

Department of Computer Science

Appalachian State University

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B.S. in Computer Science

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M.S. in Computer Science

More than \$4M funding from the NSF since 2002 to support student programs

NSF S-STEM joint CS and Math Scholarship Program since 2002

McKinney Scholarship Program

ECRS Scholarship Program

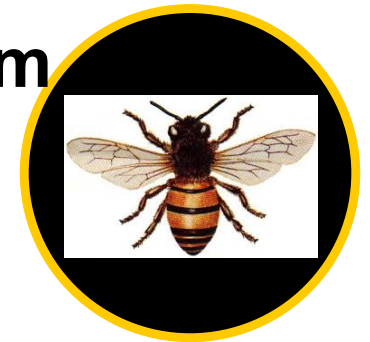
50+ undergraduate presentations at the regional and national conferences since 2002

~100% job placement

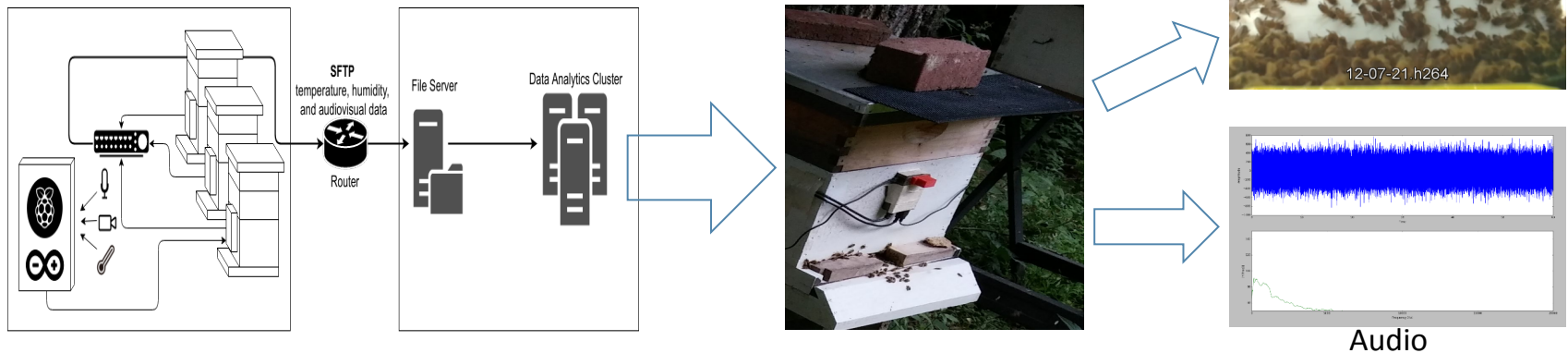
PhD students at Clemson, UNC Chapel Hill, NC State, Indiana University, UNC Charlotte, ...

World Leader in Functional Programming and honey bee monitoring systems

The Honey Bee Monitoring (BeeMon) System



In recent years beekeepers have faced significant losses of their populations of managed honey bees, a phenomenon known as Colony Collapse Disorder (CCD). BeeMon was created in the Visual and Image Processing (VIP) lab for remote monitoring of bee hives. The system not only allows beekeepers to observe their hives, it also provides significant data to researchers in the field.





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Appalachian State University

Estimating Daily Beehive Activities Using Image Processing

Jonathan Brotherton

Mentored by: Dr. Rahman Tashakkori and Dr. Mitchell Parry
Appalachian State University Department of Computer Science
Presented at the National Conference for Undergraduate Research 2017
Memphis, TN

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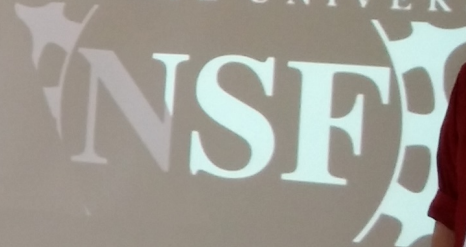
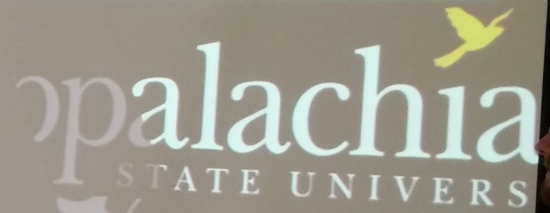
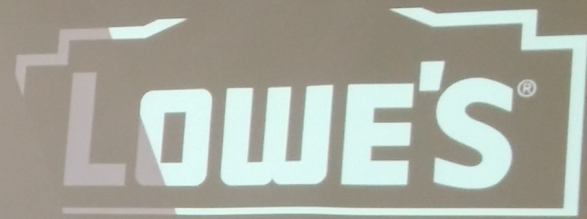




