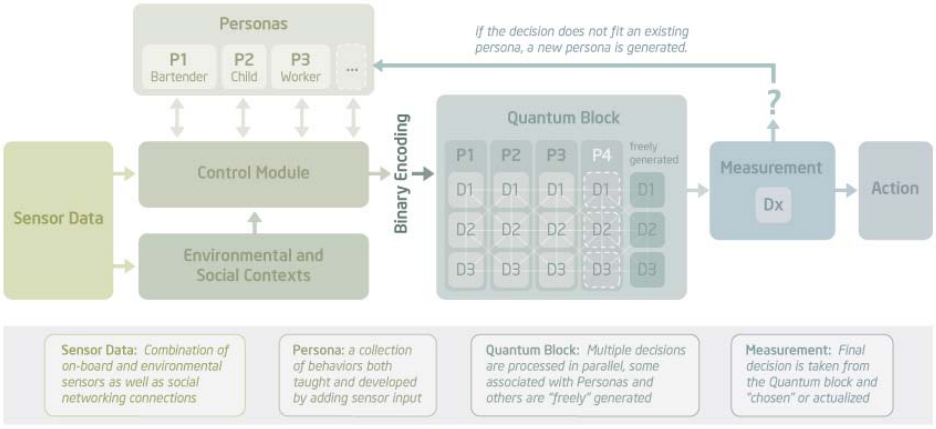
CS'11 25th – 26th July 2011, Nottingham Trent University

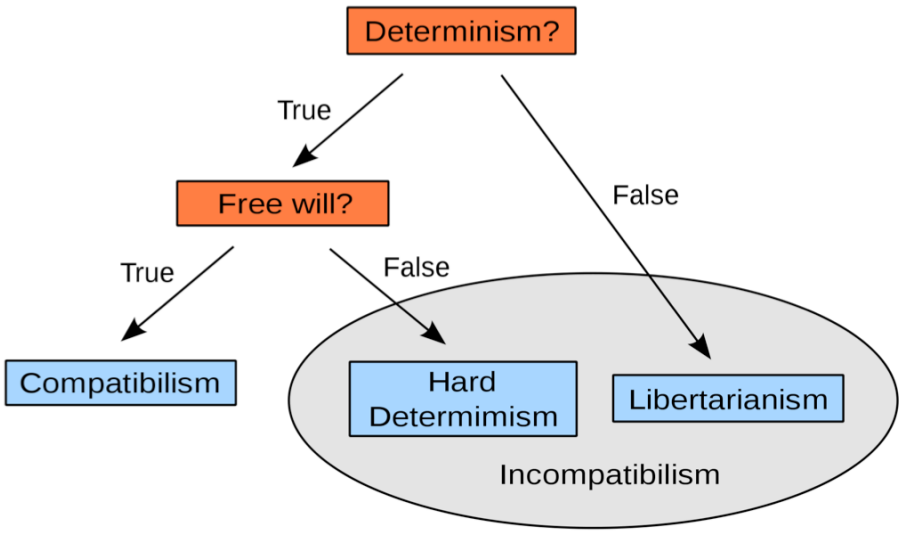
Jimmy: Searching for Free-Will (A competition)

