Blacked Out

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Preface:

Today, we are riding a wave of a technological revolution. Consumers are demanding user interfaces that are not only easier to use, but also more flexible and easily customized. Consumers want more products that have remote intelligent access from any location. More importantly, consumers want the freedom to choose how they interact with their product. The research and development that is being done today promises significantly improved production and increased flexibility in all areas of electronic products.

The area we are focusing on is outdoor activities, like bird watching, hiking, camping, and boating. Our product can also be used for search and rescue applications. Outdoor devices like the laser rangefinder, aid in making these activities fun and exciting. This handheld device allows you to view objects at a distance and determine how far away an object is. As demands are made to make more handheld products integrated with GPS like cell phones, data organizers, and other capabilities into small mobile devices, the laser rangefinder is a logical step that combines an old idea with a new one.

Statement of Objectives:

We propose a product that can be used for most outdoor activities, a laser rangefinder that is integrated with GPS capabilities. If you have GPS connected to your laser rangefinder you will be able to track your objects and note their exact location. It is valuable in pinpointing incidents and happenings for your records. It also allows you to record direction when an object leaves the area. This project involves the design and integration of GPS with a laser rangefinder.

Background History:

George Eastman's invention of flexible photographic film led to small cameras. Eastman's first Kodak cameras used a simple optical viewfinder to compose the image and relied on the depth of field of a moderate speed lens to achieve sharp focus. The optical rangefinder traces back to an invention by the French scientist and astronomer Alexis Marie Rochon, who developed the basic principles in 1771. Optical rangefinders were relatively easy to manufacture and so it was natural to adapt the concept for photography. Basically an optical rangefinder uses an eyepiece on the back that the user looks into and two windows on the front spaced widely apart horizontally. Inside the rangefinder prisms and or mirrors take the images coming in through the two windows and superimpose them so that the person using the rangefinder sees both of them. By adjusting the angle of a prism or mirror the user aligns the two images and reads the distance form a scale.

As far as the history of the Global Positioning System (GPS) goes, it was originally designed for and is still used by the U.S. military. GPS is funded, controlled, and maintained by the United States Department of Defense (DOD). The DOD first initiated the GPS project in 1973, and the first experimental GPS satellite was launched

in February 1978. The GPS system achieved full operational capability (FOC) on July 17, 1995. GPS works by triangulation: calculating the position of an object based on its distance from several other objects. In this case, the reference objects are satellites. A GPS receiver determines distance from the satellites by calculating the time it takes for signal to reach it. The satellites are powered by solar panels and containing highly accurate atomic clocks, the satellites transmit timing signals that are picked up by GPS receivers. The system uses 24 satellites, which circle Earth every 12 hours at an altitude of about 12,000 miles. The original scope of the GPS for military operation has been far outgrown be civilian operations, and is provided free of charge or restrictions (actually, our tax dollars pay, even free cost money). The system provides continuous, highly accurate positioning anywhere on the planet (where the radio signals are not impeded), 24 hours a day.

Timeline:

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Proposal	********									
Specifications		****								
Research	**********	**********	**********							
Product Design				**********						
Prototype Construction						**********	**********			
Test Prototype								**********		
Written Report							**********	**********	**********	
Prepare Presentation									*******	
Oral Presentation										***

Task Descriptions:

Proposal: Write a detailed engineering proposal for the chosen design project. An engineering specification shall be composed and included as part of the completed request for approval proposal.

Specifications: This specification will be the general set of guidelines used for construction of the final product and shall be viewed as a set of required minimums. The specifications shall state the overall operating conditions and environment, the expected lifetime and duty cycle for the final project and identify the demographic of the product.

Research: Thorough research must include a review of the current literature, practices and new technologies out on the market. Our focus will be on outdoor activities and real world application using a laser rangefinder integrated with GPS, and will include a review of the current trends and practices used.

Product Design: Prepare solutions to achieve the approved requirements as indicated in the engineering specification and include preliminary sketches and conceptual designs. Select the solution that is the most cost effective and has a relative ease of construction/assembly. Once final design is selected, prepare a drawing of the parts or method of construction for the final solution.

Prototype Construction: Manufacture the required parts and assemble the prototype.

Test Prototype: A series of test will be conducted to ensure proper working conditions of set product and we will make any modifications as needed during this troubleshooting phase.

Written Report: Prepare a comprehensive report following the guidelines set forth by Dr. Ducharme.

Prepare Presentation: Prepare any material needed to convey ideas, theories and demonstration. Make final adjustments to prototype at this time.

Oral Presentation: Present an oral report to the public. This portion will require the use of PowerPoint as well as a live demonstration of product.

Engineering Specification

Nikon Laser 400 ProStaff Rangefinder

Performance packed and water-resistant with a 437-yard range for a true reading on game, even if partially screened by grass or brush. True 1/2 yard accuracy and pocket-sized portability. Integrates 8x multicoated optics and a focusing diopter. Operates on a CR2 lithium battery.

Power Required:	**CR2 Lithium battery**
Magnification:	**8x**
Range:	**11 - 437 Yards yd(s)**
Accuracy:	**+ / - 1/2 Yard yd(s)**
Laser Class:	**Class 1 (eye safe)**
Maximum Overall Size:	**3.7" x 2.8" x 1.6"**
Maximum Weight:	**7 oz. Lbs.**

Review of Current Literature

[1] GPS Explained, by Paul Bertorelli, which originally appeared Jan. 1996, provides a comprehensive discussion of how GPS really works without being a rocket scientist.

The author points out the key components that make up GPS, who maintains the GPS system and what exactly it is doing.

The author concludes that there are more civilians using GPS than the military.

The article includes no color photographs but a short bibliography.

[2] A new way to integrate GPS and INS Wavelet multiresolution analysis-Innovation, by Naser El-Sheimy, Ahmed Osman which appeared in GPS World Oct. 2003 provides an in-depth discussion of the increased demand to integrate more GPS using inertial navigation system (INS) and differential GPS (DGPS) outputs.

The author going in to great detail about some equations used to achieve a better system stating that current use of Kalman filtering to integrate (INS) and (DGPS) has drawbacks related to computation, noise effects, and observability.

The article includes a number of sites related to Kalman filtering, and wavelet analysis.

[3] Software For Mobile Mapping, by Nigel Conolly appeared in South Pacific Science Press International Aug. 2001 provides and discussion about current software packages used in mobile mapping.

Author points out various packages out that run on Palm and Windows operating systems. But goes on to say that the trend will be shift towards users doing all their mapping in a web browser.

The article includes contact information to several software companies as well as a comparison to most of the industries leaders in mapping software.

List of References

[1] Bob Shell, "Rangefinder Renaissance"
http://www.rangefindermag.com/magazine

[2] Matt Lake, "The Global Positioning System: Getting There With Help From Above," *The New York Times Circuits How Electronic Things Work,* Edited by Henry Foundation

[3] "Global Positioning System (GPS) Explained,"
http://www.anglerselectronics.com/global-positioning-system-explained.html