# Resource-Senstive Multimodal Interfaces

- Research carried out by Murray Crease, with Phil Gray & Steve Brewster
- The goal: to produce a widget toolkit that provides appropriate output given the interaction requirements and the resources available



# Why Resource-Sensitive?

- What is Resource-Sensitivity?
  - Form of context sensitivity
- Presentation resource may not be available
  - e.g. no sound card
- Presentation resource may only be available in limited quantities
  - e.g. small screen of mobile device
- Presentation resource may not be suitable
  - e.g. audio feedback in quiet (loud!!??) environment



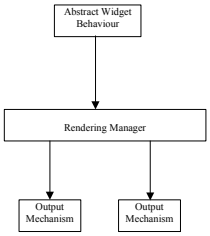
# Toolkit Design - Requirements

- Make multimodal widgets as easy to incorporate as graphical widgets
  - Toolkit of widgets
- Make it easy to incorporate new forms of presentation
  - No assumptions about widget's use
- One interface for multiple platforms
  - Different presentation resources available
  - Different contexts of use



# Toolkit Architecture

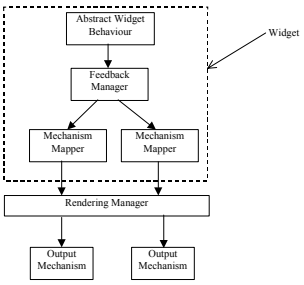
- Separate the behaviour of the widget from the presentation
  - Widget requests presentation
  - Allows the presentation to be easily changed
  - Unsuitable/unachievable requests can be ignored or modified






# Toolkit Architecture

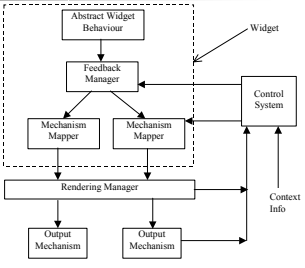
- Allow the feedback of individual widgets to be tailored
  - Which output modality
  - Look & Feel (& Hear) Options





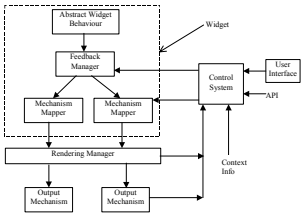

# Toolkit Architecture

- Allow the widgets to be sensitive to context
  - Availability of resources
  - Suitability of resources



# Toolkit Architecture

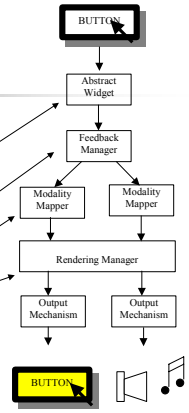
- User control important
  - Provide API to Control System
  - User interface designed






# Example

- User moves mouse over button
  - Event passed to abstract widget which generates request
  - Request split into one for each output mechanism
  - User parameters added
  - Rendering manager checks requests
  - Output generated






# Scenarios

- Button size reduced due to limited screen space
  - Add audio feedback to compensate (Brewster, 1999)
- Audio feedback from progress indicators clashing
  - Differentiate audio feedback (Spatialise, timbre, …)
- Ambient volume increases
  - Increase audio feedback level
- Ambient volume reaches threshold
  - Switch to alternative feedback
- User makes phone call on mobile phone
  - Stop using visual feedback



# Toolkit Implementation

- Most widgets implemented
  - button, menu, progress indicator, radio button, slider
- Simple rules incorporated
  - Ambient volume of environment
  - Screen size
  - Multiple progress indicators



# For More Information

- Murray Crease
  - http://www.dcs.gla.ac.uk/~murray