

Smart Technology

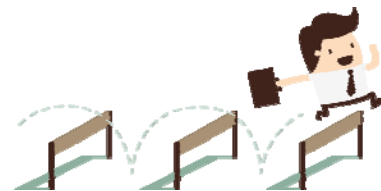
"If only every other module could be more like you..."

*Experience of Joeri and Jorik
2016-2017*

Movitation

- Matches interests
- Challenging
- More master oppurtunities

- Matches interests
- Lots of deadlines ♥
- Bit more serious



Subjects

- Circuit and electronics
- Sensors
- Telecommunication
- Systems and signals
- Control systems
- Literature project

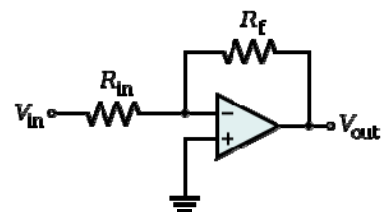
Disclaimer:
Teacher and courses might
be a little different

Circuit and electronics

- Lectures
- Tutorials
- Labsession

Topics

- OpAmps
- 1st and 2nd order filters
- Lab sessions (intense)
 - 2nd order filters
 - Noise cancellation
- Audio lab (how to hook up some serious audio)



Sensors

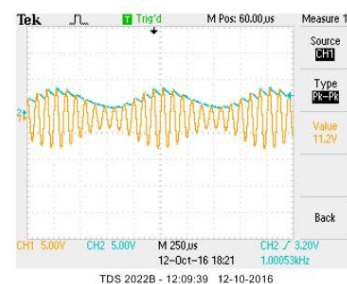
- Completely filled tuesdays
 - Lecture
 - Tutorial
 - Assignment

- Kinds of sensors
 - Capacitive
 - Resistive
 - Optical
 - Magnetic
 - Acoustic



Telecommunication

- Some lectures
- TBL
 - Videos in advance
 - Little test
 - Same test in teams
 - Discuss test
 - Tutorial
- Labsession (analog (de-)modulation)

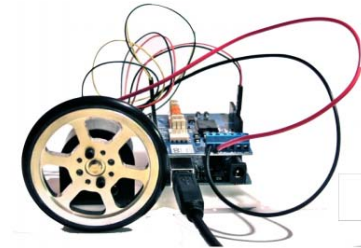


Control systems

- Lectures
- Tutorials

Topics

- PID controllers
- 'How to control a system?'

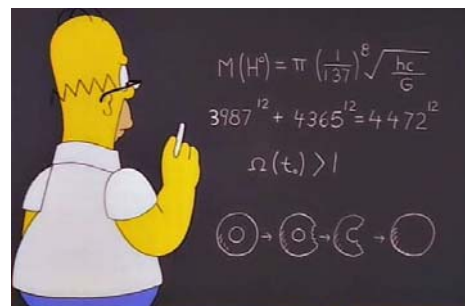


Systems and signals

- Lectures
- Tutorials

- Mathematics

- First part hand-in-hand with Circuits and Electronics
- Second part hand-in-hand with Control Systems



Literature project

The role of unmanned aerial vehicles in modern agriculture

Jorik Groeneveld Sierd Meijer

Introduction

People need food. One way to obtain food, is to cultivate it yourself. For years humans have been supporting farming to get the highest yield at the lowest cost. Modern technology takes this research to a new step by using unmanned vehicles. This unmanned vehicles contribute to higher yields, lower costs, less workers and a better product quality. An already existing but rapidly growing part of agriculture is the use of unmanned aerial vehicles (UAV). The use of UAVs is essential in this paper.

Materials & method

In order to get articles in the research, different databases are used: Scopus and Google scholar mainly. To search through all the data in the databases, a search sentence is phrased which contains words like agriculture, aerial farming, unmanned aerial vehicles, mapping and measurements. When articles were selected, these are summarized in order to be left with only the relevant information. Using this knowledge a conclusion is made.

