

# The Gadget Show Project

March 17, 2011  
Birmingham, United Kingdom

# The Challenge

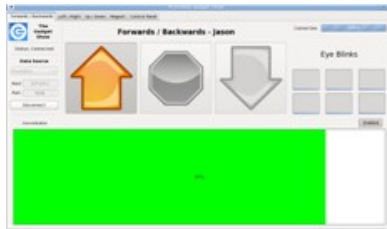


# The Challenge

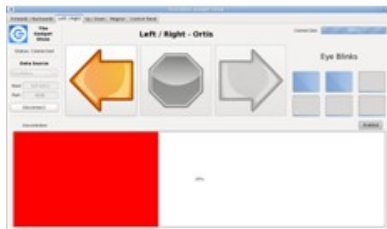
In February 2011, Puzzlebox was approached by NeuroSky in San Jose with a unique concept. UK's “The Gadget Show” wanted to present their show hosts with a series of challenges for their season finale, culminating in leveraging the power of their minds to maneuver a car across a warehouse using EEG headsets to control a 50-tonne crane. NeuroSky would supply a set of MindWave hardware and Puzzlebox would develop the software controls and visual displays to give feedback to the users during the event. Filming would take place on-site in Studley, just outside of Birmingham, and if successful would establish a new Guinness World Record.



