PROGRESS OUTCOME 6

Monitoring wildlife

Context

For his digital technology project, Finn has elected to design and build a system to help a local ecosanctuary monitor wildlife. The system needs a web-based interface so that staff and volunteers can remotely monitor the enclosures and a graphical function to make the best use of the data.

Insight 1: Research and end-user consultation

In order to understand the requirements and purpose of the project, I met with a range of end-users and stakeholders, including the primary manager of the site, the volunteers who help manage the wildlife, and an electronics expert who understands electronic systems in outdoor environments. I also needed to visit the site to understand the physical requirements and constraints.

From my research, I realised that my system had to be accessible for people such as the volunteers at the ecosanctuary, so it needed to have a user-friendly interface and be easy to maintain.

I could see I would need to integrate specialised knowledge from a range of digital technologies, including electronics, programming, databases, and web coding, in the development of my outcome. For example, I needed to develop a way to graph the data collected by the system. Graphing shows visible trends in data over time and would help the ecosanctuary staff to analyse the data collected.

I researched some existing graphing-interface solutions, using GitHub and YouTube, to see how they were designed. I decided to use HTML5 to create the graphs because it's up-to-date, fast, and secure. I wanted to build something based on current technology to future-proof the system as much as possible.

Insight 2: Key design decisions

I decided to use online project-management and code repositories to manage the project and version control.

When developing the hardware and software for the website's front and back ends, I considered:

- which devices and alert representations would best suit the volunteers
- how to develop a system that would suit a volunteer organisation with limited funding
- how to set up the system so that it could be maintained and developed in the future without incurring major costs.

I decided that my platform would be released as open source and that I would only use open-source software to develop the outcome. This was both an ethical and a cost-saving decision. I also decided that all of the components should have a modular structure to make it easy to add new alerts or monitoring in the future.

Insight 3: Building and testing the system

This system is for use in monitoring outdoor areas, so my solutions had to be weatherproof. I tested different casing options to find one that would be both inexpensive and watertight.

I had to work out how to transfer data from the sensors to the central system in an outdoor environment in which network wires are impractical because of the distances involved. I ran a series of tests for radio range and frequency propagation over terrain to determine the impact that weather or radio interference would have on reception.

I configured the software to trigger the alert system if a gate was triggered and had been open too long. Data was sent via Picaxe using a RADIUS (Remote Authentication Dial-In User Service) server that I also configured.

To determine if gates were open or closed, I first tried a Hall Effect Sensor. However, a pin broke off the HES I was using, which raised concerns over the delicacy of the device and how to secure it to a gate.

I decided that a more robust solution was a magnetic reed switch. I drilled the magnet and embedded it in the gate, and used the same poking-through-wood approach for the sensor. The Picaxe was protected in a plastic container attached to the side of the fence post, making it both decent looking and weather resistant.

I knew that the application needed to be user-friendly, so it was important to get the interface to work well on mobile devices to provide quick and easy access to data. After some research, I chose a system that uses two cascading style sheets (style.CSS and mobile.CSS) for the different screen sizes of computers and cellphones.

This was far easier than having two different websites and meant I could manage them both from one codebase. Also, the ability to download data makes it easier to analyse (for example, in custom programs). To allow this, I created a PHP script that automatically gets the relevant data from MySQL and puts it in a CSV file.

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