Falcon Pack

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Problem Description

Communication between mass numbers of military drones is difficult to coordinate.

Mexican free-tailed bats serve as an ideal model to study:

- Emerge from caves in dense stream at ~25 mph.
- Demonstrate ideal swarming behavior avoiding collisions with obstacles and each other.
- Emit short, high frequency pulses that sweep across frequencies to communicate.

Proposed Solution

Attach electronic rig to falcon, and train it to fly around bat swarms.

- Yes, we bought a falcon.

Basic Goal: PIC32 microcontroller connected to high-frequency microphone.

- Record communication between bats to aid in research.
- Adjustable gain
- Analog to digital conversion

Stretch Goal: Two microphones for stereo-sound, and video recording with a camera.

- Synchronization of audio and video poses challenges

Demonstrated Features

High-quality data vs. measured video and audio - Signal-to-Noise Ratio

Response to low-volume and frequencies inside/outside range

Synchronization compared to iPhone video

Length of audio/video clips that can be saved to memory

Less than 25 g

Available Technologies

Knowles Mini Sonic Ultrasonic Acoustic Sensor

PIC32MX series

SOC (undecided)

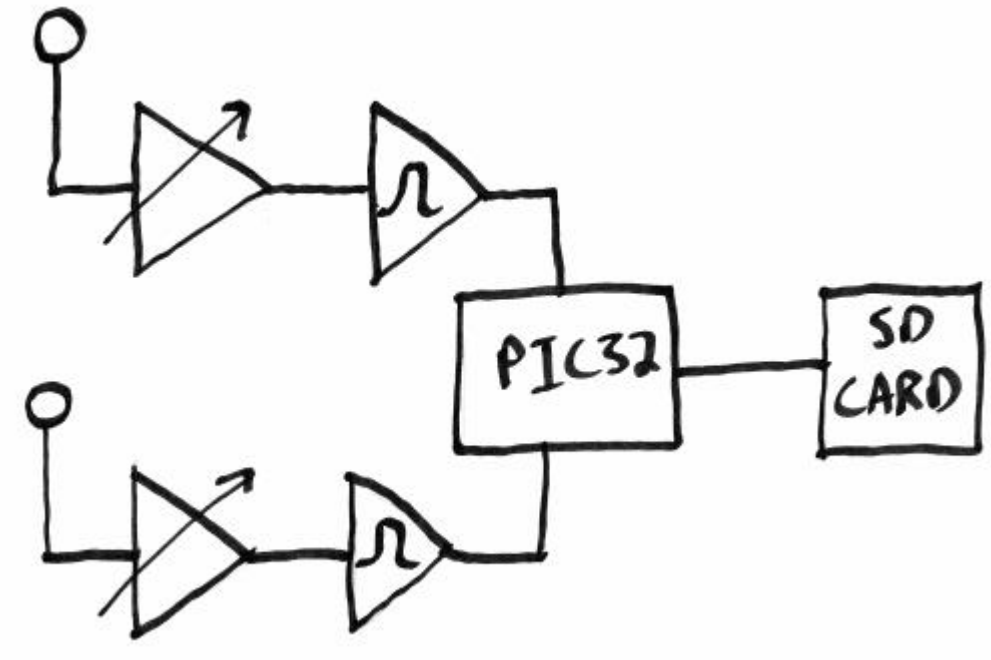
SanDisk microSD

CMOS image sensor

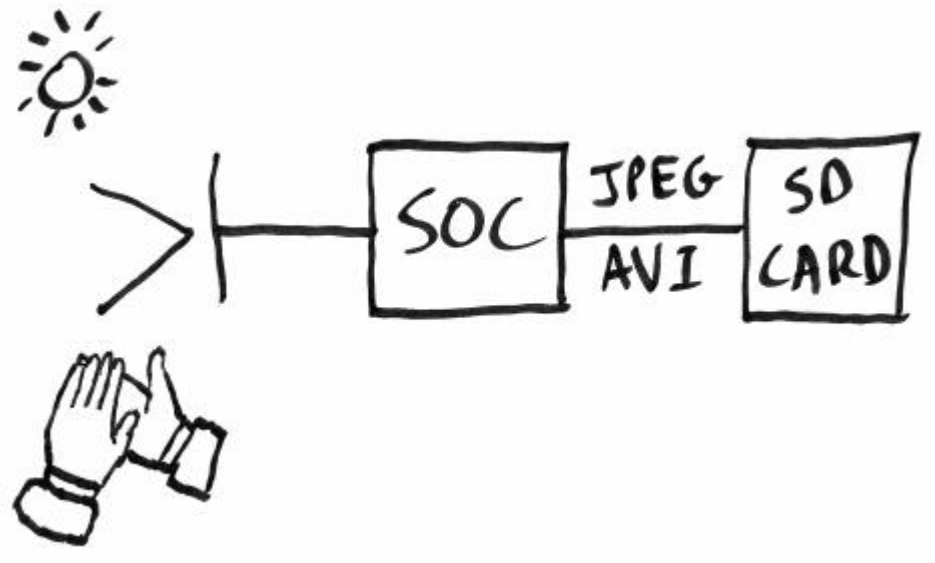
Op-Amp and lumped components

Falcon hood

Block Diagrams



Block Diagrams



Engineering Content

- Make data blocks
  - Analog front end
    - Amp, anti-aliasing, band pass filtering
  - Microphone/microSD interface
- Process data blocks
  - A/D conversion
  - Write to microSD
  - Stereo audio processing