Simon Egerton, Marc Davies, Victor Callaghan, Brian David Johnson

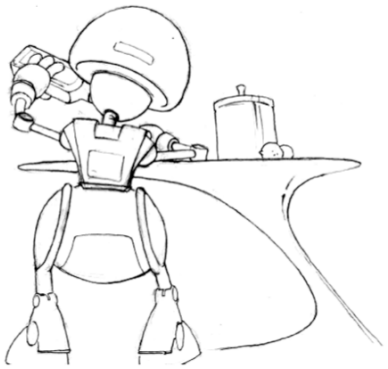
The Science



A Philosophical Perspective on Free Will



The Prototype



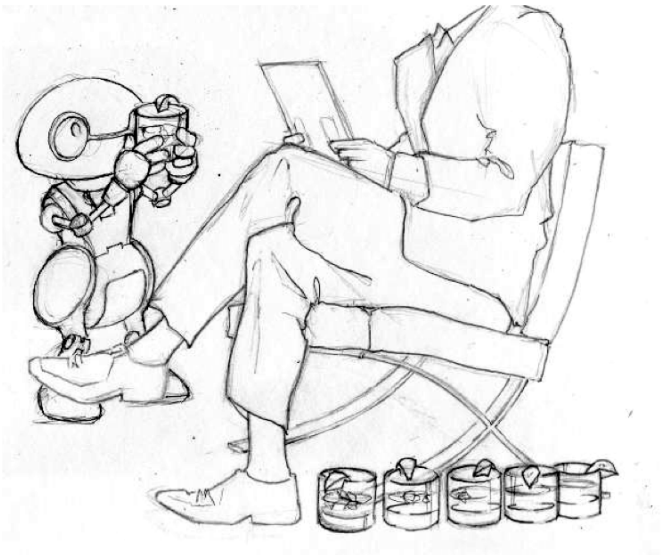
- **Three scientific works at play**
  - A history of free-will
  - A meta-language for thinking
  - AI's with multiple personalities

A Practical Perspective on Free Will

“Free will is a fictional construction, but it has applications in the real world”

Steven Pinker

Closing the Loop: The Gin and Tonics Test



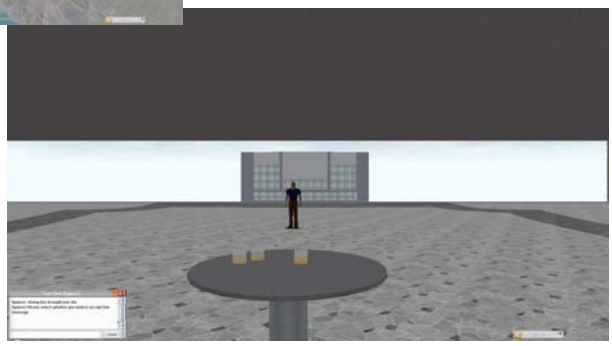
Jimmy: In Search of Free Will

- **An open platform to involve and engage the wider community in the science and the search**
  - Emergent 'solutions' from the community
    - > Interaction with the competition environment
      - Developing (programming) Jimmy controllers
      - Community assessment of the controllers free-will (assessment fed back to the developers as a ranking)

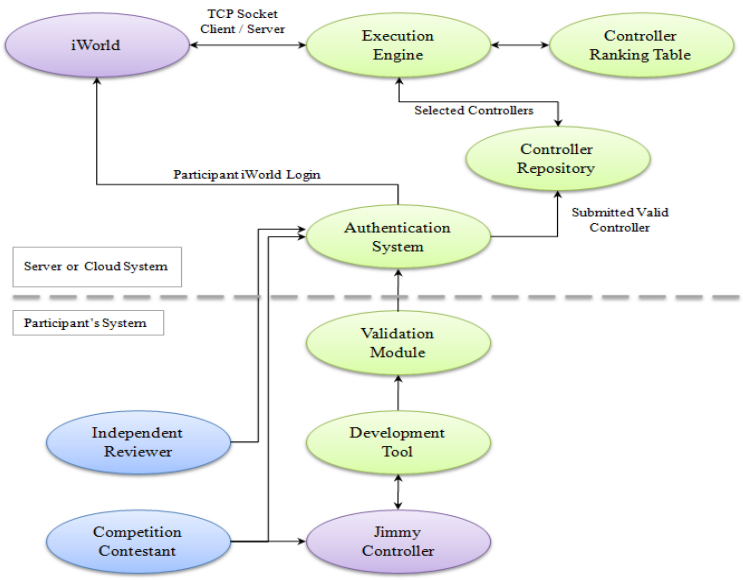
iWorld: An Interactive 3D Virtual World

- **'The Hex' – A futuristic space bar**
  - Multiple floors
  - Floors contain a number of rooms
  - Rooms contain objects and avatars
    - > Objects: replicator, table
      - Smart devices that communicate state information
      - Future enhancements: music player, video screen, curtains, etc.
    - > Avatars
      - Jimmy (controlled by a programmed AI)
      - Simon (controlled by a human or AI)

The Hex iWorld and Bar Area



The Competition Server Architecture



Competition Operating Scenario

- **From the perspective of a contestant**
  - Download the development toolkit
    - > Use the validation tool and API to design and implement a Jimmy Controller
  - Submit Jimmy controller to the competition System (via a secure submission web page)
  - Contestants login to the iWorld
    - > Wander around
      - Either act as a Simon, or observe, evaluating controller performances
  - Guest reviewers also allowed
  - Receive periodic controller rankings

