Quality Assessment of Peanut Kernels

Group #10

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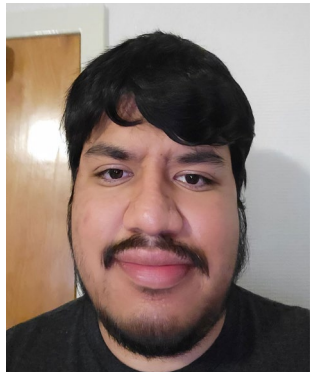

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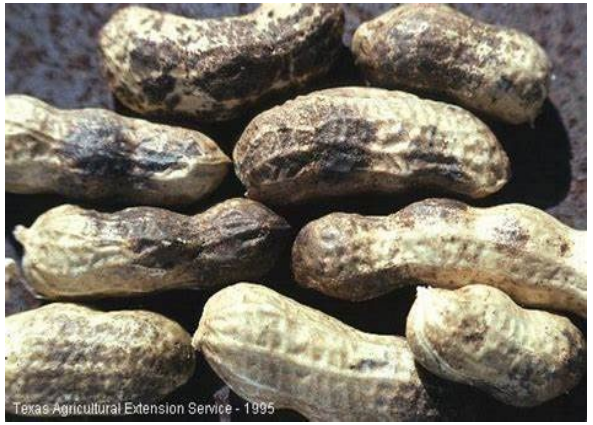
Background & Project Plan

- Project Background
  - Our project is determining a way to detect aflatoxin in peanuts kernels in post-harvest and seperate the bad peanuts
  - Aflatoxin is a toxin commonly found in peanuts
  - FDA restricts high levels in peanuts (>20 ppb)
- Project Plan
  - Start with determining a viable solution for aflatoxin detection
    - An E-Nose is our first candidate
    - We will test with known samples of aflatoxin
  - Once we have the sensing solution, we will determine how to separate the bad peanuts



Design Objective

- The Design objective is to find a sensor that will recognize aflatoxin in peanuts in post-harvest.
  - To do this we need to find a sensor that can detect the toxin, and at what speed, if any, the sensor can detect the toxin.
- Our design will also involve separating the bad peanuts after the sensing process

Key Stakeholders

Internal

- Georgia Peanut Commission
  - Need an efficient/effective way to detect aflatoxin levels in post-harvest peanuts
  - Need a way to implement detection system in production facilities

External

- Consumers
  - Need peanuts that are safe to consume
- FDA
  - Need peanuts to be meet standards
- Peanut Producers
  - Needs high quality peanuts to make the most profit
- Factory Workers
  - Need implementation to be safe, easy to use/upkeep, and effective

Engineering Specifications

1. Ability to detect aflatoxin within peanuts using an e-nose.
    1. Detect aflatoxin at levels 5 ppb or higher.
    2. Detect aflatoxin from 5 feet away.
    3. Detect aflatoxin levels within 1 second.
    4. Detect aflatoxin from a moving target.

2. Implement e-nose into the post-harvest process.
    1. Specifically, during the peanut shelling process.

Benchmarking

- As of now, there are no sensors that can smell aflatoxin other than the e-nose.
- There are aflatoxin sensors that can scan individual kernels,
  - This is an impractical solution for the purposes of our client
  - For now, our best option is to see how the e-nose responds to our method of testing.

Design Concepts

- E Nose with a conveyer belt
  - E Nose will test peanut aflatoxin levels while peanuts pass by on conveyer belt
  - Peanuts will be separated further down conveyer belt based on results
- Advantages
  - Easily implemented into production process
- Disadvantages
  - Speed at which E Nose can detect aflatoxin is in question
    - The speed of the conveyer belt might need to be so slow it isn't viable

- E Nose attached to a rover
  - Implemented during storage process
  - Rover would drive around storage warehouse and map aflatoxin levels
  - Different areas with different levels can be sold where appropriate
    - Different countries have different standards
    - Really high aflatoxin levels can be used for peanut oil
- Advantages
  - Would need to design/build any new infrastructure
  - E Nose doesn't have to perform at a specific speed
- Disadvantages
  - Storing bad peanuts with good peanuts could lead to spread of aflatoxin.
  - Warehouse would need controlled environments

New Knowledge Development

- The Cryanose 320 is the e-nose the group is using for the testing of aflatoxin within peanuts.
- The Cryanose 320 uses a chemical sensor in the unit to measure VOC's, this is done using a sealed vile.
- The e-nose then analyzes the vapor within the vial and gives a data chart showing the response of the sensor.
- Then using PCnose, the program uses different methods to train the e-nose over the data.
- Allowing the group to train the e-nose on aflatoxins signiture.

Project Planning for Spring

- Our next steps in our project is to train our e-nose to recognize aflatoxin in peanuts, which we will do once we acquire infected samples.
- Next, we will use the conveyer and e-nose to run various experiments to find: a.) whether the sensor recognizes aflatoxin while the product is moving, and b.) at what speed the sensor still works
- If these tests fail, we will begin a search for another method of testing