Results

Doing research about the use of UAVs in agriculture resulted in a big list of advantages, which could make people think about why they are not extremely popular. UAVs do not just make pictures for the farmer to examine, UAVs collect large amounts of data in different ways.

For example they can make pictures using special lenses. These lenses can indicate whether the plants are healthy or if there is a weed infestation throughout the plants. It is also possible to count 3D maps of the field using photos under different angles, these point clouds can be used to determine crop growth over time or volume estimation. The UAVs can provide information that no farmer could ever be aware of using the naked eye. Another big advantage of the drones is the financial efficiency. Before there were UAVs, farmers needed to employ people in order to examine the field or even a plane to do large mapping operations. Drones are relatively cheap to buy and do not have additional costs. UAVs can cover large areas in a short amount of time and deliver more useful information. Only one person is needed to operate the drone and a skilled eye can make great use of this.

Conclusion

In precision agriculture, UAVs are of great use. They are relatively cheap and provide a lot of capabilities in order to support the farmer for instance. Big data collection can be done, point cloud generation in order to create a map, measurements can be performed and crop production and pest treatment can be performed. UAVs come in different shapes, each with their own pros and cons for different tasks. The use of UAVs is significant in the future, but still need a lot of adjustment in order to become really useful and a big success.

Acknowledgements

We thank Van Dae for his supervision by means of feedback in this literature research.


Resources

Mattarello, F. (2016) Technical analysis of Unmanned Aerial Vehicles (UAVs) for agricultural applications, University of Padua, Italy

Dhargalkar, V. (2014) Precision monitoring and field estimation using autonomous quadcopter for precision agriculture, 2014 IEEE International Conference on Robotics and Automation (ICRA), Stockholm, Sweden.

Further information

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UAV working over the 3D point cloud map.

Drones against wildfires

Introduction

Wildfires have a huge impact on both the economy and the environment, but to mention the real firefighters take. An average of 1.2 million acres of US woodland burn every year. By using drones, the fire, economical and environmental losses can very likely be reduced. Drones have a very promising future in all kinds of sectors, as also in firefighting. Next to fighting the early detector is very important in which drones can play an important role as well.

Materials and methods

The articles that were used were found using scopus. Important keywords for finding relevant papers were: UAV, wildfire, autonomous, sensor, IR, heat, detection. For selecting articles important property's were if the articles contained relevant information, if they were recent and if they could be well connected to other articles.

Conclusion

Early detection and monitoring fire in real-time is very important. Drone technology can play a big role in this industry. There are a lot of ways in which drones can be improved to serve for wildfire fighting and detection. What stands out from all articles is the autonomous cooperation between multiple UAVs. The future lays in this region. The autonomous cooperation of drones offers great opportunities that can save many lives.

Results

Early detection is key in wildfire fighting. UAVs (unmanned aerial vehicles) equipped with IR sensors and cameras can provide aerial data, which is processed by software in real-time. This provides location information of the detected fire. The major advantage over satellite aerial data is that drone flights are more flexible. Normally, water towers are used to back-up satellite aerial data when clouds block the image, but these can be reduced when drones are used.

By applying a control strategy, multiple drones arrive simultaneously and scatter around the fire front, fighting the fire in elliptical order from the outside to the inside. This method can be expanded by adding unmanned ground vehicles and a motion planning scheme to prevent vehicle collision.

While fighting fire, monitoring the fire (front) is important as well. Multiple drones in symmetrical formation can use their cameras to detect the contour of the fire over time, from which the rate of spread can be calculated.

References

Chen, S., Yu, L., Li, G., Li, S. (2016) A study on the application of UAVs in fire fighting. *Journal of Fire Protection and Engineering*, 10(1), 1-8.

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Further more

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To download the poster or the research report go to: <https://doi.org/10.1002/ghw.1011>



Experiences

- Very nice
 - Learned a lot
 - Coherent module
 - Worth all the hard studying
-
- Satisfying
 - Interesting
 - Fun



Wrap up

- Busy module
- Learn a lot
- Perfect coherent
- Nice teachers



Questions?

