Drone mesh for crowd density monitoring

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Abstract

Crowd counting is immensely important not only for businesses, such as shopping malls, but also for public safety like in music concerts.

This project aims to take advantage of the versatility of UAVs, more specifically drones, combined with the power of AI in the field of object detection, using YOLO[1].

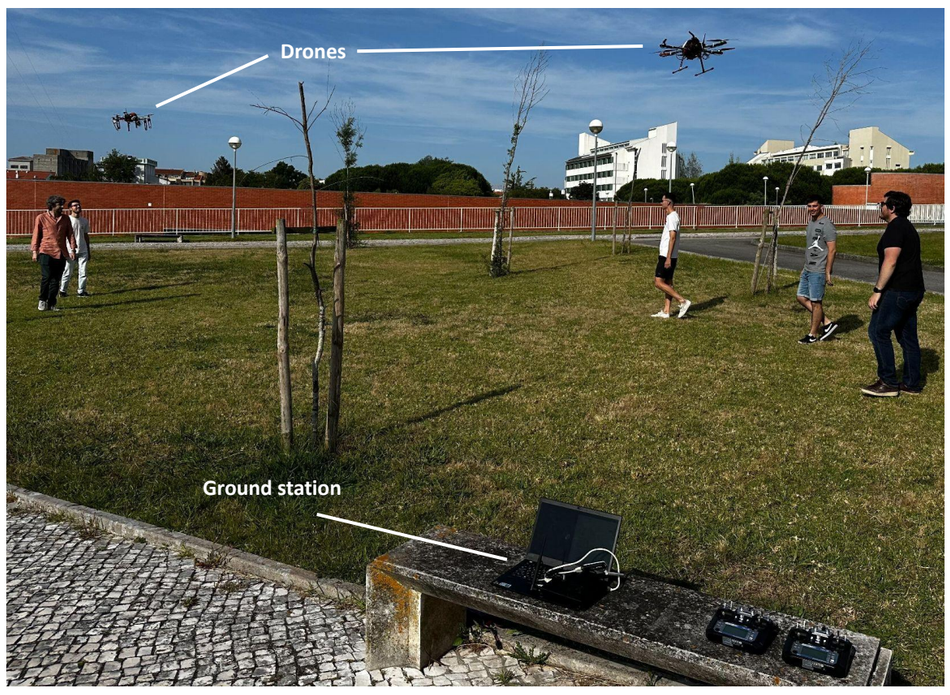

Fig 1- Real World demonstration

Architecture

This project follows an ad hoc oriented approach, in which we use B.A.T.M.A.N.[2] to create a network between all nodes. The Ground station node is composed by an APU with a WLAN interface for ITS-G5 and one for Wi-Fi. The Drone node also has an APU with ITS-G5, which allows for communication using ROS 2 with the Ground station (using the Fleet Manager[3] framework), and a Raspberry Pi with Wi-Fi to integrate the ad hoc network and run the Object Detection module.

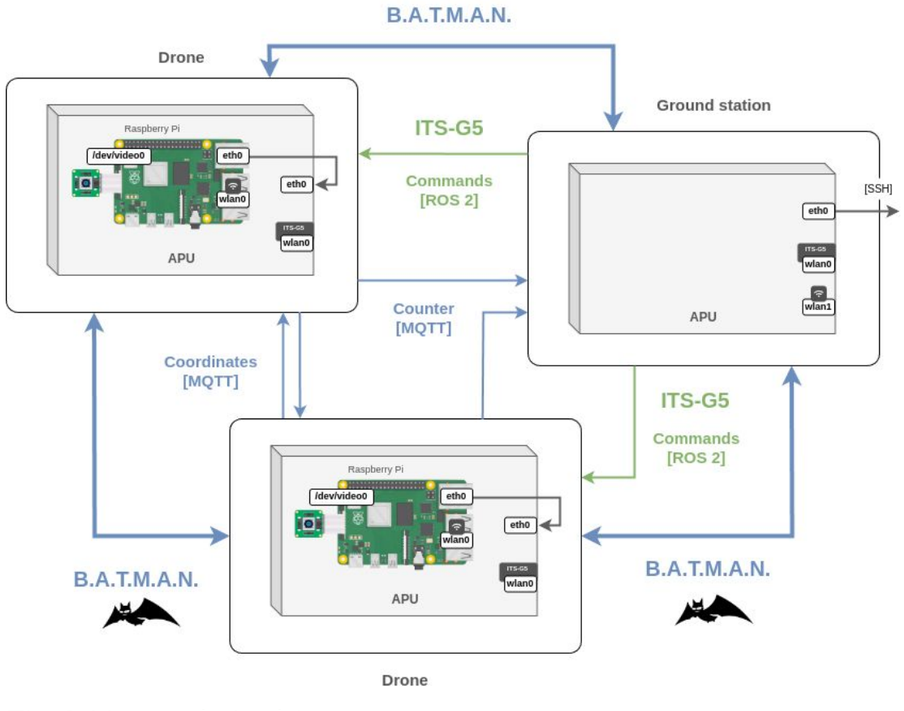

Fig 2-Network Architecture.

