

Creative MultiModal StoryTelling Robots

Expression of Interest

Cognitive Systems Foresight Project

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Co-applicant: Prof. Fionn Murtagh, Royal Holloway, University of London

Co-applicant: Prof. Noel Sharkey, University of Sheffield

Partner/user: Dan Dubowitz, Manchester Ancoats Regeneration Project

Partner/user: BBC

1 Research aims and objectives

- investigate the state of the art in computational storytelling, creativity and multimodality
- design models, algorithms and programs for creative multimodal storytelling robots
- develop and test a creative multimodal storytelling robotic system with varied application domains such as film/drama production

2 Summary of the research

Although there has been work in the field of Cognitive Systems in the areas of creativity, storytelling and robotics there has been little progress in the development of creative storytelling robotic systems, i.e. most systems produce bland, expected stories with little or no element of surprise. In addition, most storytelling systems are unimodal in that they produce stories in one modality (mainly textual language). The aim of this research project is to develop a *creative multimodal storytelling robotic system* which is much more creative in its generation of stories but also which is multimodal, i.e. produces stories not just in textual language form but also with spoken dialogue, non-speech audio (e.g. music) and has embodiment, i.e. storytelling robots.

3 Beneficiaries of the research

This beneficiaries of this research project are that a creative storytelling robotic system has numerous applications in interdisciplinary education and training and film/drama production. Potential partners and user groups are museums and exhibitions such as the mechanical art installations for the regeneration of the Ancoats region of Manchester joint with artist/architect Dan Dubowitz and robot control and construction competitions for children and young adults which Prof. Sharkey has conducted in 26 countries and BBC Northern Ireland (Bright Sparks childrens' science challenge series).

4 Project plan and details of methodology

This project will be conducted over three years with the following deliverables:

- (D-1) Evaluation & testing existing models of creativity
- (D-2) Evaluation & testing existing models of storytelling and multimodality
- (D-3) System design & Report on state of the art
- (D-4) Modelling & programming model of creativity
- (D-5) Modelling & programming model of storytelling

- (D-6) Modelling & programming multimodal storytelling robots
- (D-7) Integration of creativity, storytelling and multimodality modules
- (D-8) Testing of integrated system with storytelling robots
- (D-9) Report on integrated system

The project will be coordinated by the University of Ulster with three RA's, one at each of three sites. The University of Ulster will focus on multimodal spoken dialogue and creative storytelling modelling. The University of London will perform signal and image processing, modeling and visualisation for robot detection of gesture. The University of Sheffield will conduct modelling of multimodal storytelling with a robot depicting gestures in conjunction with spoken dialogue. Creativity within storytelling will be tackled by enabling the computational model to apply artificial life and evolutionary learning techniques such as genetic algorithms to generate a corpus of stories randomly from selected story line and plot data structures.

5 Interdisciplinary aspects & Funders Group

This project is *interdisciplinary* in that it brings together work in the fields of robotics, computer science, artificial intelligence, computational linguistics, bio-inspired methods, signal processing, multimodality, natural language processing, cognitive science, and psychology. It addresses relevance to scientific remits of members of the *Cognitive Systems Funders Group* and Foresight Project since perception, learning, reasoning, decision-making, communication and action for artificial information processing systems are included. The project lies at the interface between life sciences, social sciences, engineering and physical sciences.

6 Project applicants

Prof. Paul Mc Kevitt is Professor of Intelligent MultiMedia at the University of Ulster and former *EPSRC Advanced Fellow* (1994-1999). He has extensive knowledge of theories, models and software engineering for Cognitive Systems with particular emphasis on natural language processing, intelligent multimedia and multimodal systems and has published over 100 articles in international journals, conferences and books and is Editor of *Artificial Intelligence Review Journal* (Springer).

Prof. Fionn Murtagh is Professor of Computer Science at Royal Holloway, University of London. He has research focus on data and information understanding and coding with particular focus on clustering and unsupervised classification and signal and image processing, modeling and visualisation with focus on multiresolution methods and data-driven, physics-based modeling. He has published over 100 academic articles and books and is Editor of *the Computer Journal* (Oxford).

Prof. Noel Sharkey is Professor of Computer Science at the University of Sheffield, and EP-SRC Senior Media Fellow (2004-2007). His main research interests are now in biologically inspired robotics, cognitive processes, history of automata (from ancient times to present), human-robot interaction and communication, representations of emotion, and machine learning. He has published over 100 academic articles and books and is founder and Editor-in-Chief of the journal *Connection Science* (Taylor & Francis).

7 Approximate costs

The budget for this proposed project for a duration of 3 years is £380,000 approximately. This includes the employment of 3 research associates and percentage of existing academic staff time and equipment, travel, consumables, dissemination and indirect costs with Full Economic Costing.