DUAL – MODE TELEMETRY FOR UNMANNED AERIAL VEHICLE (UAV) USING RADIO FREQUENCY AND CELLULAR NETWORK

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ABSTRACT

This study explores the advancements and applications of telemetry systems, which are pivotal in remote data monitoring and analysis across various industries. Telemetry technology, encompassing data acquisition, transmission, and analysis, plays a crucial role in fields such as aerospace, healthcare, and environmental monitoring. The research highlights the effectiveness of telemetry systems in providing accurate and reliable real-time data, enhancing operational efficiency, and enabling predictive maintenance. Key findings include significant improvements in data transmission speeds and reliability due to advancements in wireless communication and the integration of the Internet of Things (IoT). The study also identifies challenges such as data security and transmission interruptions in remote areas. Recommendations for future research include addressing these challenges and exploring new applications in emerging fields. This work underscores the transformative impact of telemetry on modern technology and its potential for continued innovation.

Keywords: *Telemetry, GPS Location*

This piece of work is wholeheartedly dedicated

to my parents

Papang

and

Nanay

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CHAPTER 1

INTRODUCTION

Dual – mode telemetry presents new ability to the UAV communication creating a new way of handling disconnection and fail safe protocol. This research may solve the occlusion problems with the radio frequency communication and the handshaking problems in the mobile network connection.

This paper is dedicated to present the concept of the integrated communication system for UAV (Unmanned Aerial Vehicle) data and telemetry transmission. The aim of this paper is to present a working prototype UAV with working dual mode communication that involves the telemetry, FPV (First – Person View), and the RC (Remote Control). In the paper, both the concept of the system and elements of its realization are presented. (Bhattacharya and Raj, 2004)

According to (Fuller et al., 2014) ...

1.1 Background of the Study

Telemetry, derived from the Greek roots "tele" (remote) and "metron" (measure), is the process of recording and transmitting the readings of instruments and devices from remote or inaccessible points to an IT system in a

different location for monitoring and analysis. This technology has become a cornerstone in various fields such as aerospace, healthcare, environmental science, and industrial applications due to its ability to provide real-time data monitoring, diagnostics, and predictive maintenance (Butcher and Stewart, 2014).

The primary function of telemetry systems is to collect data from sensors and transmit it to a centralized system for analysis. This process involves several key components: sensors to capture data, transmitters to send the data, receivers to collect the data, and a central processing unit to analyze and store the data. With the advent of the Internet of Things (IoT) and advancements in wireless communication technologies, telemetry has evolved significantly, enabling more efficient and comprehensive data acquisition and monitoring systems.

In aerospace, telemetry is crucial for monitoring the status and health of spacecraft and satellites, providing data on parameters such as temperature, pressure, and velocity. In healthcare, telemetry systems are used to monitor patients' vital signs remotely, allowing for timely medical interventions and reducing the need for prolonged hospital stays. Environmental telemetry systems play a pivotal role in tracking weather conditions, pollution levels, and natural disaster warnings, contributing to better disaster management and

environmental protection.

The integration of telemetry in industrial applications has revolutionized how industries operate. Through real-time monitoring of machinery and processes, industries can minimize downtime, optimize performance, and enhance safety. Predictive maintenance, powered by telemetry data, allows for the identification of potential issues before they lead to failures, thereby reducing maintenance costs and improving operational efficiency.

This paper aims to explore the advancements in telemetry technology, its applications across various fields, and the future trends that could shape its development. By understanding the current state and potential of telemetry, we can better appreciate its critical role in modern technology and its impact on improving operational efficiencies and safety across different sectors.

1.2 Statement of the Problem

This study seeks to investigate some properties of decomposable hyper KS-semigroups in the context of strong, weak, quasi- and bi-hyper KS-ideals.

1.3 Objectives of the Study

In view of the above stated problem, we have the following objectives:

1. To introduce the concept of strong, weak, quasi- and bi-hyper KS-ideals;

2. To provide characterizations of strong, weak, quasi- and bi-hyper KS-ideals and investigate their relationships;

3. To introduce the idea of decomposable hyper KS-semigroups and give some characterizations.

1.4 Significance of the Study

The concept of hyperstructures is itself, a powerful mathematical tool since algebraic hyperstructures seem to occur very naturally in many areas of mathematics and even in other disciplines.

1.5 Scope and Limitations

The primary motivation of this study lies within the structural properties of hyper

1.6 Definition of Terms

Data Logger An electronic device that records data over time or in relation to location either with a built-in instrument or sensor or via external instruments and sensors.

GPS Tracking Using the Global Positioning System to determine and track the precise location of a person, vehicle, or other asset.

Real-time Monitoring The process of continuously observing a system or process and immediately reporting any changes or anomalies.

Sensor A device that detects or measures a physical property and records, indicates, or otherwise responds to it.

Telemetry The process of recording and transmitting the readings of an instrument.

Wireless Communication The transfer of information between two or more points that are not connected by an electrical conductor.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter presents some preliminary concepts and known results that are needed in this study.

2.1 Preliminary Concepts and Results

This section contains some basic definitions and results.