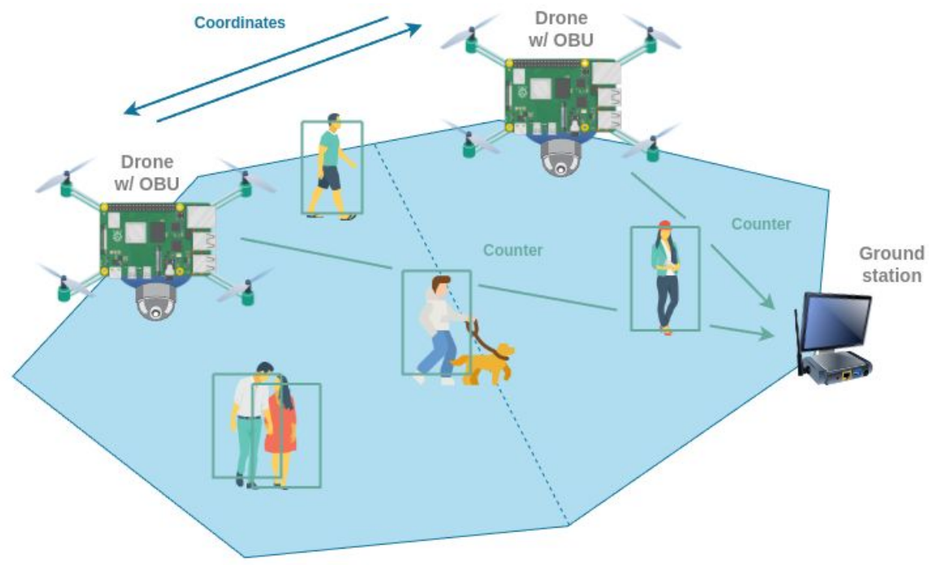

Fig 3-Envisioned use case scenario

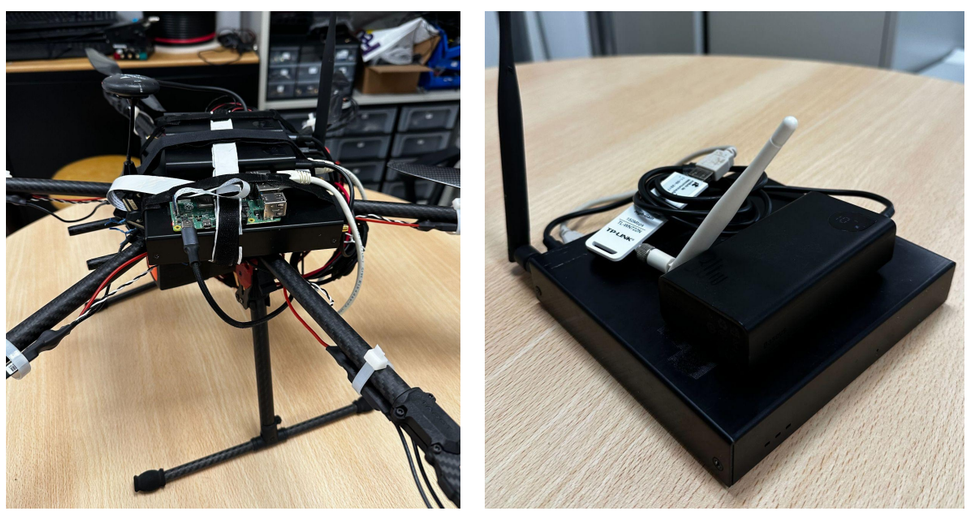

Fig 4-Drone and Ground station components

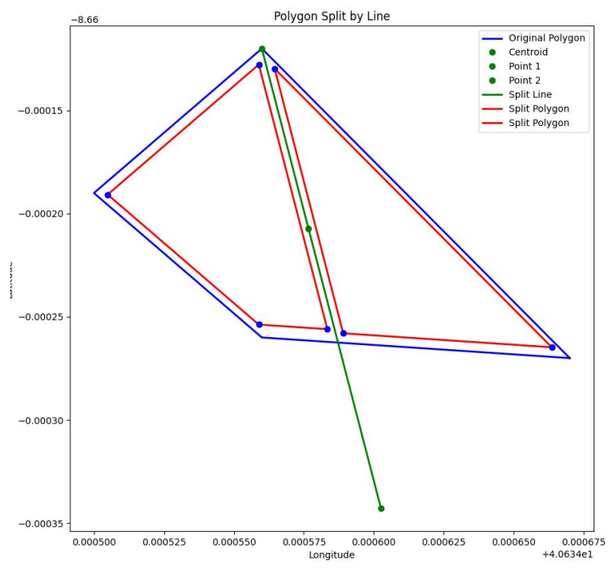

Fig 5-Dynamic field mission creation

Conclusion

In this day and age, automation is key. With this project, we demonstrated that a couple of drones are able to achieve a task that would be demanding for a couple of individuals. All of this, without a centralized infrastructure, allowing for lower costs and complexity in the implementation.

References

[1] https://pjreddie.com/darknet/yolo/
[2] https://www.open-mesh.org/projects/open-mesh/wiki
[3] https://link.springer.com/article/10.1007/s10846-023-01820-7

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