Group 30: Moulting stage Penguin Monitoring System

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Team Introduction

- Dichochi Ramotlou
- Philasande Ngema
- Tohlang Rakhaphu

Problem Background

Critical Endangerment

African Penguins are on track to become **extinct by 2035** if current trends continue.

The Moulting Challenge

They Undergo a 21-day catastrophic moult, during which they they shed and regrow their feathers

Conservation Data Needs

- Conservation relies on monitoring physiological changes such as weight and health during moulting.
- Moulting is asynchronous→ system must monitor year-round.

Individual Data Matters

With the population shrinking, tracking individual penguins is essential for targeted conservation strategies.

Objectives

Smart Monitoring System
Implementation of an integrated system that automatically collects physiological data to track the moulting progression of individual penguins.

Remote User Interface
Develop an interactive platform that allows researchers to remotely monitor and analyse moulting data in real time.

Long-Term Data Storage
Implement a data storage system to retain individual penguin records, enabling the analysis of long-term health trends and supporting conservation strategies.

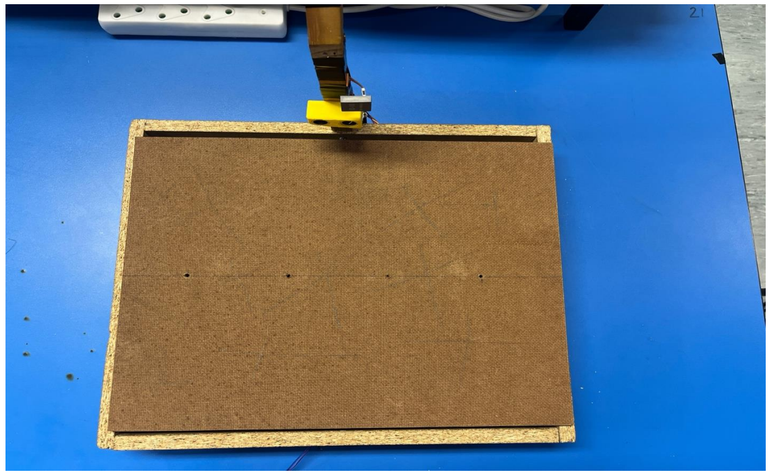
System Overview

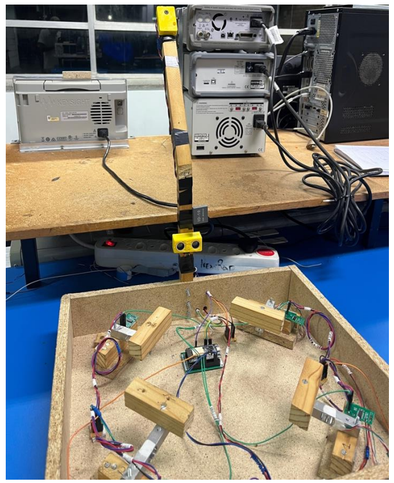
Mechanical subsystem
Scale Housing & Calibration as well as placement of all hardware components

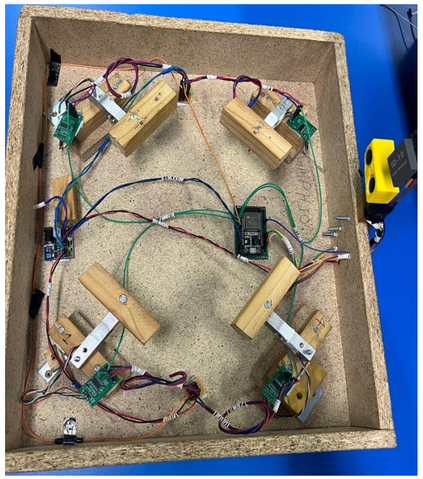
Electrical Subsystem
Integration of all hardware components and the packaging of collected individual penguin data that is transmitted to a remote server

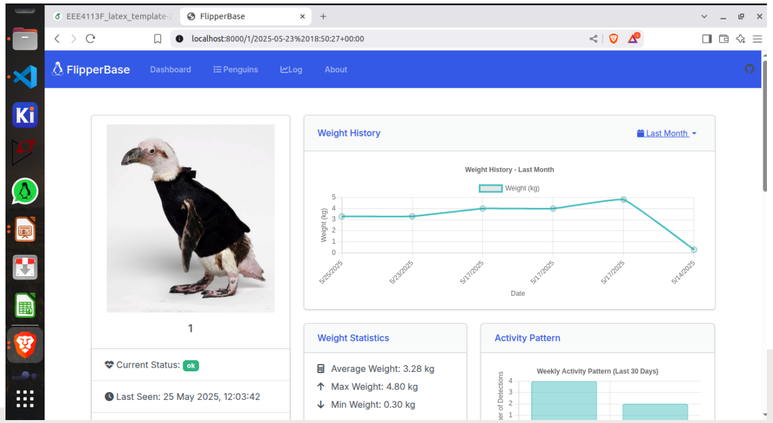
User Interface & Data Storage
Involves creating a server and user interface that enables researchers to track moulting progression. Includes experiments in implementing machine learning models for penguin identification and moulting stage estimation.

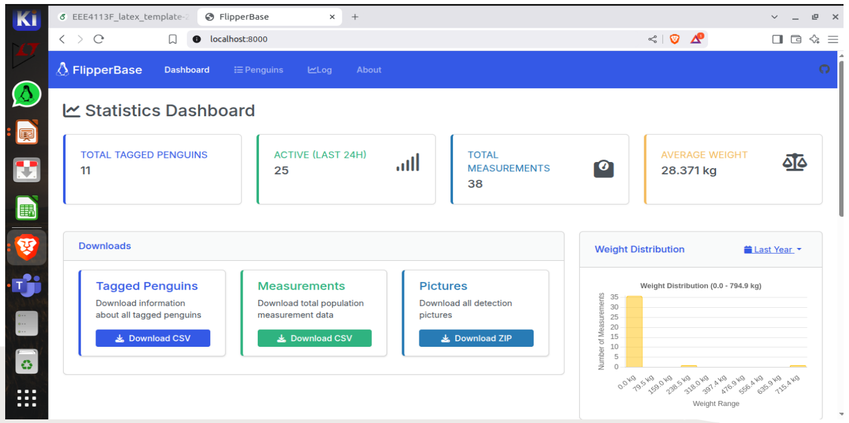
Final Solution











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Adaptability & Deployment Considerations

- Designed for remote setup
- Non Invasive
- Scalability to other penguin colonies or bird species
- Low maintenance, solar/battery powered operation

Conclusion & Future Work

Valuable Long-Term Insights
Enables collection of **individual-level, long-term data** — essential for analysing **species health trends** over time.

Hybrid Identification Approach: Camera+RFID
Future enhancement: Integrate machine learning-based image recognition

Ideal for Moulting Behaviour
Automated, non-invasive data collection suits moulting penguins' low mobility

Key Requirements Met
- Works in **remote environments**
- Focuses on **individual penguins**
- Ensures **non-invasive monitoring**
- Supports **year-round automated data gathering**