Dronible: Operating drones with Tangible objects

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Abstract

The goal of the **Dronible** workshop is to design and prototype interaction to fly and operate drones using tangible objects. This hands-on workshop will start with a video brainstorming for rapid and physical exploration of potential interaction. The workshop will continue with a digital prototyping phase with small-sized drones, motion sensors and haptic actuators. Finally, a presentation session will allow all participants to show off their prototypes and reflect on future Human-Drone Interaction perspectives.

Keywords

Human-Drone Interaction, Tangible User Interface, Haptic Feedback, Prototyping

1. Introduction

Drones are becoming more and more popular and widespread for professional or leisure applications. Most drones are either controlled via remote controllers, touch controls on screens or automated with dedicated ground control stations [1]. Recently, Human-Drone Interaction (HDI) is becoming an established field of research within the Human-Computer Interaction community [2] and various challenges for the control and communication with highly automated vehicles in public space are emerging among other ones.

Unfortunately, designing new forms of interaction with such devices can be complicated due to the specific nature of flying robots and the required technical challenges to achieve functional interaction techniques as with Tangible Interaction or haptic feedback.

For the **Dronible** workshop, we would like to invite participants to envision how drones can be operated with tangible objects and provide haptic feedback for various use cases that will emerge from the participants interests. We will perform ideation and physical design activities as well as digital prototyping to invent and craft new forms of interaction with drones.

The workshop has three distinct goals:
1. Democratizing the field of Human-Drone Interaction
2. Developing the use of physical and digital prototyping techniques for HDI
3. Have fun in a creative and cooperative activity

(bonus) create future collaborations within the participants on Tangible Human-Drone Interaction.

2. Workshop Organization

2.1. Scheduling

The workshop is planned to take place over a full day or possible two half days.

- Morning
  - Introduction to the workshop and participants round-table (30 minutes)
  - Group definition with mixed background (30 minutes)
  - Video Brainstorming session with physical prototyping (90 minutes)
  - Video prototypes presentations (30 minutes)

- Afternoon
  - Tutorial on the drones, sensors and actuators available (30 minutes)
  - Physical and Digital prototyping session (120 minutes)
  - Prototypes presentations and discussions (30 minutes)

2.2. Apparatus

We will provide several small-sized drones (Dji Tello, BitCraze Crazyflies and Parrot Bebop2) that can be programmed with python. We will also provide various physical prototyping material and motion sensors from Bitalino RioT allowing to retrieve motion data such as acceleration or rotation via Wifi and to embed external sensors such as pressure sensors or potentiometers. For the haptic feedback part we will provide DFROBOT Bluetooth audio cards (DFR0720) and LRA vibrating motors. Facilitating code will be provided and shared via GitHub before the workshop.

The afternoon prototyping session will take place at the ENAC flight hall to ensure participants' safety while testing their flying prototypes. The hall also features a recording system to document the results of the workshop.

2.3. Participants

The workshop can accept a maximum of 12 participants in 3 groups of 4 people to ensure each group can have access to a drone and the remote sensors. They are no prerequisite to the participation but some programming skills might be helpful during the digital prototyping phase.

3. References

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