Project proposal template
Graduate School studentships
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Project title	Video Analytics for Intelligent Aerial Vehicles
First Supervisor	Professor ▼ Paolo Remagnino
Second Supervisor	Dorothy Monekosso
School	Computing and Information Systems ▼
Other member of supervisory team *(no more than three KU supervisors in total)*	Vasselios Aryriou
Specific requirements beyond 2:1 degree	

Project summary

(max 4,000 characters)

The last two years have witnessed a rapid increase in the development of manned and unmanned aerial vehicle technology. Intelligent aerial vehicles can be employed in house sales to provide 360 aerial views of a property, they have been employed to deliver parcels (Australia and China), they are more and more used to provide dramatic real-time views of sports events (skiing, snowboarding, extreme sports etc.), they can also be used to provide additional perspective by following a person, for instance, riding a quad, recording the surroundings.

intelligent aerial vehicles can also be used to survey or monitor a property or the premises of a company. Modern intelligent aerial vehicles are equipped with reasonable payload and can easily fly a high specification camera (such as a GoPro), providing very high resolution streaming of video data complemented by telemetry information.
Our Robot Vision Team owns a DJI Phantom intelligent aerial vehicle equipped with high resolution a camera. It is currently used in a European project to develop an intelligent tracker that works with aerial views and makes use of video and telemetry information to better follow a person in a complex scene.
We would like to carry on working on video analytics from aerial views, with the specific intention of analysing automatically behaviour of people and object dynamics streamed from the air.
The entailed course of studies will be articulated to first learning the capabilities and functionality of a generic intelligent aerial vehicle; how the intelligent aerial vehicle can operate safely, securely and the privacy implications of using a intelligent aerial vehicle in private and public areas.

Research will then move to more technical work, regarding the capture of video, telemetry and, whenever possible, audio information; how this information could be processed on board and how must be streamed to a ground computer to be more efficiently analysed.

Particular interest will be on video processing, on how a scene can be captured, video information efficiently extracted and can be compactly represented as a mathematical model. For example, can moving objects and people be detected and tracked during a flyover? How can the intelligent aerial vehicle move to keep the tracked target visible? How can this be implemented efficiently? Visual odometry can help, but telemetry information can also play an important role in improving accuracy and efficiency. The camera must be moved and this can be done, moving the intelligent aerial vehicle and/or moving the camera on the intelligent aerial vehicle. What is the best combination of movements?

Although people and other objects (for instance vehicles) are simpler to identify from an aerial view, the distance from the target to follow might change, the view might change, to keep a target in view and perspective might complicate matters, by creating drastic changes in the shape and appearance of the target.

The course of studies will explore existing and novel methods to identify a target (person or other object) robustly, creating models invariant to such changes, or models able to rapidly cope with large/wild variations.

Existing semi-professional intelligent aerial vehicles have limited range, of the order of 20 minutes. The study will also take into consideration this as a crucial parameter, designing and implementing methods that can locate, recognise and then track a target quickly. The idea is to design methods that could then be used with dispensable cheap intelligent aerial vehicles, capable of operating for short periods of time, in a variety of applications, for instance as aid in a military operation or the monitoring of a perimeter, such as a company or a prison.