DEPARTMENT OF MINING ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN OF A REAL-TIME STORAGE TRACKING SYSTEM.

(Case study: Greenstone resources open pit mine in Busia)

BY

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This final year project report is submitted to the department of Mining engineering at Busitema University in partial fulfillment of the requirements for the award of a Bachelors' degree.

DECLARATION.

I, **RWOTHOMIO BRIAN**, registration number **BU/UP/2019/3263**, declare that this project proposal report is my original work and has never been presented to any university or institution for the award of a bachelor's degree in mining engineering or any other related award.

Signature: .....

Date: 15/12/2023

APPROVAL.

This is to certify that the project report entitled **'Design of a Real-Time Storage Tracking System'** has been done under the supervision of the lecturers mentioned below and is ideally submitted for examination assessment.

Mr. TUGUME WYCLIFFE

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Date: 15/12/23

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DEDICATION.

I am very grateful to the Almighty God for the guidance and good health he has provided to me and for enabling me reach this year of study.

Sincere appreciations to my supervisors Mr. Tugume Wycliffe and Mr. Bagoole Christopher for their continuous efforts in guiding me through final project writing. May God bless them abundantly.

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ABSTRACT

The mining industry grapples with persistent challenges related to ore tracking and security, where theft and unauthorized access to valuable ore containers represent significant financial losses. To address these issues, this project introduces a comprehensive and innovative system designed to precisely track ore placement within containers and proactively prevent theft. The system integrates state-of-the-art hardware components, including RFID authentication modules, highly accurate load cells with HX711 modules, precise GPS tracking modules, and real-time notification capabilities via GSM modules. A robust servo motor-controlled locking mechanism ensures that ore containers remain secure during transport and storage, enhancing the overall security posture of mining operations.The project's modular design not only ensures scalability but also positions it for future upgrades, making it adaptable to the evolving needs of mining operations. By implementing this cutting-edge solution, mining enterprises can significantly mitigate theft risks, reduce financial losses, and elevate overall operational effectiveness.

Table of contents

List of figures

List of Tables

List of acronyms

LCD- Liquid Crystal Display

RFID- Radio Frequency Identification

GSM- Global System for Mobile Communication

ACM- Association for Computing Machinery

IEEE- Institute of Electrical and Electronics Engineer

CHAPTER ONE

1.0 Introduction

1.1 Background

Mining is a major contributor to socioeconomic and human development. The ever-increasing expansion of manufacturing demands increases the company's pressure to complete the order(Ononiwu *et al.*, 2016). The purpose of implementing a real-time production tracking system in a mining is to monitor and manage the production process of ore efficiently. This system enables tracking of the quantity, quality, and movement of ore from the extraction site to the processing plant or storage facility. Mining operations face various challenges, such as the need for accurate production data, timely detection of bottlenecks or production issues, and efficient coordination between different stages of the mining process. Real-time tracking helps overcome these challenges by providing up-to-date information and improving operational transparency(Komane, 2019). The needs of effective mined ore tracking throughout the whole metal production process consisted of ore mining, transporting and beneficiation are growing, following the rising understanding of the impact of the exact identification of ore parameters on the effectiveness of the ore processing. Surveys prove that even the neighboring mines that exploit the same lode, differ from one another when compare their operational parameters (like exploitation gate), ore compound and effectiveness of ore beneficiation. The resulting grade engineering strategies are based on the identification of metallurgical ore parameters in-situ and control them throughout the ore processing processes. A monitoring information system is beneficial for integrating data, production scheduling, and data collection for each product manufactured. Sensor technologies, such as RFID tags, GPS trackers, and weight sensors, can be used to collect data on ore quantity, location, and quality(Gosine and Warrian, 2020). These devices are installed at different stages of the mining process (e.g., extraction, transportation, and processing). Communication Infrastructure: A robust communication network is necessary to transmit data from sensors and devices to a central database or monitoring system. This may involve wireless technologies, such as Wi-Fi, cellular networks, or satellite communication. The collected data needs to be stored in a centralized database or cloud platform for analysis and access. Data processing techniques like data analytics, machine learning, or artificial intelligence can be applied to extract insights and optimize production. Presenting the data in a user-friendly format through interactive dashboards and reports allows stakeholders to monitor production in real-time, identify trends or anomalies, and make informed decisions.

Seek guidance from experts with knowledge of mining regulations and compliance to ensure adherence.

Make the system to adapt to changing conditions, regulations, and technological advancements to maintain the system's effectiveness.

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Appendices