全球衛星定位系統在澳洲登山組織之應用與登山安全之研究

王瑞麟

摘要

本研究的主旨在於探討全球衛星定位系統之應用情況與對於登山安全影響的關係。研究的假設爲全球衛星定位系統之應用情況與對於登山安全之影響有明顯及重要的關係。研究設計是採用量化的方式，以問卷調查來進行整個研究。本次研究的樣本爲澳洲的300位登山愛好者[1]。而研究的方法是以對澳洲的登山愛好者進行問卷訪談，針對受訪者在登山之中應用全球衛星定位系統之情況與對於登山安全的影響狀況來分析其相互的關係。對於研究結果的探討是以史畢滿氏的順位相關係數 (Spearman Rank Correlation Coefficient) 針對全球衛星定位系統之使用情況與對於登山安全的影響的關係進行分析及研究。研究的結果指出全球衛星定位系統之使用情況與對於登山安全的影響有明顯及正面的關係。

關鍵詞：全球衛星定位系統、登山安全。

[1] 本研究實證結果於中原大學2003全國性7th Conference of Youth Mountaineering 公開專文發表

王瑞麟：修平技術學院工業管理系講師

Global Positioning System Usage and Mountain Climbing Safety in Australia Mountaineering Associations

Jui-lin Wang

Abstract

The purpose of this research was to explore possible relationship between the use of Global Positioning System (GPS) and mountain climbing safety. The hypothesis for this research was: There was a significant relationship between the use of GPS and mountain climbing safety. The method employed quantitative research method in conducting this study was measured the use of GPS in various Australia climbers and provided an overview of the method of GPS applied in mountain climbing safety. The research participants were 300 Climbers in Australia Mountaineering Associations.[1] The Spearman Rank Correlation Coefficient and descriptive statistics were used to test the research hypothesis. Research result supported the research hypothesis that there was a significant relationship between the use of GPS and mountain climbing safety. Research result also indicated that this relationship between the use of GPS and mountain climbing safety was positive.

Keywords: Global Positioning System; Mountain Climbing Safety.

Jui-lin Wang : Lecturer Insturtor Department of Industrial Management, HIT

1. INTRODUCTION

1.1 Purpose and Hypothesis

The purpose of this research was to explore possible relationship between the use of Global Positioning System (GPS) and mountain climbing safety. The hypothesis for this research was: There was a significant relationship between the use of GPS and mountain climbing safety. GPS is an invaluable tool in nearly every activities of mountain climbing.

1.2 Significance of Research

Mountain climbing that cannot utilize GPS both as directed tool and as a safety tool may have a tremendous disadvantage in their operations. This exploratory study investigated the possible relationship between the use of GPS and mountain climbing safety of mountain climbing. This study may offer important information about the impact of GPS applied and mountain climbing safety for mountain climbing.

2. Literature Review

The Global Positioning System (GPS) is a radio navigation system that allows land, sea, and airborne users to determine accurate location, velocity, and time twenty-four hours a day, anywhere in the world. A GPS receiver is in many ways a highly technologically advanced version of the magnetic compass, but with capabilities that far surpass traditional orienteering. The receiver continually gathers real-time data from satellites, from which it calculates a person's speed, location, altitude, and direction of travel (Broda and Baxter, 2002). GPS provides a wide range of mountain climbing safety benefits that include navigation, aiding police and ambulance dispatchers and future applications such as the ability to locate the origin of emergency calls from wireless phones. But vital services would be placed at risk if existing spectrum allocations for GPS were removed to allow sharing by mobile satellite services providers (Clarke, 1999). According to Australia Federal

Highway Administration (AHA) (1995), the GPS multipurpose project will help the Federal Highway Administration determine what's out there and what shape it's in. The project will include a basic inventory of the features on each of the routes, road conditions, and safety features. The use of GPS technology can provide innovative solutions for enhancing intelligent mountain climbing including assisting climbers in reaching a desired destination with in-vehicle navigation systems that also increase personal safety enroot through collision avoidance and mayday signaling (Johnson, 1995). GPS signals is increased satellite power, the study found, recent proposals have suggested a 6-dB power increase. The author also found that GPS systems could be affected by unintentional interference, a combination of procedural and technical measures should be implemented to reduce the effects of interference on the GPS navigation (Leopold, 1999).