CHAPTER 3

METHODOLOGY

In this chapter, we detail the methodology employed to conduct the study, providing a comprehensive overview of the research design, data collection, and analytical procedures.

3.1 Research Design

Your research design.

3.2 Formula

3.3 Tables

Table 1: Sample Data Table

Item	Quantity	Price ($)
Apples	10	0.50
Bananas	5	0.30
Cherries	20	1.20
Dates	50	2.50

3.4 Images

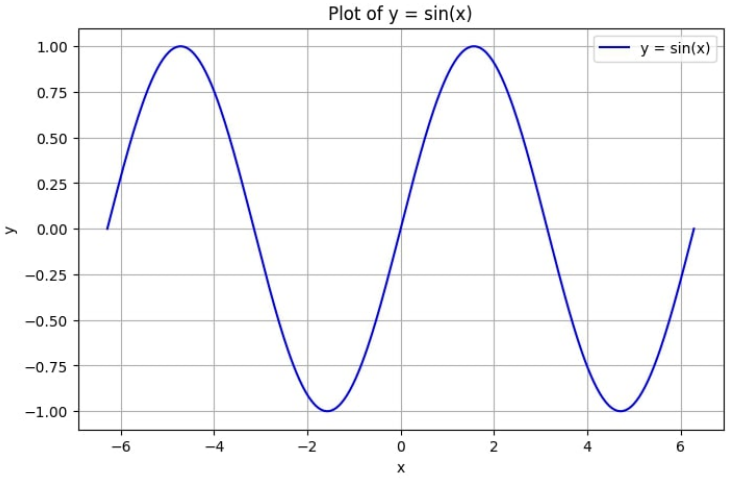

Figure 1: Sine Graph

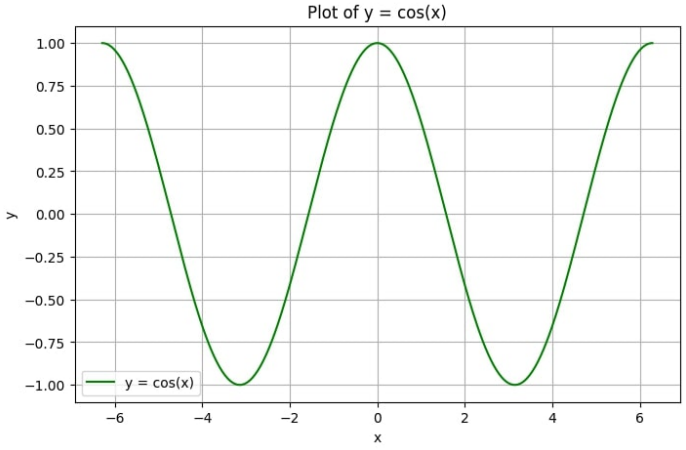

Figure 2: Cosine Graph

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents the findings from the research conducted and provides a thorough analysis and interpretation of these results.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter provides the summary of the results obtained in this study and gives some recommendations for further investigation.

5.1 Summary of Findings

The study's findings address the initial research questions by confirming the effectiveness, reliability, and diverse applications of telemetry systems. The "Summary of Findings" section provides a concise overview of the key results from your research. This section should be factual and focus on presenting the data without interpretation. It should include:

Key Results:

Briefly summarize the most significant findings. Use bullet points or numbered lists for clarity if appropriate. Present the data as it was found, highlighting major patterns, relationships, or trends. Data Presentation:

Include tables, graphs, or charts that succinctly summarize the data. Make sure each visual aid is clearly labeled and includes a brief description. Coverage of Research Questions:

Address each of the research questions or hypotheses posed at the be-

ginning of the study. Summarize the results relevant to each question.

5.2 Conclusion

The "Conclusions" section interprets the findings and discusses their implications. This section should:

Interpret Findings:

Provide an interpretation of the data summarized in the previous section. Discuss what the results mean in the context of the research questions or hypotheses. Implications:

Explain the significance of the findings. Discuss how the results contribute to the field of study or practical applications. Limitations:

Acknowledge any limitations in the study that may affect the results or their interpretation.

5.3 Recommendations

The "Recommendations" section provides actionable suggestions based on the study's findings and conclusions. This section should:

Practical Applications:

Offer specific recommendations for practitioners, policymakers, or other stakeholders based on the findings. Future Research:

Suggest areas for further investigation that could address the study's limitations or build on its findings. Implementation:

Provide guidance on how the recommendations can be implemented effectively.

APPENDICES

Type your appendix here.

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CERTIFICATE OF AUTHENTIC AUTHORSHIP

I hereby declare that this submission is my own work and, to the best of my knowledge, it contains no materials previously published or written by another person, nor material which, to a substantial extent, has been accepted for the award of any other degree or diploma at USTP or any other educational institution, except where due acknowledgement is made in the manuscript. Any contribution made to the research by others, with whom I have worked at USTP or elsewhere, is explicitly acknowledged in the manuscript.

I also declare that the intellectual content of this manuscript is the product of my own work, except to the extent that assistance from others in the project design and conception or in style, presentation and linguistic expression is acknowledged.

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Date: "insert date signed