# **Arduino Head-Mounted Drone Controller**

**Initial Project Proposal**

Name: Marcel Troscianko

Matric No: 40173086

Abstract

The recent rise in VR and motion controls has yielder results on in the virtual world – this project aims to bring those benefits to real-world controllable drones. A simple version of this will be done by creating a head-mounted sensing system to control a drone, a basic drone with wheels[1] and a movable camera, and a mobile application to help with the control of the drone as well as displaying its output (something that would be replaced by a VR headset in future iterations).

The devices will be linked via Bluetooth and the processing will be done either on the drone or the headset – the mobile app will simply change calibration and display pre-calculated results. The mobile app will be very simple in user interface unless the hardware proves easier to create than anticipated.

The deliverables from the project will be a drone, a sensing and controller headset, and a companion app for calibration.

**Declaration of authorship: I confirm that the work submitted is mine and that wherever possible the work of others has been clearly acknowledged and referenced.**

**Signature : Marcel Troscianko Date: 15/02/2017**

## Introduction

### Background/context

Multiple games have recently come out with controllable drones (Watch\_Dogs 2 and Rainbow Six: Siege to name a couple), and with the recent rise of Virtual Reality and motion controls the concept of a head-mounted drone controller springs to mind.

The basic idea is to create a helmet or goggle mounted sensing system that detects the user’s movements and translates those into commands for a little drone on wheels holding a camera, such that the camera moves in-sync with the user’s head. The basic prototype will relay the video from the camera to the mobile app, while the full product would include two cameras linked to a VR headset so that the user can see what the drone sees along with full 3D perspective.

### Aims and deliverables

* Controllable wheeled drone with cameras
* Headset with sensors for drone control
* Mobile app for drone control and headset calibration

Design choices

The project will consist of three main parts:

* The drone will be the simplest deliverable to create – it’ll be a simple drone with a mounted camera. The drone should be remote controllable, and will be able to move forward/backward, turn left/right, and tilt the camera up/down.
* The mobile application will be the centre of control for the project – it’ll consist of the camera output, a set of calibration options, and a simple layout of up-down-left-right. The user interface will be very simple seeing as the time spent on this project is very limited and there may be problems in properly implementing the two other deliverables.
* The head-mounted sensing system will consist of multiple devices measuring the user’s movements. It is uncertain as of yet whether the main processing will happen here or on the drone itself, but both have their pros and cons – the processing should be done before any information is transmitted, but having a clunky unit on the user’s head is very counter-intuitive. The head piece itself could also come in two different forms – a helmet would be easier to use, but mounting it on a set of goggles would definitely be more comfortable for the user. The final goal is to use the built-in features of a VR headset and output directly to its screens, but that will most likely prove too advanced for this course. Using gyroscopes and accelerometers with Arduino has been done many times before so it should be easy enough to implement [2].

The information will most likely be transmitted via Bluetooth – the maximum range is approximately 100 metres which is enough for a remote-controlled vehicle.

Method

The project will be put together using two separate Arduino boards communicating with each other using a slave-master relationship [3]. While the drone can be put together quite loosely, the head-piece will mostly likely be welded together so as not to be too heavy or clunky to wear. The mobile app will be written in Android Studio while the Arduino software will be written using the Arduino development environment. The specific hardware components are yet to be selected so no diagram can be legitimately drawn up, but they must be the smallest components available to avoid building a heavy kit. The components will be bought online so freedom of choice is big.

Below is a diagram representing the timeline of the project development.



The first prototype will be just a phone-controlled drone as well as a headset-controlled sphere in a 3d environment to calibrate the headset. Once the headset is calibrated well, the next prototype will be a proper headset-controlled drone.

A major limitation is my lack of experience with wireless transmission – the information is very likely to either be sent more slowly than the headset records it or with information being long, so the car may go more and more out of calibration with time. A way to counter that would be to make up for that on the side of the headset, but I’m far too inexperienced with wireless technology to know whether this would fix the issue for sure, and it would make the headset far heavier than need be.

Another issue is the accuracy of freely available and inexpensive accelerometers and gyroscopes.

Finally, mounting the equipment on a headset comfortably could prove too time-consuming to be feasible.

References

* [1] Simple RC car for beginners Tutorial - <http://www.instructables.com/id/Simple-RC-car-for-beginners-Android-control-over-/>
* [2] Arduino 5 Minute Tutorials: Lesson 7 – Accelerometers, Gyros, IMUs - <http://www.robotshop.com/blog/en/arduino-5-minute-tutorials-lesson-7-accelerometers-gyros-imus-3634> (May 2, 2012)
* [3] RC Hobby Controllers and Arduino - <https://www.sparkfun.com/tutorials/348> (May 22, 2012)