GPS is being used to map anything in the outdoors you can imagine. Tree locations, turf areas, shrub and flowerbeds, woodlands - you name it and you can map it. The beauty of good-quality GPS is that you not only map the item, but also collect and store information about it. Imagine having an accurate map of the property you manage, with detailed information about everything on it. GPS can tell you your exact position anywhere on the globe. Your position can be described in many different ways. Some prefer the old confusing "latitude and longitude" system, while others use a newer "state plane coordinate" system, or some modification of it. The state plane coordinate system simply uses two numbers to describe your location on an "X" and "Y" axis. A third number can be used to describe a "Z" axis for three-dimensional locations. This third dimension is important for elevation information. The "system" is composed of three main parts. First, a constellation (or group) of satellites orbits the earth transmitting signals. Second, a small hand-held receiver stores

the signals transmitted by the satellites. Third, a powerful computer interprets the signals and provides the location information you want. Many GPS units on the market today combine the receiver and computer into a single hand-held or backpack-mounted unit. GPS is capable of providing estimated time of arrivals to the stores that are accurate within minutes. This helps plan personnel for unloading the trailers and reduces the waiting times for tractors, trailers and climbers thereby reducing the cost of delivery and improving timeliness of shelf replenishment (Kincaid, 2002). GPS is as simple as the ancient technique of triangulation and as sophisticated as a $100,000 atomic clock. Orbiting in precisely fixed paths some 12,000 miles from the surface of the earth are 21 compact-car-size satellites (and three backups). When a GPS receiver as small as a credit card is activated, it compares its distance from four satellites by measuring the length of time it takes the satellites' radio signals to reach it, computing altitude, latitude, longitude and even speed and direction of travel. GPS tells you where the sun will be in 15-minute increments on a given day. It's a great way to stay ahead of problems." In an age in which velocity is a fact of life, GPS is also the best way yet to stay on the top of age-old question, "Where am I?" Using this uncannily accurate navigation tool, one's location anywhere on the globe can be pinpointed to within a few hundred feet (Granatstein, 1997).

3. Methodology

3.1 Research Design and Participants

The method employed quantitative research method in conducting this study was measured the use of GPS in mountain climbing and provided an overview of the method of GPS applied in mountain climbing safety. All Australia Mountaineering Associations served as respondents. Each individual was randomly assigned to the sampling from the U.S profession investigation database. In total,

the sample consisted of n=300 due to the limited investigation cost.

The goal of this study was to help climbers understand how important it was to integrate GPS into mountain climbing. A correlation research design was utilized to test the research hypothesis. The hypothesis for this research was: There was a significant relationship between the use of GPS and mountain climbing safety. The research participants were 300 Climbers in Australia Mountaineering Associations.

3.2 Data Collection and Data Analysis

In this research, the author used survey instrumentation to collect the research data. This research was focus on 300 Climbers in Australia Mountaineering Associations. Data analyses were based on research data and compiled from the responses to the Survey of the Impact of GPS Applied in Mountain Climbing to test the correlation between the use of GPS and mountain climbing safety. Statistical procedures were conducted to determine the possible existence of a relationship of GPS applied and mountain climbing safety of marketing organizations. Descriptive statistics was used to analyze the impact of GPS applied in the marketing organizations. The Spearman Rank Correlation Coefficient was used to test the research hypothesis for whether there is or is not a relationship of the use of GPS and mountain climbing safety of marketing organizations. The accepted level of significance in research has been established at the 0.05 level of significance (Fraenkel & Wallen, 1993; Popham and Sirotnik, 1992). The Statistical Package for the Social Sciences (SPSS) computer software program was used to complete the analysis of data.

4. Presentations and Analysis of Data

The purpose of this chapter was to present a description of the research data and to analyze the data relating to the research hypothesis of the study. The

hypothesis for this research was: There was a significant relationship between the use of GPS and mountain climbing safety. The findings in this chapter contain the raw data, and the narrative results relating to the research. The results are organized and discussed in three sections: source of data, analysis of data, and summary.

4.1 Source of Data

The research was conducted with 300 Climbers in Australia Mountaineering Associations. Each participant completed the Survey of the Impact of GPS Applied in Mountain Climbing. The specific rank variable of Spearman Rank Correlation is identified by the perceptions of mountain climbing safety.

4.2 Analysis of Data

This section includes an analysis of the data obtained using the research instrument. The analysis of the data for research results provides information necessary to answer the hypothesis posed. The sample consisted of 300 Climbers in Australia Mountaineering Associations. (n=300). The survey instrument, The Survey of the Impact of GPS Applied in Mountain Climbing, designed to determine the impact of GPS applied in the organization. The responses from the surveys were entered into the Statistical Package for the Social Sciences (SPSS) and a series of statistical tests were run using a significance level of 0.05. The hypotheses are listed below.

The study contained a major hypothesis. There was a significant relationship between the use of GPS and mountain climbing safety. This hypothesis was examined as follows. The Spearman Rank Correlation Coefficient was used to examine the relationship between the use of GPS and mountain climbing safety. Correlation is a statistical technique that is used to measure and describe an impact between two variables. Siegel and Castellan (1988) stated that the Spearman Rank Correlation Coefficient is used to

discover the strength of a link between two sets of data. The Spearman Rank Correlation Coefficient is identified by letter r（ compared to the ρ of population）.