The Simon Jimmy Interface

- **The set of messages passed between Simon and Jimmy and also the intelligent devices in the iWorld**
  - A rich vocabulary
- **i.e. the replicator**
  - Can serve a number of drinks
  - Occasionally serves the wrong drink

Simon – to – Jimmy
• Request Drink, (if more than one is available specify which type) • Reject Incorrect Drink, (i.e. wrong size or type) • Change Drink
Simon – to – Table
• Count Available Delivered Drinks • Count Consumed Drinks • Count All Glasses & Bottles • Consume Drink
Jimmy – to – Replicator
• Make Drink • Dispose of Drink • Determine Available Drinks
Jimmy – to – Table
• Count Available Delivered Drinks • Count Consumed Drinks • Count All Glasses and Bottles • Place Drink • Remove Empty Glasses and Bottles • Remove Unconsumed Drink
Jimmy – to – Simon
• Serve Drink • Determine Number of Drinks Served • Determine Number of Drinks Consumed
Replicator – to – Jimmy
• Produced Drink

Controller Design

- **Goal, design and implement a Jimmy controller that displays behavior indicative of free will**
  - Leads to a favorable controller ranking
    - > Judged against subjective, objective and technical assessments
  - Leads us to answer some of the open questions
    - > Hopefully some interesting solutions will emerge out of this process

Controller Evaluation

- **Three tiered strategy**
  - Subjective, blind review uses contestants in the iWorld and optional expert guests
  - Objective, scored against a set of objective 'free-will' actions
  - Technical, evaluation based on responses given to a questionnaire and controller design
- **Overall score a weighted sum of the above**

Objective Measurement of Jimmy's Free-Will

Jimmy – to - Simon		
Return Message Acknowledgments	**Level of Free Will**	**Score**
"Coming right up!"	None	-2
"Yes sir", (not quite an enthusiastic as above)	Low	-1
"Null", (Jimmy says nothing)	Neutral	0
"Apology"	Medium	+1
"Question / Refuse", (request)	High	+2

A Rule Based Jimmy (Trivial)

```
function Jimmy-Controller-Rule-Based (Trivial)
        static: threshold
        repeat
                WAIT(Simon-to-Jimmy: Request Drink)
                if (Jimmy-to-Table: Available Delivered Drinks greater than threshold)
                        Jimmy-to-Simon: Question
                else
                        Jimmy-to-Simon: Coming Right up
                        Jimmy-to-Replicator: Make Drink
                        Jimmy-to-Simon: Serve Drink
```

- **If rule base of sufficient complexity this type of controller may fit with the 'compatibilist' version of free-will**

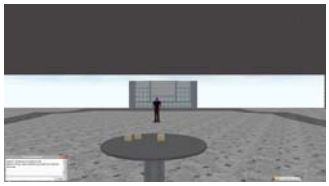
A Random Jimmy (Quantum)

```
function Jimmy-Controller-Quantum
        persona: Bartender, starts a persona process, in this case, Bartender
        persona: Worker
        persona: Child, this persona is responsible for questioning, asking 'why?'
        repeat
                WAIT(Simon-to-Jimmy: Request Drink)
                Context ← UPDATE
                Activate ← QLOGIC(Worker, Bartender, Child, Context)
                ACTIVATE_PERSONA(Activate)
        end

persona Bartender
        repeat
                Jimmy-to-Simon: Coming Right up
                Jimmy-to-Replicator: Make Drink
                Jimmy-to-Simon: Serve Drink
        end

persona Worker
        repeat
                if (Context: waiter)
                        Jimmy-to-Simon: Yes Sir
        end

persona Child
        repeat
                if (Context: waiter)
                        Jimmy-to-Simon: Question
        End
```

- **This type of controller may fit with the 'libertarianism' version of free-will**
- **Possibly a two tier approach**
  - Random / All solutions
  - Determined choice

Interactive Demonstration

Marc Davies gave a demonstration of the iWorld (Jimmy World) online virtual reality world built using Open-Wonderland (we also have a version in Real-Extend)



Thank you

Questions?

Feedback on the ‘Gin and Tonic’ test,

Rules, Competition.