# Robot sniffers for infections and infestations in plants


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## 1. Project Aims

Large percentage of crops are lost every year due to plant infections and infestations. It is proposed that an electronic nose could be used to detect the odour given off by the infection.

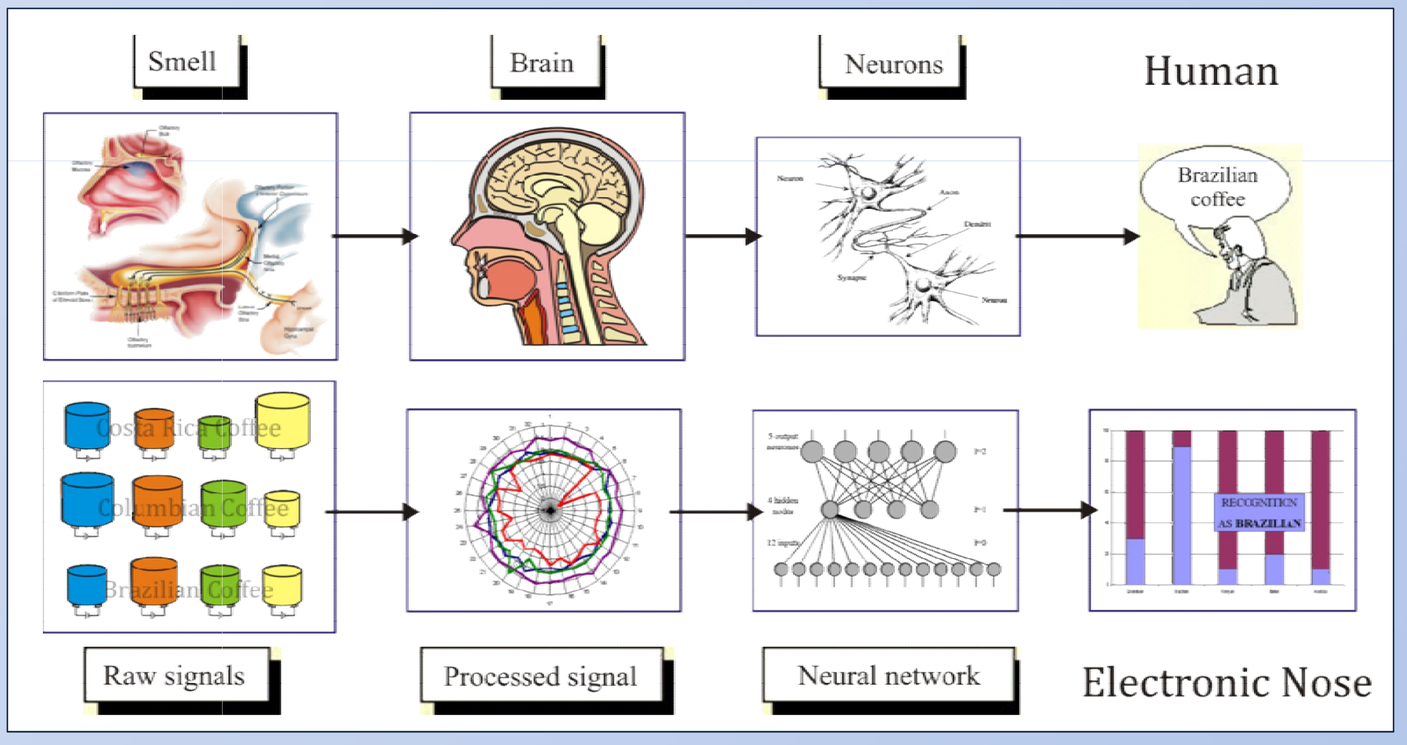
### Project Objectives

1. Refurbish the Warwick Electronic Nose
2. Evaluate if it can be used with plant infections

Since the original design and construction of the Warwick Fox 2000 electronic nose, over 15 years ago, it has undergone a series of modifications and upgrades to increase and expand its capabilities. Over the course of this project, we aimed to implement a new set of changes and improvements to the Fox system and apply it to a novel application – the detection of disease in plants.

