

The Possibilities in the Collection and Recording
of Data For the Study and Improvement of Sky
Diving and Formation forming

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Abstract

When skydiving the ability to record data of the jump is essential when jumping in formation. With the use of inertial measurement units (IMU) it is possible to gain a better understanding of the technique used and improve on form. With the use of sensing equipment such as ; Magnetometer, accelerometer, gyroscope it is possible to get accurate results of pitch, yaw and roll. The choice of a good micro-controller will determine the over all efficiency. Storing this data and being able to access it either between jumps or after a day of jumping is essential. Making this easy for the user to attain will be looked at in the form of SD cards and direct link. Blue-tooth will also be discussed. Making the device energy efficient and possibilities of scavenging energy from wind and sun will be discussed. During the project, the price of materials will be in the forefront of thought, ensuring that a good price to efficiency ratio will be met.

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0.1 Introduction

Chapter 1

Hardware Selection and Design

Choosing the correct hardware will define the overall practicality of the project. Several factors have to be taken into consideration when selecting hardware such as functionality, connections, power consumption and size with many more. These will be discussed in detail and compared to other products with indication why they were chosen over them. What storage is used for the device and the format in which it is stored in will be discussed Both prototyping and final design will be discussed in separate stages to provide a structured design to the final product. The three main sensing components that will be used will be a gyroscope, accelerometer and a magnetometer. Using all three allows for greater results. When combined together the accelerometer and gyroscope will work with each other to provide the pitch and roll. To receive the yaw result the manometer will be used.

1.1 Breakout Board Prototype

For the prototyping breakout board will be used. By creating the prototype using breakout boards.

1.1.1 Micro-controller

1.1.2 Gyroscope

The gyroscope that will be used in the prototype will be the Triple-Axis Digital-Output Gyro ITG-3200 breakout board. By using the inter-integrated his particular model has been chosen due to the completeness of the device and it flexible power consumption rate.

1.1.3 Accelerometer i^2c

The triple axis MMA8452Q break out board will be sourced for the prototype. One of the great features of this particular device is the ability to stay in low power mode until told otherwise. This will save power and can be incorporated with possibly another embedded device such as the barometer or a simple switch to swap between power modes.

1.1.4 Magnetometer

Triple Axis Magnetometer Breakout - MAG3110 will be sourced for the magnetometer. This particular board comes with its own voltage regulator opposed to its main competitor, HMC5883L, which does not. This allows for a wider spectrum of voltage control

1.1.5 Barometer

Barometric Pressure Sensor - BMP180 Breakout will be used to measure pressure. This will be used to measure the altitude of the device.

1.1.6 SD Card Reader

SD cards are non volatile storage. This allows information to be stored even when the device is not under direct power. The ability to remove the storage device will allow the user to retrieve the data collected and upgrade the devices storage. The component used for prototyping will be Breakout Board for microSD Transflash. This product will also be sourced out for the final design.

1.2 Final Product Specification

1.2.1 Micro-controller

1.2.2 Gyroscope

1.2.3 Accelerometer

1.2.4 Magnetometer