The Skiidometer

Introduction:

I have been skiing since I’ve been able to walk. As my skills have improved, and as ski technology has progressed over the last couple decades I have been overcome with a need for speed. However, there does not seem to be device for measuring velocity for the avid skier and snowboarder. The project I propose to build over the course of the next several months is what I call The Skiidometer. It will be a simple device which will serve as a digital companion on the ski slopes. By using a Global Positioning System (GPS) receiver to track the users’ position, see their velocity, altitude, and distance traveled. All of these useful measurements can be found on a convenient handheld portable device with an easy to read digital LCD display.

Description:

The Skiidometer will measure, record, and display the users’ longitude, latitude, height, velocity, heading, and time. The main function of The Skiidometer will be the “quick glance” digital speedometer (please see figure 2). This function will exist separately from the rest of the portable unit for instant viewing while hurling down the mountain at heroic velocities.

The Skiidometer uses the Motorola 68HC12 microcontroller as the brain of the device. Its duties will consist of sending the updated data to the display(s) and to receive the data entered by the user via the keypad (please see figure 1). It will mathematically manipulate the data received by the M12 GPS receiver to obtain the desired data. The M12 is the GPS receiver module device manufactured by Motorola. This device continuously tracks the NAVSTAR satellites.
The NAVigation Satellite Timing and Ranging (NAVSTAR) GPS is an all weather radio based satellite navigation system that enables users to accurately determine their 3-dimensional position, velocity, and time worldwide. The overall system consists of three major segments: the space segment, the ground segment, and the user segment. The space segment is a constellation of satellites operating in 12-hour orbits around the earth. The constellation is composed of twenty-four satellites, twelve of which the M12 uses for global positioning. The ground network tracks the satellites, precisely determines their orbits, and periodically uploads this information and other system data to all satellites for retransmission to the user. The user segment is the collection of all GPS user receivers, like the Motorola Oncore M12 GPS Receiver that I’ll be implementing. The 12 satellites send their signals to earth which are received all in parallel to determine worldly position. The receiver measures the transmission time required for a satellite signal to reach itself then manipulates all 12 of these times to establish the user’s three-dimensional position.
**Benefits:**

The Skiidometer will soon become a cornerstone for all downhill sport enthusiasts. It has benefits for the user which range from the novelty of their current speed and the practicality of their worldly position, altitude, distance traveled, and direction headed. I think that all skiers would appreciate the many options on this device. The speedometer will be a separate component from the actual device. It will have a large, easy to read digital display. This display will be mounted somewhere on the user for a quick glance when hurling down the slope. The benefits may also include saving the users life. When hiking up the backcountry to hit the fresh powder and find themselves lost, they could feasibly find their way back by using and knowing the GPS coordinates.

**Comparison:**

As an application of a skiing velocity sensor The Skiidometer stands alone. In comparison to other similar products, to the best of my knowledge, there are none like it. There are many applications for the GPS receiver however. In today’s market there are many different brands and types. They usually cost a couple hundred dollars, and most have the same basic features. The basic features include: latitude/longitude coordinates, altitude, trip odometer, and speed indicator.

**Project Development:**

The Skiidometer will be developed during the school year. I am just beginning to research the M12 and what it will take to implement this device into my project. During this fall quarter I will establish a parts list and concurrently get these needed components. The programming and hardware development to interface all the components together will begin winter quarter and will I will work on this project until the end of spring quarter.
A key development tool is going to be a program called WinOncore12 which is software that will accompany the M12. Since the GPS device is to be used outdoors this program can record hours of GPS tracking signals. These signals can then be used during laboratory development.

The Skiidometer will basically consist of the Motorola 68HC12 microcontroller, the M12 GPS receiver, an antenna to the receiver, and two LCD displays (one for menu options, one for velocity).

![Figure 2](image_url)