Honeybee Acoustics
Frequency Analysis

Preston Wilson and Chris Smith
Mentored by: Dr. Rahman Tashakkori and Dr. Mitchell Parry
Appalachian State University Department of Computer Science
Presented at the National Conference for Undergraduate Research
2017
Memphis, TN

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Programming Modern Design

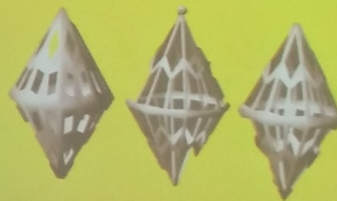
Alisha M. Sprinkle

Appalachian State University

Department of Applied Design

Department of Computer Science

National Conference on Undergraduate Research







Preliminary Analysis
of
Honey Bee Film

LaTeunya Tillman

Mentored by:
Dr. Rahman Tashakkori Appalachian State University
Department of Computer Science and Dr. Jennifer Galt
Appalachian State University Department of Biology

Presented at the National Conference for Undergraduate Research 2017
Memphis, TN

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LOWE'S

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Determining the Net Traffic at the Entrance of a Honeybee Hive

Garney B. Buchanan and Scott Shaffer
Mentored by Dr. Warren Sabelko and Dr. Michael Perry
Appalachian State University Department of Computer Science
President of the National Conference on Artificial Intelligence 2017
Memphis, TN

Problem: Data Analytics

Beemon produces 240 one-minute videos for each hive every day. Currently, we have 5 active honeybee hives producing video data. This means we produce approximately

20 Hours of Video Data Per Day

In order to produce useful data and recognize patterns of behavior, we need a common, reliable, qualitative metric by which to judge each beehive.

Solution: Computer Vision

In order to allow us to collect meaningful data efficiently, accurately, and consistently, we began work on a utility to use computer vision to analyze videos collected by Beemon. We chose to use Python with NumPy and OpenCV to create a utility that would identify honeybees in video frames, track their vectors and positions within their entrance boundaries, and produce a count of arrivals and departures based on this data. The goals of this utility are to produce accurate (within tolerances) records of arrivals/departures consistently and do so in real time.

Abstract

One of the primary projects in the Visual and Image Processing (VIP) lab in the Department of Computer Science at Appalachian State University is Bee Monitoring (Beemon). The Beemon project studies honeybee behavior using video recordings obtained at the entrance of hives. The goal is to detect the collapse of honeybee hives by studying the traffic at the entrance. As part of the project, we collect live video from a number of beehives. Once the data is collected, we manually analyze the video recordings to make observations on honeybee activities.

Our Metric: Traffic at the Hive Entrance

Our primary metric for hive health was developed as a result of the qualitative observations usually made when viewing a video of a hive entrance. When observing a beehive, you normally ask the question:

How much activity is at the Entrance?

The activity at the entrance can indicate problems WITHIN the hive. The entrance of a hive can indicate the active population, population of drones, and leadership of a hive.

Solution: Beel and Beevae

Our initial efforts resulted in a command-line utility which we called **beel**. This utility could take command-line arguments for parameters such as entrance location and save the output to an **honeybee** video while displaying the video with analysis overlays. Without displaying videos, this utility was hard to run in up to 1000 hives which presented a serious improvement over previous efforts.

Having created a command-line utility (see Fig. 24), we developed a back-end to be used in a user-friendly GUI (see Fig. 28).

In order to supplement or replace this time-consuming manual analysis, we are developing a learning tool that utilizes computer vision to count the incoming and outgoing bees and determine the net traffic. We implemented a utility in Python that would identify bees in video frames and track their vectors and locations to determine whether they had entered or departed a set entrance boundary allowing us to keep a real-time count of bee arrivals and departures. We found both versions of each utility and have begun to

Significance of the Traffic at the Hive Entrance

Changes in activity at the entrance of a hive can indicate the following:

- Decreased activity - potential reduction in hive population
- Increased activity - potential preparation for a "swarm"
- Large numbers of bees at entrance - hot day
- Large numbers of drone bees - potentially backqueen hive
- Consistent decrease in activity - dying hive
- Bees being departing than arriving - bees flying away from



Modeling eBook Sales Rank In The Amazon Marketplace: A Machine Learning Approach

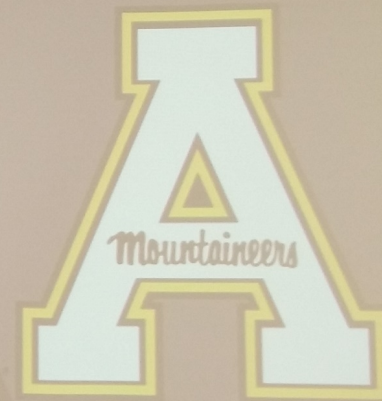
Kevin Alvarez

Mentored by: Dr. Mitchell Parry

Appalachian State University Department of Computer Science

Presented at the National Conference for Undergraduate Research
2017

Memphis, TN



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Google

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