These analyses were based on research data and compiled from the responses to the Survey of the Impact of GPS applied in Mountain Climbing. Correlation between the use of GPS and mountain climbing safety, Spearman r had a value of 0.516 (p = 0.000) for the total sample. This result explained the desire to use the GPS technology, and the need to utilize the GPS information database. However this study supported the research hypothesis that there was a significant relationship between the use of GPS and mountain climbing safety. The result also indicated that this relationship between the use of GPS and mountain climbing safety was positive.

4.3 Summary

The Spearman Rank Correlation Coefficient results were used to test the primary research hypos thesis: There was a significant impact of the GPS applied on mountain climbing safety. The Spearman Rank Correlation Coefficient results supported the following research hypothesis: There was a significant relationship between the use of GPS and mountain climbing safety.

5. Conclusions and Recommendations

The purpose of this chapter is to present and discuss the results of the study. The chapter is divided into the following major categories: findings, conclusions, and recommendations.

5.1 Findings

This section describes the finding of this research. All findings are based on Spearman Rank Correlation Coefficient. The results indicated that most of participants agree or strong agree that the use of GPS could have important impact on

their mountain climbing safety. Therefore, the analysis supported the research hypothesis: There was a significant relationship between the use of GPS and mountain climbing safety.

The major focus of the study was to determine if there was relationship between the use of GPS and mountain climbing safety. Research hypothesis was examined. Specifically, the research hypothesis stated that there was a relationship between the use of GPS and mountain climbing safety. Research participants were surveyed and tested scores to determine the relationship. A Spearman Rank Correlation Coefficient was conducted to determine if relationship existed between the use of GPS and mountain climbing safety. The data revealed there was a significant relationship between the GPS applied and mountain climbing safety ($p= 0.000$). The two variables, the GPS applied and mountain climbing safety, were shown to have a significant and positive relationship ($r= 0.516$). This positive relationship suggested that as the use of GPS increased, the impact of mountain climbing safety increased. Therefore, there was a positive significant relationship between the use of GPS and mountain climbing safety. The finding supported the research hypothesis: There was a significant relationship between the use of GPS and mountain climbing safety.

5.2 Conclusions

The goal of this study was to help Climbers understand how important it is to integrate GPS into mountain climbing. The study showed the existence of a significant positive relationship between the use of GPS and mountain climbing safety. What are the implications of these findings? The results substantiated the existence of relationship between the use of GPS and mountain climbing safety. Overall, the study accomplished the task of establishing the relationship between the use of GPS and mountain climbing safety. The results of this research supported the research hypothesis: There was a significant

relationship between the use of GPS and mountain climbing safety.

5.3 Recommendations

The study provided a starting point for investigating the relationship between the use of GPS and mountain climbing safety. While providing useful information, further research should be conducted to obtain more concise information in the use of GPS. For some of climbers involved in the study, it would be interesting to investigate further with larger groups of participants, focusing on different kind of climbers around the world. The future research also could focus on the impact of the use of GPS in the any kinds of mountain climbing around the world.

The impact has been established in this study. The challenge now is to assist plan for the use of GPS to exceed mountain climbing. However, with the following recommendations, the car manufactories' leaders and climbers can effectively utilize GPS to gain competitive advantages for mountain climbing safety:

1. Determine the types of resources that the climbers intend to utilize and the services that the climbers will be providing applying GPS.
2. Determine what types of GPS connection best suits the needs of climbers.
3. Determine what types of efforts and activities are needed for use of GPS in the climbers.
4. Train climbers on the proper use of GPS tools.
5. Emphasize the nature of GPS and the importance on mountain climbing safety.

Reference

Australia Federal Highway Administration (AHA) (1995), Federal Highway Administration Inventorying Unpaved Roads, Geo Info Systems.

Broda, H. W and Baxter, R. E. (2002). Using GIS and GPS technology as an instructional tool, The Clearing House, 49.

Clarke P. (1999). GPS coalition voices opposition to sharing spectrum with Mss., Satellite News.

Granatstein, L. (1997). Making contact once the exclusive navigation tool of the U.S. military, Time, 52.

Johnson, W. W. (1995). Enhancing intelligent mountaineering with GPS. (Global Positioning System), Satellite Communications, Vol. 19, 70.

Kincaid S. (2002). Reliable GPS is here, Grounds Maintenance.

Leopold G. (1999). News: Study: GPS can fly as commercial air navigator, Electronic Engineering Times, 18.

Nunnally, J. (1967). Psychometric theory. New York: McGraw-Hill.

Popham, W. J. and Sirotnik, K. A. (1992). Understanding statistics in education, Itasca, Illinois: F. E. Peacock Publishers.

Siegal S. and Castellan Jr. N.J. (1988). Nonparametric statistics for the behavioral sciences 2nd. Ed. McGraw Hill Book Company New York.