# The Solution



Forwards / Backwards



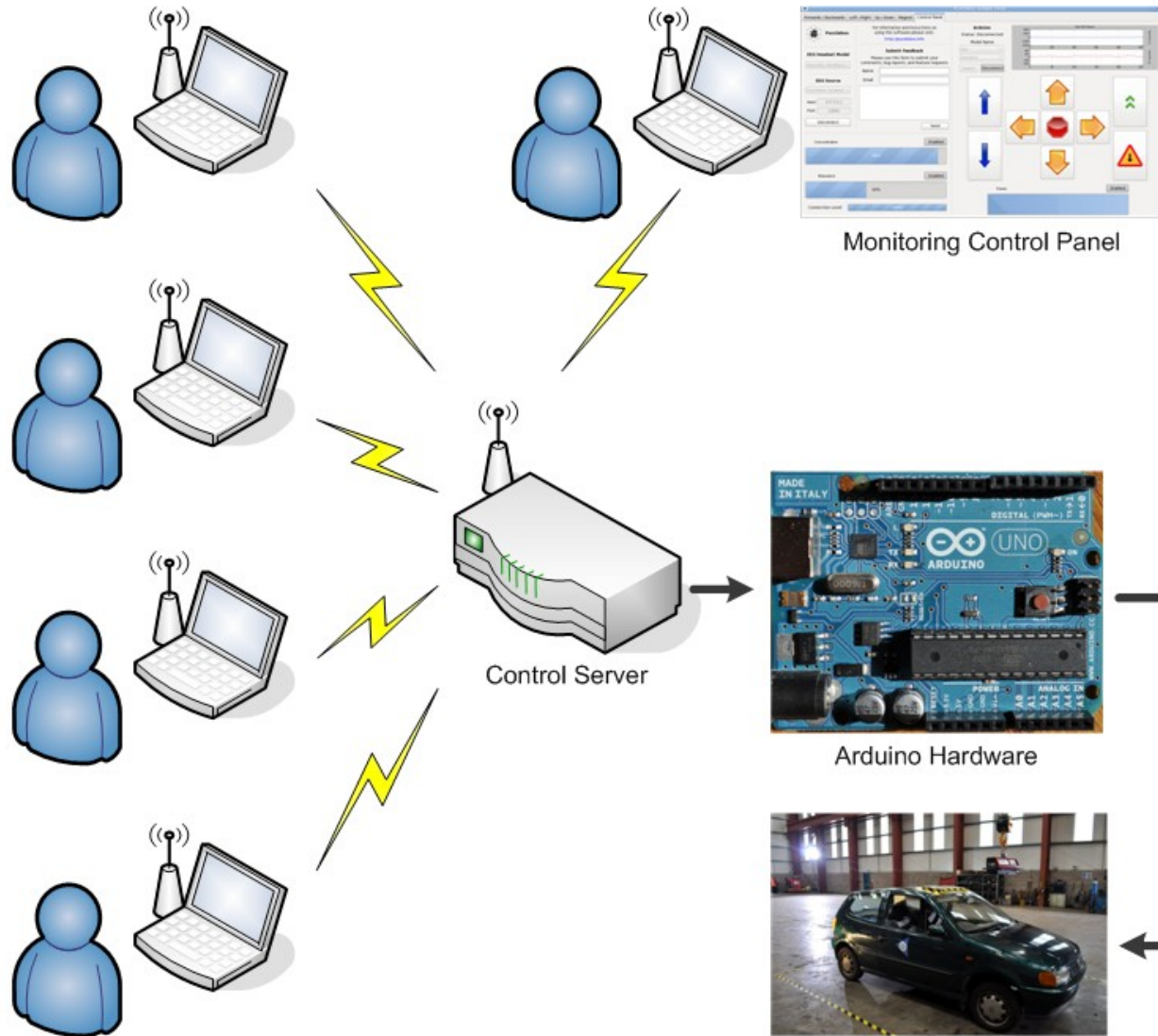
Left / Right



Up / Down



Magnet On / Off



Monitoring Control Panel



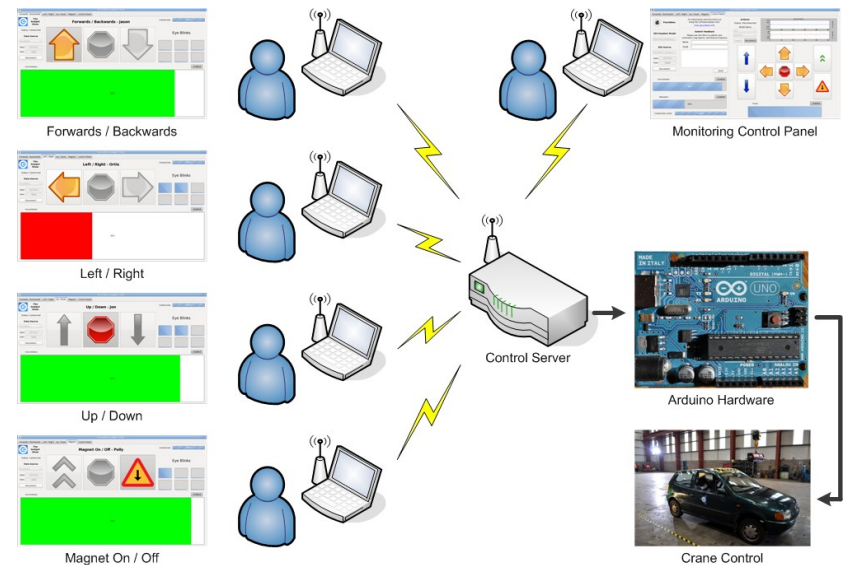
Arduino Hardware



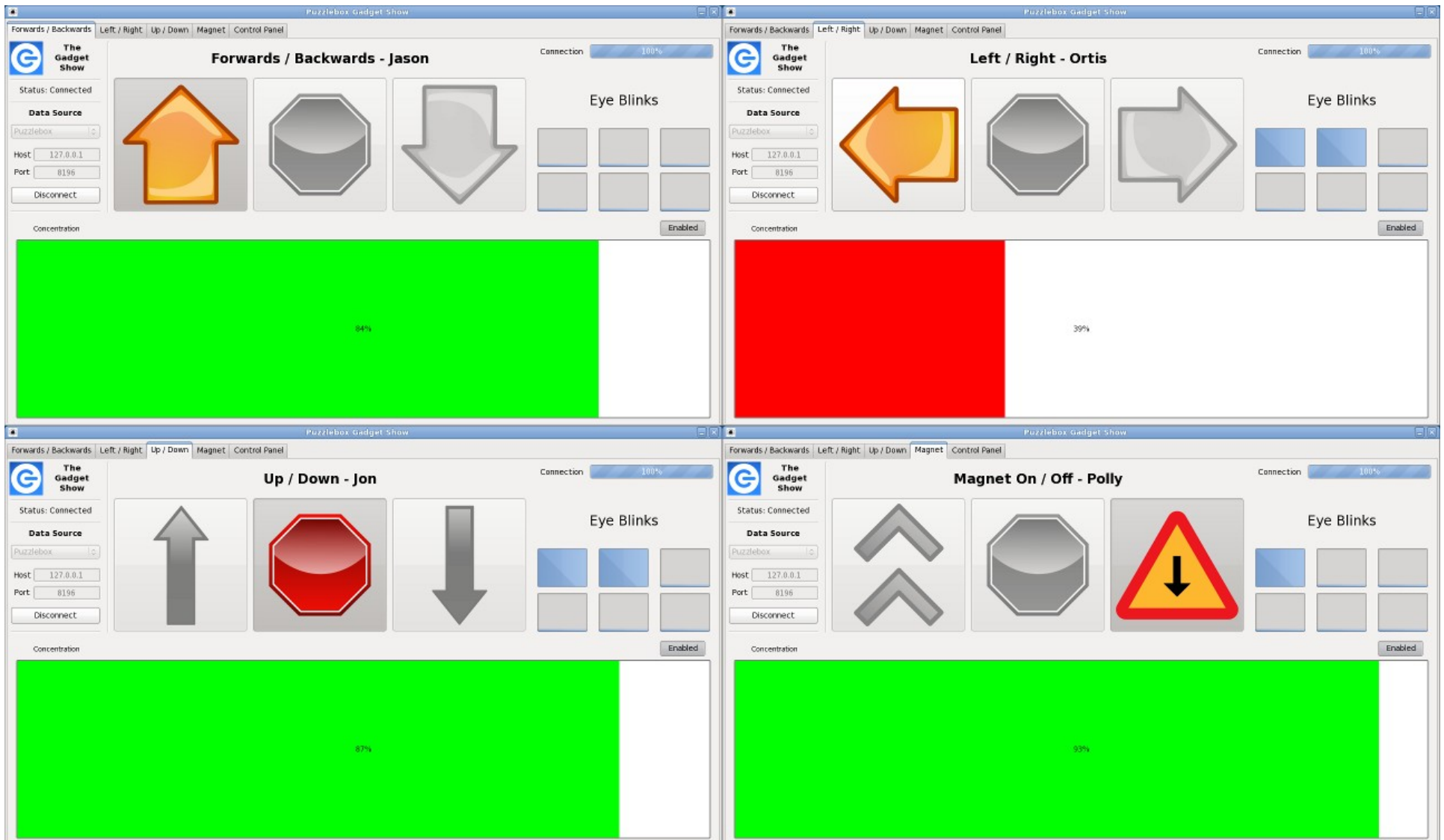
Crane Control

# The Solution

The solution developed by Puzzlebox consisted of six computer systems, linked over a local wireless network, with four laptops reading data from NeuroSky MindWave EEG headsets and providing a personalized graphical user interface for each show host, one system displaying a master control panel to monitor the overall system and provide an emergency manual override, and the sixth acting as