Motivated Copter
( Brain-controlled drone )

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Goal

A BRAIN COMPUTER INTERFACE
Brain Computer Interface - History

• 1970s: Fetz and colleagues first showed that monkeys could learn to control the deflection of a biofeedback meter arm with neural activity.
• 1980s: Apostolos Georgopoulos found mathematical relationship between the motor-cortex neurons in monkeys and the direction they moved their arms.
• Mid-1990s: Niels Birbaumer trained severely paralysed people to self-regulate the slow cortical potentials in their EEG to such an extent that these signals could be used as a binary signal to control a computer cursor.
1999: Yang Dan decoded neuronal firings to reproduce images seen by cats (UC Berkeley).

2000: Miguel Nicoleius decoded brain activity in monkeys and used the devices to reproduce monkey movements in robotic arms.

http://www.youtube.com/watch?v=gnWSah4RD2E
Applications

• Restore sight
• Restore hearing
• Overcome other disabilities
• Cognitive sciences
• Gaming
A.R. Drone

• A quad-copter, with four engines for extra stability.
• Drone has two cameras, installed in front and bottom.
• Front camera can be used for object recognition.
• Bottom camera enables to stay stable even with perturbation.
• An Ultra-Sound sensor installed at bottom, can be used as an altimeter.
• Control from any client device supporting WiFi ad-hoc mode.
Drone SDK

• AR Drone comes with API and some examples.
• Drone provides three main communication services.
• API has built in functionalities to For:
  • AT Command (Control commands to maneuver Drone)
  • NavData (Information about current state of Drone)
  • Video (Video captured by two cameras on Drone)
  • Configuration
Emotiv Headset

- Emotiv headset for capturing electroencephalographic (EEG) signal.
- A very good alternative to the medical EEG headset.
- Uses fourteen probes
- Can be trained to capture:
  - Conscious thoughts (Cognitive suite)
  - Emotions (Affective suite)
  - Facial expressions (Expressive suite)
  - Head rotation

Preprocessed Data
Emotiv SDK

- **EmoEngine**: capture and process signals
- **Control Panel**:
  - Cognitive suite: display Cognitive state
  - Affective suite: display Affective State
  - Expressive suite: Display Expressive state
- **EmoKey**: can send key events associated with a particular state
- **EmoComposer**: Simulates EmoEngine inputs.
Project Outline

Step 1
• Control AR.Drone from Customized code
  • Based on SDK templates
  • User defined control signals

Step 2
• Write a custom code capture inputs from EmoEngine/EmoComposer
  • Parse and filter the input signals.

Step 3
• Interface Emo inputs with ARDrone controller.

Step 4
• Replace EmoComposer with EmoEngine
  • Connect the headset!!!
AR Drone Module

From Interface

Custom Bitmap

Read

Drone Module
- Render Video

Write Navdata

To Interface

Queue

AR Drone API

Interact

College of Computer and Information Science
Emotive Interface

- Emotiv Engine
- Emotivel Interface
- Filter
- Queue
- To the Interface
Experience

Microsoft C++ Development
Ease of availability of BCI component.
Thank You