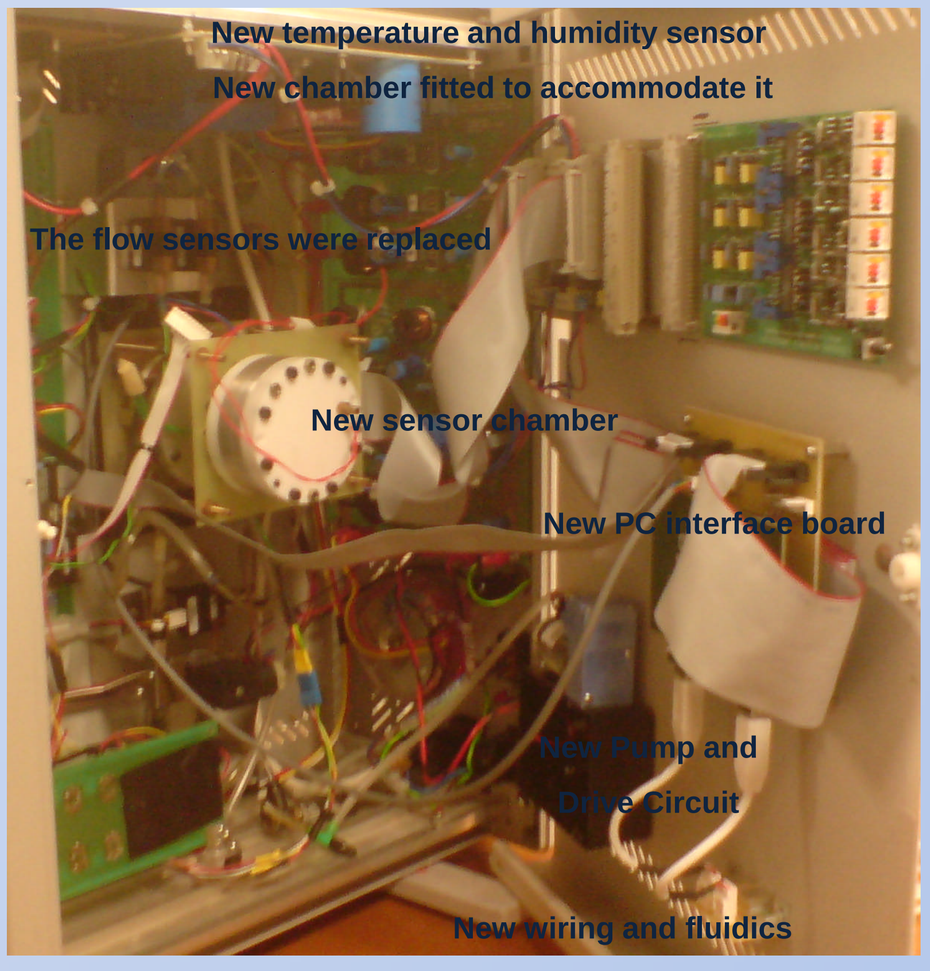
## 2. What is an "Electronic Nose"?

An electronic nose is an inspired by the human olfactory system. It used a series of partially overlapping sensors (i.e each sensor responds to a chemical group) to produce an odour fingerprint. This is possible as each sample contains different amount of each chemical group.



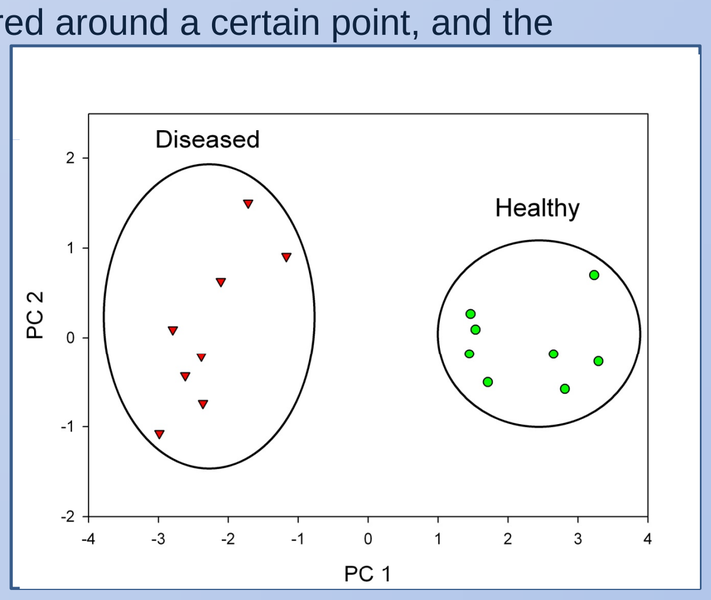

## 3. Refurbishment of Warwick E-nose

To allow us to use the Fox system for our planned application, numerous upgrades and modifications were required to the system. The flow sensors in the Fox were replaced with newer models and the sensor chamber was repaired and remounted. A new temperature and humidity sensor and chamber were fitted. Much of the wiring and fluidics or tubing was replaced, and a new USB interface board to the PC was designed, fabricated and fitted which was a considerable simplification compared to the previous interface. A new, higher voltage pump and step-up circuitry were also fitted.




## Results

The data gathered from the Fox was analysed and a graph produced. From the graph it is evident that the readings from the healthy plant all lie clustered around a certain point, and the readings from the diseased plant lie clustered around a distinct separate point. This shows that we achieved a good degree of accuracy with the Fox system able to correctly identify and differentiate the diseased and healthy plant specimens.




## Conclusions

Overall, we successfully implemented all of the proposed modifications to the Fox hardware and updated the software accordingly. We found that we were able to successfully differentiate between a diseased tomato plant and a healthy tomato plant with a good degree of accuracy. The application of electronic nose technology to the real-world problem of detecting disease in plants such as agricultural crops is an important issue as it has the potential to reduce the use of hazardous chemicals such as pesticides in food production.

## Summary and acknowledgments

I have enjoyed working on my URSS project and feel that it has been an excellent opportunity for me to experience working in an academic research environment. Over the course of the project I have been able to develop and improve many useful and transferrable practical skills such as planning and managing my time, working around any problems which may arise and working independently.


I would like to thank Dr Covington for taking me on as a URSS student and the Engineering department technical staff for their help throughout the project.



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