a central control server. The control server receives movement commands from each of the client systems and translates those requests into digital signal states on an Arduino prototyping board. Finally, servomotors housed in a robotic enclosure produced by the engineering team at Loughborough University pressed physical buttons on the crane's control.



# Display Interface

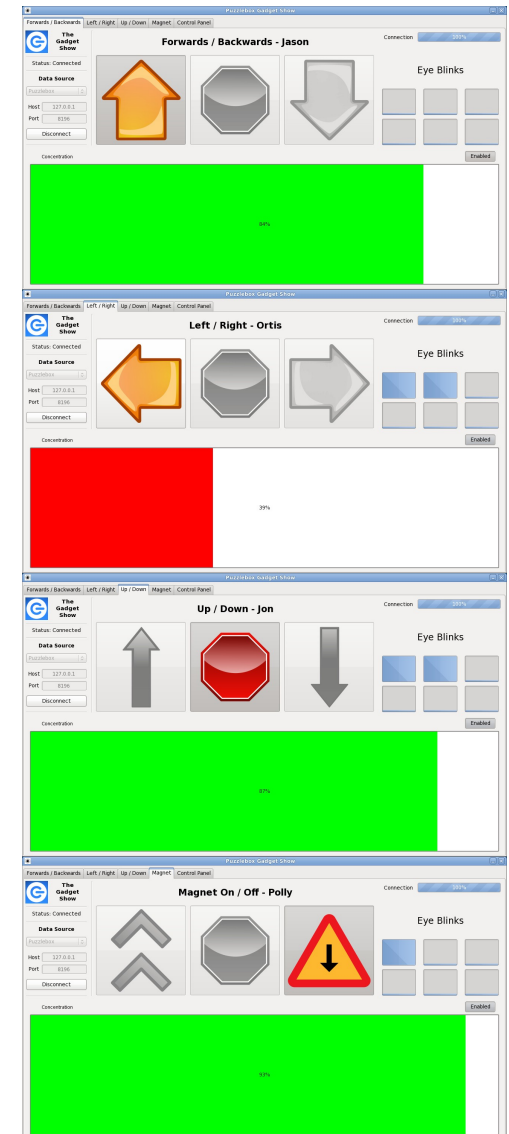


The image displays four instances of the 'Puzzlebox Gadget Show' interface, each showing a different control panel. Each panel includes a status bar, a data source dropdown, host and port information, a connection status indicator, and a concentration gauge.

