Sheep link

Introduction

Our project aims to address the issue of locating wandering sheep in the town of Mthatha in South Africa.

Stakeholders and Stakeholder Values

The main stakeholders for this project are \_\_\_

Relevant UN sustainability goals that we will aim to address are:

Meet the Team

Arielle is a (I think this is too much to put on the brochure names are good enough)

Ethan is an Electrical and Computer Engineering major interested in integrated circuit design. He strives to optimise the efficiency of hardware components whilst retaining functionality.

Team Values

As a team, we value

Design Description and Showcase

Front end

Image of the tracker already on Canva also put the buckle

Back end

* **User Interface**

Table

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The sheep will each be given a collar that has

Back end

This data will then be relayed through the Global S GSM, mention UI

Evaluation

1. Functionality
   1. Notification ✅

The design is able to notify the users through the user interface

* 1. Detection of missing sheep ✅

The Clustering algorithm is able to detect when sheep leave their clusters and do not join a new one. This was tested over all possible use cases and edge cases

* 1. Ability to locate sheep using GPS Technology ✅

1. Cost

The Prototype was created using MyFab components for a lower cost of $20.21 The breakdown of the major components for follower sheep are as follows:

|  |  |  |
| --- | --- | --- |
| Part Name | MyFab Price | Market Price |
| Arduino UNO R3 | $7.37 | **$24.95** |
| Adafruit Bluefruit LE UART Friend | $6.00 | $17.50 |
| 9V Battery | $3.84 | $3.70 |
| 3D printing (@0.03CAD per gram) | $3.00 | $3.00 |
| Total | $20.21 | $49.15 |

GSM + GPS

Acquiring the components at market price would cost more, at $49.15 per unit.

1. Environmental Impact
2. Safety

Passed the Waterproof test, dustproof test. Operating frequency of Bluetooth is 2.4Ghz. Device operates at 3.3V and there is no exposed wiring, so it passes electrical safety standards [cite]

Prototype Progress

Currently, we have one fully functional follower sheep collar complete with a case, adjustable belt strap and concealed electronics. The electrical component interacts with the Blue Fruit app and uses the UART wireless communication protocol to send the sheep identification number to the app when the circuit receives a request message.

\*Add pictures\*

We also have the circuitry for another follower sheep collar and the case, however the battery for this collar has not been set up since it was proven with the first collar that it was possible to operate the circuitry on battery power.

The database has been implemented on a mixture of python and SQL. Upon receiving (write stuff about the back end here)

1. What is the value that the design is intended to provide?   
   2. What is the design and what are its key features?   
   3. How does the design provide the intended value?   
   4. What is the current prototype and what does that tell us about the design?
2. Stakeholder, environment, framing of the opportunity, also the opportunity overview
   * Team values: empathy, sustainability, functionality, accessibility (affordability, ease of learning)
   * Stakeholder values: affordability, effectiveness
     + Functionality:
   * Our prototype design is:
     + Affordable
       - Using inexpensive GSM for most sheep instead of GPS
     + Effective/Functional
       - Helps locate the sheep and notifies once they go missing
       - Prototype battery life is 24 hours currently.
     + Durable
       - Passed waterproof, dustproof, and drop test
     + Safe
       - Safe for both the sheep and human users as electrical hazards are
     + Portable
       - Add measurements
   * Which aligns with both the stakeholders’ values and our team’s values
3. Final design concept
   1. Front end highlighted features/requirements:
      1. Wireless tracker and synchronized update of the missing sheep allowed immediate notification of the missing sheep
      2. GPS level accuracy (justify for the follower sheep) of the missing sheep locations meets the stakeholder’s requirements
      3. User-Friendly UI of the backend database allowed easy view of the alerts

Diagram

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* 1. Backend missing sheep detecting algorithms:

A piece of paper with writing on it

Description automatically generated

* + 1. Cluster based missing sheep detecting algorithm divides up the 150 sheep into clusters, in each cluster there is a leader sheep with a GPS tracker and the rest of the sheep are follower sheep only with Bluetooth transceivers that can talk to the leader sheep.
    2. Flexibility in choosing the cluster size/leader sheep numbers, user can balance between cost and accuracy. (More leader sheep means more GPS tackers and smaller cluster size, more accurate of the location. Less leader sheep means less GPS trackers, les cluster size, less accurate)
    3. Backend algorithm can easily detect when a sheep is missing and send the location info to the UI immediately
  1. Physical Collar Design
     1. Engraved sheep id allowed easy and unique identification of each sheep
     2. Customized collar color for each sheep owner allowed distinguish of sheep between different owners
     3. Waterproof + dust proof mechanism
     4. Possible materials make it more durable

1. Prototype + evaluation

Follower Sheep

A picture containing text, jack

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Waterproof and dustproof support that the device can be used in different situations, there are three layers for the case since we want to stable all the components inside. The outer wall of the cover is longer than other parts since that can be used to maintain waterproof and dustproof. The middle layer is used to put Bluefruit and battery. Arduino is placed on the bottom of the case, and on the four sides, there are rubber bands that can improve the level of waterproof. Screws are used as connectors on the four corners. There are two extended components on right and left sides of the case, which is the design for connection with the sheep. The buckle is a design that connects with the extension part using a rubber belt which can be changed into other materials in the real design. There is no sharp corner or sharp edge on the case since safety is a big consideration of the design, and design of belt can make the sheep feel comfortable when wearing the tracker.

Leader Sheep

(Connecting to follower

Sheeps. Notice the RSSI) (Functions to select) (GPS of the Leader sheep) (backend + follower 1 ( sheep connection)

Graphical user interface, application

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Description automatically generated with medium confidenceGraphical user interface, text, application

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Backend

1. Testing results