WCNN
Wireless Camera Node Network

Preliminary Design Review
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Our Team

Alan Boguslawski - EE

Andrew Flewellen-Gore - EE

Ping Fung - EE

Advisor: Professor Siqueira
What is the Problem?

- Many wildlife species are becoming endangered
- Need to study their behaviors to help them better cope with their surroundings.
- Need to monitor wildlife to determine how population sizes change over time.
How Significant is the Problem?

- Changes in population sizes may disrupt the food chain, which can affect other populations.
- Over 25% of prescription drugs contain chemicals from animals. Endangered animals may contain an undiscovered chemical that can be used to treat health conditions.
Existing Solutions

Store images from wildlife camera on memory cards

Pros:
- Cheap, reliable, easy to implement

Cons:
- No immediate access to data
- Requires a person to periodically collect memory cards, which can interfere with wildlife.
Existing Solutions (Cont.)

Example:
On September 15, 2014, Marin County, California announced that it will spend $40,000 on a grid of 100 wildlife cameras to be deployed in several of the county’s parks. Images are stored on memory cards.
Existing Solutions (Cont.)

Use cellular modems to transmit images

Pros:
- Immediate access to data

Cons:
- Expensive (cost of modem + cost of cellular service)
- Only works in areas with cell phone service. Many areas used to study wildlife don’t have service.
Existing Solutions (Cont.)

Example:

Covert Special Ops Code Black 3G Cellular Trail Camera
by Covert

37 customer reviews | 20 answered questions

Price: $303.80 & FREE SHIPPING

Note: Not eligible for Amazon Prime. Available with free Prime shipping from other sellers on Amazon.

In Stock.
Ships from and sold by Red's Gear.

- Covert Sporting Camera voted “2012 Best Buy” from INSIDE ARCHERY
- 60 Invisible Flash LED’s
- Trigger speed 1.2 seconds

24 new
Proposed Solution: WCNN

Low cost, low power, and low maintenance wireless network of sensors and motion activated cameras.
High Level Overview

Nodes:
- Collects sensor data and images and send them to server.
- Propagate data from other nodes to the main computer.

Server:
- Receives data from nodes.
- Uploads images and sensor data to a website.
Requirements

- Weatherproof
  - Water resistant enclosure
  - Components selected to handle wide range of temperatures
- Long battery life (at least 2 weeks)
- Network is easy to expand
- Range between nodes ~ ¼ mile
- Pictures: 320 x 240 pixels (qVGA)
- Network should work with at least 32 nodes
- The system should not interfere with wildlife.
Input and Output

Input:
- Camera
- PIR motion sensor
- Temperature and barometric pressure sensors

Output:
- Images of wildlife and environmental data hosted online
Block Diagram

Server:

- Internet Connection
- Single-board Computer
- Transceiver Module
- Antenna
Node:

- PIR Motion Sensor
- Transceiver Module
- Microcontroller
- Environmental Sensors
- Camera
Component Selection:

Transceiver Module: HopeRF RFM23BP
- Frequency: 915MHz (ISM band)
- Data Rate: up to 256 kbps
- Transmit power: up to 30dbm (27dbm with 3.3v power supply)
- Modulation: GFSK
- Cost: $8.80
Component Selection (Cont.):

Microcontroller: PIC32MX170F256B
- RAM: 64kB
- Flash Memory: 256kB
- Maximum Clock Frequency: 50 MHz
- Cost: $4.49 (or 10 for $3.74 each)
Component Selection (Cont.):

Camera: Miniature TTL Serial JPEG Camera
- Maximum resolution: 640x480
- Features: JPEG Compression, auto-white-balance, auto-brightness, auto-contrast
- Cost: $35.95
Antenna Design

- Dipole Antenna
  - Perpendicular to the ground
  - Other antennas lie in the main lobe/ max directivity
  - Ideal Maximum directivity: 1.64
  - Range of operation is highly dependent on the position of the antenna
Proposed MDR Deliverables

- Demonstration of communication between transceiver modules connected to microcontroller and server.
- Demonstration of capturing and storing image with camera.
- Demonstration of reading data from sensors.
Questions?