- Forwards / Backwards - Jason:** Features three directional arrows (Up, Stop, Down) and a concentration gauge at 84%.
- Left / Right - Ortis:** Features three directional arrows (Left, Stop, Right) and a concentration gauge at 39%.
- Up / Down - Jon:** Features three directional arrows (Up, Stop, Down) and a concentration gauge at 87%.
- Magnet On / Off - Polly:** Features three directional arrows (Up, Stop, Down) and a concentration gauge at 83%.

# Display Interface


- Concentration is measured and displayed in real-time
- An interface is personalized and presented to each show host, with a variable control threshold matched to their individual skill level and task
- When concentration levels reach that threshold, the progress bar changes color from red to green and the command for the currently-selected activity is send to the crane through the control server
- Blink detection is performed to permit hands-free swapping between activities
- By selecting the “Stop” command a user can ensure their concentration levels will not accidentally move the crane
- A connection meter indicates device contact quality and signal strength



# Control Panel

**Puzzlebox Gadget Show**

Forwards / Backwards Left / Right Up / Down Magnet **Control Panel**

 **Puzzlebox**

**EEG Headset Model**

**EEG Source**

For information and instructions on using this software please visit:  
<http://puzzlebox.info>

**Submit Feedback**

Please use this form to submit your comments, bug reports, and feature requests

Concentration

94%

Relaxation

43%

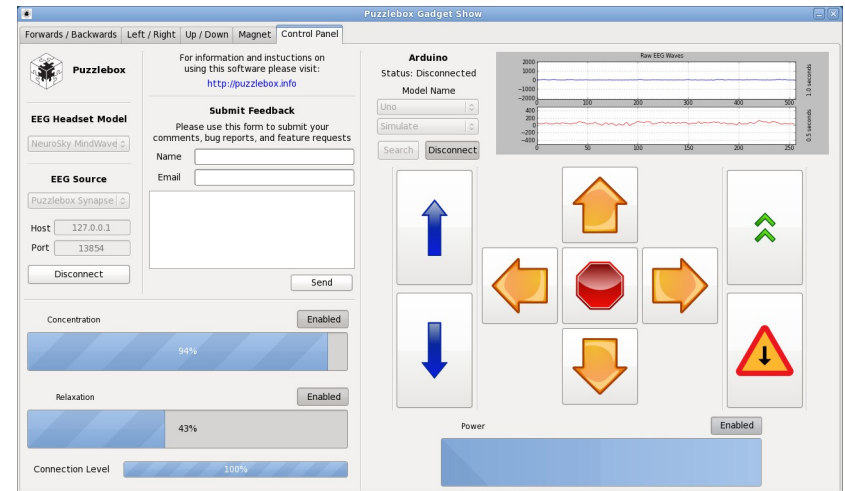
Connection Level

**Arduino**  
Status: Disconnected  
Model Name

Power

# Control Panel

- An independent control panel provides the ability to directly manipulate the crane, including performing an emergency stop mechanism if necessary
- Communications to the Arduino hardware can be performed directly, bypassing the control server
- Measurements of user concentration, relaxation, and device contact and signal strength are charted in real-time
- A power meter displays when the user's control threshold is reached
- Raw EEG signals are graphed and displayed on screen
- An EEG source selection option can be directed to a local or remote ThinkGear Connect capable socket server, such as Puzzlebox Synapse
- A user feedback form is provided to directly contact Puzzlebox support



# Live Production



# Live Production

- The show hosts were unaware of the challenge prior to arriving at the site
- For many this was their first exposure to BCI technology
- During a break, one of the hosts left the premises with their EEG headset still attached, causing a temporary re-connection issue when they returned but otherwise no major issues were encountered during the event
- In the course of filming Suzi Perry, one of the show hosts, was quoted as saying “This might be the coolest thing we've ever done on the Gadget Show!”



# Guinness World Record



The Gadget Show team's effort resulted in a successful completion of the challenge and new Guinness World Record





**Puzzlebox**

